The Role of Risk and Ambiguity Preferences on Early-Childhood Investment: Evidence from Rural India

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Abstract. This study examines how mothers' risk and ambiguity preferences affect early childhood investments and outcomes by assessing over 6,000 mothers in Rajasthan, India. Results show that more risk and ambiguity averse mothers make greater investments in their children's nutrition between ages 0-6. These investments correlate with superior cognitive and non-cognitive skills in children, even after controlling for socioeconomic factors. Notably, higher maternal risk and ambiguity aversion can mitigate negative impacts of socioeconomic disadvantages (maternal illiteracy, belonging to historically discriminated groups, limited media access) on all measures of early-life skills, highlighting the importance of understanding preferences in addressing inequities.

Keywords: Risk Aversion, Ambiguity Attitude, Early-life Skill, Maternal Nutrition Investment, Socio-Economic Disadvantage

JEL Codes: D13, I12, I14, J13, J24

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1. Introduction

At the core of every economic model lie agent preferences, beliefs, and constraints. As such, they represent key contributors to understanding economic growth, social and wealth inequities, and opportunities for policy interventions. Preferences dictate the choices agents make to maximize their utility, while beliefs shape their expectations about the outcomes of these choices. Constraints, whether they be budgetary, informational, or institutional, limit the feasible set of choices available to agents. By analyzing these elements, economists can predict behavior, identify inefficiencies, and propose targeted interventions to enhance welfare and promote equitable growth. For instance, understanding how constraints affect access to education can inform policies aimed at reducing income inequality and fostering long-term economic development.

This study delves into the nuanced interplay between risk and ambiguity preferences and early-childhood investment decisions. Previous research in economics has established that parental investment in early childhood is a key determinant of a child's future success.[1] Yet, despite the recognized importance of early-childhood investment, there remains significant heterogeneity in parental investment behaviors. We explore the role of risk and ambiguity preferences in shaping these investment decisions. By examining how parents' tolerance for risk and ambiguity influence their choices regarding early-childhood education and health investments, we aim to uncover underlying mechanisms that contribute to disparities in child development outcomes.

Our experimental setting is 495 villages in the district of Udaipur, in the State of Rajasthan. The district is characterized as a very poor region of India: only 6.1% of the children under the age of two receive adequate diets (Ministry of Health and Family Welfare, Government of India), leading to one of the highest infant mortality rates in Rajasthan, which has infant mortality rates of 32 per 1000. Our experimental sample consists of randomly sampling 6,557 mothers of children between 0 and 6 with approximately 14 mothers from each village.

The crux of our data collection revolves around three areas. First, we apply the elicitation methodology developed in Gneezy, Imas and List (2015) to jointly estimate risk and ambiguity preference parameters of mothers of infants. Second, contextualizing survey questions taken from the Demographic and Health Survey (DHS), we obtained information on nutrition investment in children and data on a range of household and individual characteristics of each mother in the sample. Third, we administered Woodcock-Johnson III, Peabody Picture Vocabulary, Clancy Blair, and Spatial Conflict tests to measure the cognitive and non-cognitive skills of one child per mother. Combined, these three areas provide the necessary information to examine the correlation of preferences for risk and ambiguity with nutrition investments and children's outcomes in our low-income context.

We document three main findings. First, we find substantial variation in both risk and ambiguity aversion parameters. For example, the first two moments of the coefficient of risk aversion among the population of disadvantaged mothers of infants in high child-mortality environments are consistent with the findings in the literature (Holt and Laury, 2002; Tanaka et al., 2010; Andreoni et al., 2013; Gneezy et al., 2015). Likewise, the parameter estimate of ambiguity attitude is statistically significantly ($p < .001$) higher than the ambiguity neutral estimate of 0.5 and shows considerable variability. In sum, the variation achieved from the elicitation experiment provides a baseline for exploring maternal investment heterogeneity.

[1] See, for example, Heckman (2006); Chuan et al. (2022); Fryer et al. (2015).

Second, using survey data to measure regular food administration to children in the age group 0-6 years, we estimate the correlation between the coefficient of risk and ambiguity aversion parameters of mothers and their child investment decisions after controlling for unobserved region fixed effects, mother's literacy, Caste/Tribe, and a range of socioeconomic covariates. We find that there is a crucial link between ambiguity and risk attitudes of mothers and their daily nutrition investments, including giving essential milk food products and providing vegetables and fruits, juices, and liquids other than water. For the youngest children in our sample, the estimates of ambiguity and risk aversion positively predict months of breastfeeding.

Third, consistent with our findings on children's investment, we find a relationship between risk and ambiguity and children's cognitive skills, as measured using Woodcock-Johnson III and Peabody Picture Vocabulary, and non-cognitive outcomes, as measured using Clancy Blair and Spatial Conflict measures. Strikingly, in relation to these early-life outcomes, the positive association of preference primitives, such as ambiguity and risk aversion, offsets the adverse effects of a range of proxies of socioeconomic disadvantage such as mother's illiteracy, Caste/Tribe, no exposure to radio, television, and no access to mobile phones.

We view our paper contributing to several strands of literature. First, it contributes to the literature on early childhood that highlights the importance of nutrition and health investments by caregivers on child outcomes (East et al., 2023; Bailey et al., 2021). In particular, it expands on the literature that establishes the salience of early life health (Currie and Vogl, 2013; Almond and Currie, 2011) by examining latent factors that could determine parental decisions impacting early-life skills and health. To our best knowledge, our study is the first to document a robust and stable empirical relationship between ambiguity attitude and risk posture on nutritional investment decisions of disadvantaged mothers and link those to early-life skills of their children.[2] Our findings in this area point toward potential mechanisms underlying investment choices by parents that could determine the impact of early childhood programs.

Second, there is a literature that reveals a systematic relationship between the socioeconomic status of parents and its impact on children (Currie, 2009; Falk et al., 2021). Aligned with this work, we find that educational disadvantages of the mothers, such as inability to read, socioeconomic disadvantages measured by belonging to a Scheduled Caste/Tribe, no access to mobile phones, television or radio, and no home-ownership have negative effects on nutrition investment and child skill. However, we show that apriori economic preference parameters of mothers can largely offset the negative effects of social disadvantage, including illiteracy of mothers, belonging to Scheduled Caste/Tribe, no access to mobile phones, television, or radio, in particular for early-life skills of the children.

Third, while other work has focused on the import of parental beliefs both theoretically (Cunha et al., 2013) and empirically (List et al., 2021) on human capital investment and formation, we present stylized facts in low-income settings that show risk and ambiguity preferences, which are key determinants of belief formation, are robust predictors of parental choices. Broadly, our work provides empirical micro-foundations to potential mechanisms underlying robust evidence on the significance early-childhood interventions for

[2]Our findings are aligned with Rieger (2015), who documents the correlation between risk aversion of primary caregivers and child health outcomes, particularly height- and weight-for-age. We show nutritional inputs indeed differ between households with different preference primitives, which potentially affects children's cognitive and non-cognitive outcomes.

economic outcomes[3] and social preferences (Cappelen et al., 2020; Bharti and Roy, 2023; Billings et al., 2020).

Finally, methodologically, our work applies a double multiple price list (DMPL) to jointly estimate the risk and ambiguity attitudes of mothers from low-income settings. We add to the literature on risk elicitation (Holt and Laury, 2002) by jointly estimating risk and ambiguity attitudes in a field experiment. Our approach shows how researchers can leverage a complicated elicitation approach in a setting with a sample of subjects who have low education levels.

The remainder of our paper is organized as follows. Section 2 provides the context and details of our data. Section 3 presents the structural model, estimation, and elicitation of risk and ambiguity parameters. Section 4 presents the results. Section 5 concludes.

2. Context and Data

Our experimental setting is the district of Udaipur in Rajasthan. According to the most recent figures from the Reserve Bank of India of India (2022), Rajasthan has one of the highest infant mortality rates in India (32 per thousand), which remains a factor of magnitude higher than that of the OECD countries. Anaemia is prevalent among children between the ages of 6 to 59 months (with a rate of 71.5%), and large shares of the child population under the age of four are stunted (36.8%) and underweight (31.5%) (Ministry of Health and Family Welfare, Government of India, UNICEF, and Population Council, 2019). These large figures are unsurprising given that it is estimated that only 3.5% children under the age of two in Rajasthan are fed the minimum acceptable diet as defined by the WHO in terms of the minimum appropriate number of meals and minimum amount of nutrients (Ministry of Health and Family Welfare, Government of India, UNICEF, and Population Council, 2019).

In the Udaipur district, anaemia among children between the ages of 6 to 59 months is comparable to the state's average (76.9%), similarly to the share of children under the age of five who are stunted (34.0%) and/or underweight (26.6%). Only 6.1% of children under the age of two are receiving an adequate diet (Ministry of Health and Family Welfare, Government of India, 2021). Therefore, our study setting is an ideal environment where the benefit-cost ratio of policy interventions to increase parental early childhood investment is likely to be high. Our study examines the fundamental preference traits that potentially explain differences in early-life investment choices by disadvantaged mothers, shedding light on potential mediators that the policies can take into account for higher impact.

2.1. **Village Sample and Data Collection.**

For the survey and elicitation of risk and ambiguity parameters of mothers of infants between the ages of 0 and 6, we obtained access to six administrative blocks in the district. We restricted our sample to villages and dropped villages where no households were recorded in the district census. Additionally, we dropped blocks where there were other ongoing projects.[4]

We followed simple stratified random sampling, where we stratified the sample by the total number of children per hectare, literacy rate, and administrative block. We kept strata that had at least four villages per strata. This yielded 496 villages in the sample, out of which one village was dropped out due to administrative issues. Mothers were randomly sampled from each village in Anganwadis (i.e., pre-K

[3]See, for example, Heckman (2006); Bleakley (2007); Almond et al. (2009); Maccini and Yang (2009); Aizer and Cunha (2012); Bharadwaj et al. (2013); Almond (2006); Bleakley (2010); Gould et al. (2011).

[4]This led us to drop five blocks from the sample.

centers). We elicited measures of preference for risk and ambiguity aversion for 14 mothers, on average, from each village in our estimation sample. For each mother, we collected data on their regular nutrition investment in their children and the early-life skills of one child who attends the Anganwadis.[5]

Using an approach that closely followed the version of Demographic and Health Survey (DHS)[6] questionnaire that is designed for India,[7] we collected detailed data on food intake, such as milk products, fruits and vegetables, cereals, juices, and water intake, of the two youngest children alive between the age of 0-6. We also surveyed mothers of the children to obtain information on maternal characteristics, including age, religion, caste, literacy, marital status, partner's occupation, age and schooling, mother's exposure to newspaper, radio, television, usage of mobile phones, house ownership, and age of each of her children.

Table 1 provides summary statistics of mothers' covariates in our sample. Our sample mostly consists of mothers who are Hindus but belong to a Scheduled Tribe. The average age of the respondent mothers is 28 years, of whom about 58% of the sample population are illiterate. More than 70% of the women have no exposure to newspapers, television, or radio, with more than 50% of the mothers not having any house ownership. Most of the women have partners who had a job in the past month. There is less variation in child mortality across the administrative blocks, with an average of 11% of mothers having had at least one child who died after birth.

We measured cognitive skills of the children using Woodcock-Johnson III, which consists of assessments including letter word identification, spelling, number series, quantitative, and applied problems. We used the Peabody Picture Vocabulary (PPV) test to assess receptive vocabulary. In PPV, four pictures are shown, and the child points to the one that corresponds to the said word. This approach to cognitive skill measurement is common in the literature (see, e.g., Fryer et al. (2015)).

To assess executive functioning, we used Clancy Blair's measures, which focused on working memory, attention shifting, and operation span. In the Clancy Blair test, the kids are shown images of houses with animals inside of each house. They are later shown empty houses and are asked to recall the animal that was there in the house. We further assessed non-cognitive skills using Spatial Conflict "Basic Arrows Task". In this test, the kids were presented with images of dogs pointing in different directions, and beads were placed on either side of the dog. The kids were asked to point to the bead that the dog was pointing to. For example, if the dog was pointing to the right, then the kids were expected to touch the bead on the right with their left hand. If the dog was pointing to the left, then the kids were expected to touch the beads on the left with their right hand. The surveyors provided corrections until question 6, after which the kids were asked to choose by themselves.

To estimate risk and ambiguity parameters of the mothers, we adopted the risk and ambiguity preference model-based elicitation method in Gneezy, Imas and List (2015). We elaborate on the instrument in the next section. Due to logistical reasons, we collected data on the cognitive and non-cognitive skills of one, randomly selected, child between the ages of 0 and 6 per mother. Therefore, there are 6,465 mother-child

[5]A total of 8,340 mothers were surveyed, of whom 8,055 responded to both the risk and ambiguity elicitation questions. Building on Gneezy, Imas and List (2015), we apply the Broyden-Fletcher-Goldfarb-Shanno (BFGS) optimization algorithm to maximize the likelihood function and derive estimates for the ambiguity and risk parameters. This approach yields estimates for 6,557 mothers.

[6]https://dhsprogram.com

[7]DHS surveys, in general, have been widely used in seminal academic research in economics, some examples include Vogl (2013); Barcellos et al. (2014); Vogl (2016); Adhvaryu et al. (2014); Fenske and Zurimendi (2017); Corno et al. (2020); Ashraf et al. (2020); Young (2012).

pairs for whom we have fundamental preference parameters of the mother and measures of cognitive and non-cognitive skills of their child.

3. Model and Structural Estimation

To elicit risk and ambiguity measures for each mother, we use the method developed in Gneezy, Imas and List (2015) that can jointly characterize such preferences in laboratory and field settings, where computer access is low and complex instructions are less likely to be understood. The elicitation method uses a double multiple price list (DMPL), and generates choice data to estimate the coefficient of risk aversion, denoted as r, and attitudes towards ambiguity, denoted as α, of the $\alpha-$MEU model. That is, we use the $\alpha-$MEU model with fixed priors (Ghirardato et al., 2004), whereby the utility specification is the CRRA model:

$$V_i(x, \alpha, r) = \alpha_i \frac{x_{min}^{1-r_i}}{1-r_i} + (1-\alpha_i)\frac{x_{max}^{1-r_i}}{1-r_i} \tag{1}$$

With $x_{min} > x_{max}$. α_i represents the ambiguity parameter of i, and r_i is the risk aversion parameter of i.

The estimation method derives the likelihood of choices made by individual i. The likelihood function is composed of two components: the contribution to the likelihood by the choices in the risky gambles, and the contribution to the likelihood by the ambiguous gambles' choices. The derivation of the likelihood of the choices in the risky gamble is as follows. The participants are given a binary gamble. An individual i's utility from the gamble is as follows:

$$V_i(y, r) = \sum_{j=1,2} p(x_j) u_i(x_j; r) \tag{2}$$

Where x_j is the outcome of the gamble, $p(x_j)$ is the probability of the outcome and y is the gamble from a set Y. In our context, the set of Y $= \{y_A, y_B\}$.

We assume individuals maximize the random utility model:

$$U_i(y, r) = V_i(y, r) + \epsilon_{iy} \tag{3}$$

where, ϵ_{iy} is i.i.d and follows extreme value distribution. The assumption on the distribution yields choice probability as

$$P^{Risk}(y) = \frac{exp(V_i(y, r))}{\sum_{k=A,B} exp(V_i(y, r))} \tag{4}$$

To derive the likelihood function of choices under ambiguity, we first specify the gamble set Z$=\{z_A, z_B\}$.

Utility from gamble z_A is given by

$$V_i(z_A, r) = \sum_{j=1,2} u_i(x_j, r) p(x_j) \tag{5}$$

where x_j is outcome j, $p(x_j)$ is the probability of outcome x_j, and z_A corresponds to gamble A, where the probability of outcomes are known and fixed.

Utility from gamble z_B is given by

$$V_i(z_B, r) = \alpha_i u_i(x_{min}, r) + (1 - \alpha_i) u_i(x_{max}, r) \tag{6}$$

We assume that individuals have random utility functions with extreme value distribution of errors. Therefore, the probability of choosing from a particular gamble z equals

$$P^{Amb}(z) = \frac{exp(V_i(z, r))}{\sum_{k=A,B} exp(V_i(z, r))} \tag{7}$$

Therefore, the joint likelihood function of the choice in the gambles under uncertainty and objective probability is

$$logL = P^{Amb}(z) + P^{Risk}(y) \tag{8}$$

Finally, we use the Broyden-Fletcher-Goldfarb-Shanno optimization algorithm to jointly estimate the risk and ambiguity parameters.

3.1. **Elicitation Implementation.** Our overarching approach to elicitation is to first have mothers make choices over gambles where the probabilities of each outcome are known, and then they are asked to make decisions wherein the probabilities of some gambles are known while others are ambiguous. The elicitation method uses multiple price lists (MPL) to elicit choices following Holt and Laury (2002).[8]

Participants were presented with ten decisions between pairs of gambles with objective probabilities over outcomes (see Appendix: Task H). As can be seen from the instrument, decisions were placed in rows, each of which involves a choice between a gamble Option A in the left column and a gamble Option B in the right column. The payoffs for Options A and B were constant for each decision. The probability of obtaining the higher payoffs in each gamble increases as one moves down the rows. For example in the first decision the mothers had to chose between Option A with 1 in 10 chance of 84 rupees and a 9/10 chance of getting 63 rupees; while Option B had a 1 in 10 chance of 168 rupees and a 9 in 10 chance of 10.5 rupees. By decision 10, the choice is between 10 in 10 chance of 84 rupees in Option A and a 10 in 10 chance of 168 rupees in Option B. Excluding high risk-seeking individuals, the list of options implied a pattern of choice where the participant begins by choosing Option A in the first row, i.e., the first decision, and then switches over to Option B at some row before the last row. The point where the participant switches from Option A to Option B, the "switch point," is used to characterize the individual's risk attitude.

A separate multiple-price list was used to elicit ambiguity attitudes. We presented individuals with decisions between gambles with known and unknown probabilities (see Appendix: Task T). Participants were presented with two urns. Urn A contained 50 red balls and 50 black balls; Urn B contained 100 red and black balls, but the distribution of colors was not known. They were asked to choose red or black, which would act as their success color, and then make a series of 15 decisions between drawing a ball from

[8]There is a long-standing literature in behavioral economics using MPL elicitation method (Kahneman et al., 1990) to measure discount rates (Andersen et al., 2008; Coller and Williams, 1999) and risk preferences (Holt and Laury, 2002).

Urn A or Urn B. If the ball's color drawn from the chosen urn matched their success color, then they would win the prize corresponding to that decision. They would win nothing if the drawn color did not match the chosen color. Decisions were stacked in rows, each row being a choice of a draw from Urn A or Urn B. The payoffs for Urn A were constant in each decision, but the payoffs for Urn B increased as one moved down the decision rows. We designed the payoffs so that unless the mothers are extremely ambiguity-loving, they would start with choosing Urn A in the first decision and, at some point, switch to Urn B, where the winning probability is not known.

In the instrument, participants effectively make a single choice: which decision row they would like to switch from Option A (Urn A) to Option B (Urn B). We do not allow individuals to switch more than once, for it can potentially lead to a significant number of inconsistent decisions (Charness et al., 2016; Dave et al., 2010; Jacobson and Petrie, 2009), which are difficult to rationalize with any standard model of preferences and are usually excluded from the analysis. This leads to a significant amount of data needing to be recovered. Enforcing a single switching choice circumvents this issue and has been shown to not significantly affect the elicited parameters (Andersen et al., 2006). Tanaka et al. (2010) have used single switching choice to elicit time and risk preferences from Vietnamese villages.

Choices within our instrument are theoretically incentive-compatible. The participants are paid according to the realization of only one decision across both MPLs. At the end of the experiment, a coin was flipped. If the outcome is Heads, then the risk elicitation MPL is used (Task H); if Tails, then the ambiguity elicitation MPL is used (Task T). A 10- or 15-sided die is then rolled to determine what decision row is used for the participant's choice. This ensures that the elicitation method does not suffer from the procedural confounds outlined by Azrieli et al. (2012).[9]

4. Results

We begin with three basic preliminaries of our data. First, as presented in Appendix Table A.I, we document a large coefficient of risk aversion in the population. The coefficient estimate is 0.481 (s.e.= 0.0017), close to the estimate found in the literature (Tanaka et al., 2010; Holt and Laury, 2002; Gneezy et al., 2015; Andreoni et al., 2013). Second, the estimated value of ambiguity attitude is 0.525 (s.e.= 0.0014), which is statistically significantly greater than the ambiguity neutral value of 0.5. The parameter estimate of ambiguity attitude is similar to the estimates found for university students in the US population (Gneezy et al., 2015). Finally, we find enough variation in both risk and ambiguity aversion parameters to permit an exploration of their relationship with our key outcome metrics.

4.1. **Role of Coefficient of Risk Aversion and Ambiguity Aversion.**

Research on early childhood has shown that returns to early childhood programs are large for socially disadvantaged parents. One hypothesis for this result is that such parents are not optimally investing during the early life years (see Heckman (2008) for a review). While the reasons for this non-optimality range from constraints to preferences to beliefs,

[9]One other issue that commonly arises in such choice settings is the "flat payoff" problem (List, 2025). Even in our low-income setting, it is important to explore the payoff space to check whether the elicitation mechanism can be reasonably believed to have incentive compatibility in an empirical sense. In our case, the expected values of the lotteries vary from a low of close to 26 rupees to a high of 168 rupees. For reference, the daily wage for unskilled labor in Rajasthan is 285 rupees. So, our most favorable lotteries have an expected value greater than half of the daily wage. In terms of marginal incentives to effort: a risk neutral individual who would choose rationally to switch after the third option, would have an expected value of close to 105 rupees; while an individual that chose at random would have 96 rupees in expectation.

the literature documents parental beliefs about early childhood investment as a potential driver of the disparities in parental inputs (Attanasio et al., 2019; Bhalotra et al., 2020; Biroli et al., 2022; Boneva and Rauh, 2018; Carneiro et al., 2019; Cunha et al., 2022). List et al. (2021), for example, find that parental beliefs are malleable and can be affected with information interventions to produce positive outcomes for children.

Ambiguity and risk aversion form primitive factors of individual preferences that are also potentially key drivers of how individuals make choices. In Table 2, we find that ambiguity aversion and above-median risk aversion significantly predict maternal early-life nutrition investments, measured as the probability of provision of essential milk food products, vegetables, and fruits and liquids other than plain water such as juice, broth, etc. The estimates suggest that ambiguity aversion increases the likelihood of nutritious food intake by circa $2-6$ percentage points. Likewise, a high risk aversion coefficient increases the probability of nutritious food intake by circa $2-6$ percentage points.

Importantly, the correlation coefficient is robust to alternative measures of ambiguity attitude and risk aversion (including standard deviation changes in ambiguity attitude and risk aversion) and is largely stable across specifications, as presented in Appendix Tables A.II,A.III and A.IV. As expected, proxies of socioeconomic disadvantage, including inability to read, belonging to historically discriminated and disadvantaged social groups such as Scheduled Castes and Scheduled Tribes, no exposure to radio or television, and no home ownership negatively predict nutrition investment. In Appendix Table A.V, we show that ambiguity aversion and risk aversion increase months of breastfeeding for younger children (average age under three years old) by 7% of average breastfeeding months, which corresponds to a month increase. The stability of the coefficient across specifications suggests socioeconomic covariates do not confound the relation between preference primitives and investment decisions.

Descriptively, early childhood investments have been linked to parental preference for a particular sex of children (Duflo, 2012).[10] Seminal work on child stunting in India (Jayachandran and Pande, 2017) indicates that India's height disadvantage relative to Africa increases with birth order due to resource allocation to the eldest sons resulting from social norms. In Appendix Table A.VI, we do not find differences between the predictability of risk and ambiguity parameters on children's nutrition investment of similarly aged girls and boys. A higher coefficient for risk aversion and ambiguity aversion is associated with mothers' higher likelihood of nutrition investment regardless of gender. It is plausible that economic preferences can determine outcomes independently of social norms. This is consistent with the fact that the correlation coefficient of risk and ambiguity aversion parameters remains relatively unchanged for most early-life investment decisions with the inclusion of socioeconomic covariates.

For children's early-life skills, we present Table 3, which summarizes the role of ambiguity and risk posture. The estimates suggest that ambiguity aversion and a high coefficient of risk aversion positively predict non-cognitive outcomes, measured using spatial conflict score and Clancy Blair tests. The correlation coefficient ranges from $0.19-0.22$ standard deviations for ambiguity aversion and $0.13-0.16$ standard deviations for risk aversion. Interestingly, the positive effects of preference primitives serve to offset the negative effects of socioeconomic disadvantage proxies, such as illiteracy, no exposure to radio or television,

[10]Note that these preferences are not universal; see for example Baker and Milligan (2016) showing that such preferences do not seem to be present in Western countries.

and no access to mobile phones. Relatedly, it is interesting to note that the mother's age is positively correlated with non-cognitive outcomes.

In terms of cognitive skills, we summarize the main results in Table 4. We find that ambiguity aversion and risk aversion are positively, and significantly, correlated with cognitive outcomes, as measured by Woodcock-Johnson III and Peabody tests. The coefficient estimates range from $0.14 - 0.22$ standard deviations for ambiguity aversion and $0.06 - 0.17$ standard deviations for risk aversion. Consistent with findings for non-cognitive outcomes, ambiguity aversion has a higher correlation coefficient than socioeconomic covariates, such as illiteracy, Scheduled Tribes, Caste, exposure to television, no access to mobile phones, and age of the mother. We show in Appendix Table A.VII and A.VIII that the results are robust to alternative measures of ambiguity attitude and risk aversion, such as standard deviation change in ambiguity attitude and coefficient of risk aversion. Combined with recent work measuring the drivers of long-term outcomes (Castillo et al., 2024), our results suggest that mother's ambiguity and risk preferences are a key determinant of later life outcomes via early life skill development.

5. Conclusion

This study highlights the profound impact that maternal risk and ambiguity aversion can have on early childhood investments and subsequent developmental outcomes. By demonstrating that mothers who exhibit higher levels of these traits tend to invest more in their children's nutrition, leading to enhanced cognitive and non-cognitive skills, we uncover a crucial mechanism for mitigating socio-economic disparities. Our findings suggest that targeted support for at-risk populations could leverage these maternal tendencies to foster better outcomes for children, even in the face of socio-economic disadvantages. This result underscores the importance of considering individual preferences and beliefs in the design of public policies aimed at reducing inequality and promoting economic growth.

We view our work as an early, large-scale, contribution that documents the salience of parents' economic preferences on early childhood parental investment and resultant children's outcomes and compares it with other socioeconomic covariates. Ultimately, our research points to a promising pathway: empowering mothers through informed interventions can translate into substantial benefits for the next generation, helping to break the cycle of poverty and build a more equitable society. The insights gained from this study can inform a range of strategies aimed at fostering resilience and opportunity in vulnerable communities.

The socioeconomic disadvantage of parents has motivated several iconic early childhood programs, including the Perry Preschool Project and the Carolina Abecedarian Project. (ABC) and the Carolina Approach to Responsive Education (CARE), which have shown to have substantial positive life-cycle benefits and intergenerational effects (García et al., 2020; Heckman and Karapakula, 2019). The next steps in this research agenda should pinpoint the causal forces underlying our results. We provide key heterogeneity in a descriptive moderation analysis. Yet, the analysis should not stop there. For example, future work should explore the factors that contribute to risk and ambiguity postures and use causal moderation to pin down exact sources of heterogeneity. This is necessary because we are then able to design policies and change institutions to leverage such causal insights (List, 2025).

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TABLE 1. SUMMARY STATISTICS

Mother's Covariates and Children Outcomes	Mean	Std. Dev	N
Hindu	0.989	0.104	6557
Muslim	0.004	0.063	6557
Scheduled Caste	0.120	0.325	6482
Scheduled Tribe	0.694	0.461	6482
Child visits Anganwadi (1-2 days a week)	0.366	0.482	6557
Child visits Anganwadi (2-5 days a week)	0.382	0.486	6557
Mother's Age	28.029	4.826	6557
Can't Read	0.576	0.494	6557
No Exposure to Newspaper	0.843	0.364	2764
No Exposure to Television	0.718	0.450	6557
No Exposure to Radio	0.962	0.192	6557
No Access to Mobile Phone	0.495	0.500	6557
At-least one Child Not Alive	0.117	0.322	6557
No House Ownership	0.521	0.500	6557
No Land Ownership	0.545	0.498	6557
Partner's Age	31.209	5.495	6468
Partner Passed Grade 10	0.126	0.331	5337
Partner Worked Last Month	0.905	0.293	6442
Married Living With Partner	0.913	0.282	6557
Rural Migrant	0.966	0.180	6486

Notes: This table presents summary statistics for the sample of mothers in our estimations. The variable Hindu, Muslim, Scheduled Tribe, and Scheduled Castes represent a share of mothers belonging to the Hindu religion, Muslim religion, Scheduled Tribe, and Scheduled Castes group, respectively. Child visits to Anganwadi (1-2 days a week) are the share of children visiting Anganwadi (i.e., pre-K school) for 1-2 days a week. Child visits to Anganwadi (2-5 days a week) are the share of children visiting Anganwadi (i.e., pre-K school) for 2-5 days a week. Mother's Age is the average age of the mothers in the population. Can't Read is the share of mothers who cannot read at all. No exposure to newspapers is the share of mothers who responded "Not At All" to the survey question. "Do you read a newspaper or magazine at least once a week, less than once a week, or not at all? ". No exposure to television is the share of mothers who responded "Not At All" to the survey question "Do you watch television at least once a week or less than once a week or not at all?". No exposure to radio is the share of mothers who responded "Not At All" to the survey question "Do you listen to the radio at least once a week, less than once a week, or not at all? No access to mobile phones is the share of mothers who report that they do not own mobile phones. At least one child not alive is the share of mothers who responded yes to the survey question "Have Have you ever given birth to a boy or the girl who was born alive but later died?". No house ownership and no land ownership are shares of mothers of mothers who do not own any house alone or jointly with someone else, and shares of mothers who do not own any agricultural or non-agricultural land alone or jointly with someone else. Partner's Age is the average age of the partner/husband of the mother. Partner Passed Grade 10 is the share of mothers whose partner/husband is reported to have completed grade 10 of schooling. Partner worked last month is the share of mothers whose partner/husband did paid work last month. Married living with a partner is the share of mothers who are married and living with their spouse/partner. Rural migrant is the share of mothers who migrated from a rural region.

TABLE 2. Risk-Ambiguity Parameter Predicting Nutrition Investment in Children

	Milk Products		Veg-Fruit		Juice-Oth	
	(1) Child 1	(2) Child 2	(3) Child 1	(4) Child 2	(5) Child 1	(6) Child 2
Amb. Averse (=1)	0.0139	0.0571***	0.0361***	0.0259*	0.0400***	0.0509***
	(0.0167)	(0.0204)	(0.0124)	(0.0136)	(0.0115)	(0.0157)
High Coeff. of Risk Aver (=1)	0.0279*	0.0596***	0.0240**	0.0146	0.0457***	0.0486***
	(0.0145)	(0.0205)	(0.0117)	(0.0102)	(0.0108)	(0.0147)
Married liv./w partner	-0.0129	0.0371	0.0365*	0.0627**	-0.00437	-0.0121
	(0.0262)	(0.0352)	(0.0217)	(0.0290)	(0.0122)	(0.0133)
Cant Read	-0.0814***	-0.0724***	-0.0155	0.0190*	-0.00742	-0.0190**
	(0.0160)	(0.0178)	(0.0119)	(0.0112)	(0.00828)	(0.00968)
Hindu	0.0875	0.0635	-0.0741	-0.0161	-0.0404	0.00810
	(0.0579)	(0.0988)	(0.0513)	(0.0615)	(0.0530)	(0.0407)
Sch. Caste	-0.137***	-0.112***	-0.0203	-0.00486	-0.0560***	-0.0678***
	(0.0276)	(0.0425)	(0.0200)	(0.0209)	(0.0159)	(0.0217)
Sch. Tribe	-0.151***	-0.122***	-0.0136	0.00752	-0.0267**	-0.0291*
	(0.0215)	(0.0316)	(0.0149)	(0.0154)	(0.0118)	(0.0154)
Child Mortality = 1, Yes	0.0137	0.0587**	0.0262	-0.00566	-0.00449	-0.0182
	(0.0206)	(0.0261)	(0.0162)	(0.0155)	(0.00981)	(0.0124)
No Exp. to Radio	-0.0982***	-0.116**	-0.0421**	-0.0208	-0.128***	-0.137***
	(0.0359)	(0.0490)	(0.0197)	(0.0226)	(0.0333)	(0.0454)
No Exp. to Mobile	-0.0450**	-0.0163	0.0183	0.0385***	-0.0156**	0.00481
	(0.0179)	(0.0208)	(0.0133)	(0.0109)	(0.00693)	(0.00947)
No Exp. to Television	-0.0876***	-0.0744***	-0.0582***	-0.0317**	-0.0175**	-0.0184*
	(0.0167)	(0.0212)	(0.0129)	(0.0127)	(0.00874)	(0.0102)
No House Own.	-0.109***	-0.112***	-0.0147	0.00914	-0.0798***	-0.0755***
	(0.0230)	(0.0253)	(0.0137)	(0.0123)	(0.0129)	(0.0159)
Young Mother (<27 yrs)	-0.00128	0.00225	-0.0106	0.00857	0.00243	-0.00312
	(0.0142)	(0.0163)	(0.0102)	(0.00867)	(0.00634)	(0.00865)
Observations	5,149	3,427	5,131	3,406	5,418	3,550
R-squared	0.133	0.097	0.030	0.047	0.055	0.061
Block F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Mean Child Age	2.766	3.471	2.765	3.476	2.829	3.469

Notes: (Bootstrapped standard errors clustered at the village level are reported). The table presents the correlation of the estimated ambiguity aversion parameter and the estimated coefficient of risk aversion parameter on mother's food investment on their children. The sample consists of two youngest children of surveyed mothers. Block (administrative unit) fixed effects are included in all specifications. Ambiguity Aversion is an indicator variable for ambiguity parameter of the mother to be higher than 0.5. High Coeff. of Risk Aversion is an indicator for coefficient of risk aversion of the mother to be higher than the median value of the sample. Child Mortality is an indicator if the mother responded yes to the survey question "Have you ever given birth to a boy or girl who was born alive but later died?". Cant Read is a dummmy if the mother cannot read at all. Hindu and Scheduled Caste/Tribe are dummy for Hindu religion, Scheduled Caste/Tribe respectively. The outcome variable in columns 1 and 2 are indicators that takes the value 1 if the food product given to the child the day before the survey either during day or at night is milk product such as canned milk, powdered, or fresh animal milk or yogurts or cheese The outcome variable in columns 2 and 4 are indicators that take the value 1 if the food product given to the child the day before the survey either during day or at night is vegetables including pumpkin, carrots, squash, or sweet potatoes that are yellow or orange inside, white potatoes, white yams, manloc, cassava or other root products, or other vegetables or fruits such as ripe mangoes, papayas, grapes, muskmelon or other fruits. The outcome variable in columns 5 and 6 are indicators that take the value 1 if the food product given to the child the day before the survey either juice drinks or clear broth other than plain water. Other socio-economic controls include whether the mother was exposed to television, radio, has access to mobile phones, owns house. Young mother is an indicator if the mother is less than 27 years old.

TABLE 3. Risk-Ambiguity Parameter Predicting Children's Non-Cognitive Skill

	(1) Spatial Conflict	(2) Spatial Conflict	(3) Clancy Blair	(4) Clancy Blair
Amb. Averse (=1)	0.217***	0.198***	0.210***	0.195***
	(0.0341)	(0.0329)	(0.0446)	(0.0424)
High Coeff. of Risk Aver (=1)	0.164***	0.153***	0.144***	0.130***
	(0.0344)	(0.0314)	(0.0453)	(0.0431)
Married liv./w partner		0.0680		-0.0240
		(0.0541)		(0.0463)
Cant Read		-0.0575**		-0.0869***
		(0.0281)		(0.0331)
Hindu		0.232		0.00189
		(0.150)		(0.149)
Sch. Caste		0.00470		-0.114*
		(0.0537)		(0.0691)
Sch. Tribe		-0.00771		-0.0361
		(0.0427)		(0.0425)
Child Mortality = 1, Yes		0.00965		-0.0198
		(0.0395)		(0.0322)
No Exp. to Radio		-0.0960		-0.0756
		(0.0708)		(0.0906)
No Exp. to Mobile		-0.0698**		-0.0695**
		(0.0291)		(0.0301)
No Exp. to Television		-0.0614*		-0.0792**
		(0.0316)		(0.0360)
No House Own.		-0.522***		-0.512***
		(0.0417)		(0.0481)
Young Mother (<27 yrs)		-0.132***		-0.0840***
		(0.0267)		(0.0252)
Observations	6,482	6,482	6,482	6,482
R-squared	0.061	0.114	0.037	0.086
Block F.E.	Yes	Yes	Yes	Yes
Mean Child Age	3.175	3.175	3.175	3.175

Notes: (Bootstrapped standard errors clustered at the village level are reported). This table presents the correlation of the estimated ambiguity aversion and the estimated coefficient of risk aversion parameter on non-cognitive skills of the children. In Columns 1 and 2, we present predicted effect of the ambiguity and risk measures on the Spatial Conflict Score. We assessed non-cognitive skills using Spatial Conflict "Basic Arrows Task". In this test, the kids were presented with images of dogs pointing in different directions, and beads were placed on either side of the dog. The kids were asked to point to the bead that the dog is pointing to. For example: If the dog was pointing to the right, the kids were expected to touch the bead on the right with their left hand. If the dog was pointing to left then the kids were expected to touch the beads on the left with their right hand. The score is the total of correct answers by a given child on the Spatial Conflict test. In columns 3 and 4, we have the score using the Clancy Blair test. To assess executive functioning, we used Clancy Blair measures which focused on working memory, attentions shifting and operation span. In Clancy Blair test, the kids are shown images of houses with animals inside of each house. They are later shown empty houses and are asked to recall the animal that was there in the house. The score is the total of correct answers by a given child on the Clancy Blair test. Ambiguity aversion is an indicator for the mother being ambiguity averse (that is, ambiguity attitude higher than 0.5) and the high coefficient of risk aversion variable is indicator for the mother having risk aversion value higher than the sample median. Block (administrative unit) fixed effects are included in all specifications. Child mortality is a variable that takes the value 1 if the respondent says yes to the following question:" Have you ever given birth to a boy or girl who was born alive but later died?". Cant Read is a dummy variable that takes the value 1 if the respondent cannot read at all. Hindu and Scheduled Caste/tribe is a dummy if the mother belong to Hindu religion and is from Scheduled Caste/Tribe community respectively. Other socio-economic controls include whether the mother was exposed to television, radio, has access to mobile phones, owns house. Young mother is an indicator if the mother is less than 27 years old.

TABLE 4. Risk-Ambiguity Parameter Predicting Children's Cognitive Skill-Woodcock Johnson III Test and Pea-Body Test

	(1) Language	(2) Language	(3) Quant	(4) Quant	(5) Pea-Body Test	(6) Pea-Body Test
Amb. Averse (=1)	0.221***	0.195***	0.157***	0.136***	0.218***	0.204***
	(0.0404)	(0.0384)	(0.0407)	(0.0378)	(0.0428)	(0.0423)
High Coeff. of Risk Aver (=1)	0.0634**	0.0421	0.121***	0.0975***	0.169***	0.157***
	(0.0301)	(0.0285)	(0.0352)	(0.0325)	(0.0373)	(0.0353)
Married liv./w partner		-0.0431		-0.0827		0.0377
		(0.0444)		(0.0528)		(0.0499)
Cant Read		-0.113***		-0.138***		-0.0872***
		(0.0331)		(0.0311)		(0.0288)
Hindu		0.176		0.324*		0.150
		(0.113)		(0.166)		(0.162)
Sch. Caste		0.0950		-0.123*		-0.108**
		(0.0861)		(0.0645)		(0.0541)
Sch. Tribe		-0.148***		-0.141***		-0.109**
		(0.0477)		(0.0471)		(0.0432)
Child Mortality = 1, Yes		0.0259		0.0201		-0.0306
		(0.0378)		(0.0380)		(0.0352)
No Exp. to Radio		-0.295***		-0.102		-0.167**
		(0.105)		(0.0828)		(0.0773)
No Exp. to Mobile		-0.0691**		-0.0660**		0.0108
		(0.0274)		(0.0302)		(0.0276)
No Exp. to Television		-0.0813**		-0.0722**		-0.0545*
		(0.0380)		(0.0365)		(0.0308)
No House Own.		-0.377***		-0.620***		-0.326***
		(0.0381)		(0.0380)		(0.0456)
Young Mother (<27 yrs)		-0.150***		-0.131***		-0.0519**
		(0.0274)		(0.0256)		(0.0251)
Observations	6,482	6,482	6,482	6,482	6,482	6,482
R-squared	0.038	0.086	0.054	0.132	0.116	0.139
Block F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Mean Child Age	3.175	3.175	3.175	3.175	3.175	3.175

Notes: (Bootstrapped standard errors clustered at the village level are reported). This table presents the correlation of the estimated ambiguity aversion and the estimated coefficient of risk aversion parameter on cognitive skills of the children. We tested for cognitive skills of the children using Woodcock Johnson III which consists of assessments including letter word identification, spelling, number series, quantitative, applied problems. In column-1 and column-2, we included letter word identification, spelling. In column 3 and column 4 we included the score on number series, quantitative, applied problems. The score on each component is the total number of answers that were given correctly by the child. In columns 5 and 6, the outcome variable is the score Peabody Picture Vocabulary (PPV) test used assess receptive vocabulary. In PPV, four pictures are shown and child points to the one that corresponds to the said word. The score on each component is the total number of answers that were given correctly by the child. Ambiguity aversion is an indicator variable that takes the value 1 if the ambiguity attitude is above 0.5 and coefficient of risk aversion variable is a dummy variable for coefficient of risk aversion higher than sample median. Block (administrative unit) fixed effects are included in all specifications. Child mortality is a variable that takes the value 1 if the respondent says yes to the following question:" Have you ever given birth to a boy or girl who was born alive but later died?". Cant Read is a dummy variable that takes the value 1 if the respondent cannot read at all. Hindu and Scheduled Caste/Tribe are dummies for Hindu religion and is from Scheduled Caste/Tribe community. Other socio-economic controls include whether the mother was exposed to television, radio, has access to mobile phones, and a dummy variable for ownership of any house. Young mother is an indicator if the mother is less than 27 years old.

Appendix A. Supplementary Tables

Table A.I. Aggregate Utility Estimates

	Ambiguity Attitude parameter	Coefficient of Risk Aversion
Joint Estimate	0.525***	0.481***
	(0.0014)	(0.0017)

Notes: The table presents structural estimates of ambiguity attitude and coefficient of risk aversion elicited using the methodology in Gneezy et al. (2015).

TABLE A.II. Risk-Ambiguity Parameter Predicting Investment in Children

Dep. Var: Milk Products (Yes=1)	(1) Child 1	(2) Child 1	(3) Child 2	(4) Child 2
Amb. attitude (in std. dev.)	0.0147**	0.0101	0.0207**	0.0174*
	(0.00643)	(0.00618)	(0.00944)	(0.00917)
Coeff. of risk aversion (in std. dev.)	0.0225***	0.0168***	0.0309***	0.0290***
	(0.00691)	(0.00649)	(0.00913)	(0.00913)
Married liv./w partner		-0.0117		0.0405
		(0.0262)		(0.0354)
Cant Read		-0.0812***		-0.0733***
		(0.0160)		(0.0178)
Hindu		0.0865		0.0669
		(0.0578)		(0.0983)
Sch. Caste		-0.137***		-0.105**
		(0.0274)		(0.0422)
Sch. Tribe		-0.151***		-0.118***
		(0.0214)		(0.0316)
Child Mortality = 1, Yes		0.0130		0.0565**
		(0.0206)		(0.0261)
No Exp. Radio		-0.0987***		-0.118**
		(0.0358)		(0.0490)
No Access Mobile Ph.		-0.0455**		-0.0179
		(0.0179)		(0.0208)
No Exp. Television		-0.0866***		-0.0742***
		(0.0167)		(0.0212)
No Home Own.		-0.109***		-0.112***
		(0.0230)		(0.0254)
Young Mother (<27 yrs)		-0.00114		0.00202
		(0.0142)		(0.0163)
Observations	5,207	5,149	3,465	3,427
R-squared	0.079	0.134	0.066	0.098
Block F.E.	Yes	Yes	Yes	Yes
Mean Child Age	2.765	2.766	3.469	3.471

Notes: (Bootstrapped standard errors clustered at the village level are reported). The table presents the correlation of the estimated ambiguity attitude parameter and the estimated coefficient of risk aversion parameter on mother's food investment of their children. The sample consists of two youngest children of surveyed mothers. The outcome variable is an indicator that takes the value 1 if the food product given to the child the day before the survey either during day or at night is milk product such as canned milk, powdered, or fresh animal milk or yogurts or cheese. Ambiguity attitude and coefficient of risk aversion variable are normalized for comparability with each other. Child mortality is a variable that takes the value 1 if the respondent says yes to the following question:" Have you ever given birth to a boy or girl who was born alive but later died?". Cant Read is a dummy variable that takes the value 1 if the respondent cannot read at all. Hindu and Scheduled Caste/Tribe are dummies for Hindu religion and Scheduled Caste/Tribe community respectively. Other socioeconomic controls include whether the mother was exposed to television, radio, has access to mobile phones, owns any house or houses. Young mother is an indicator if the mother is less than 27 years old.

TABLE A.III. Risk-Ambiguity Parameter Predicting Investment in Children

	(1)	(2)	(3)	(4)
Dep. Var: Vegetables and Fruits (Yes=1)	Child 1	Child 1	Child 2	Child 2
Amb. attitude (in std. dev.)	0.00939*	0.00815*	0.00661	0.00730
	(0.00490)	(0.00494)	(0.00463)	(0.00466)
Coeff. of risk aversion (in std. dev.)	0.0125**	0.0115*	0.0118**	0.0128***
	(0.00602)	(0.00592)	(0.00484)	(0.00480)
Married liv./w partner		0.0382*		0.0653**
		(0.0218)		(0.0291)
Cant Read		-0.0160		0.0185*
		(0.0120)		(0.0111)
Hindu		-0.0725		-0.0131
		(0.0514)		(0.0611)
Sch. Caste		-0.0174		0.000568
		(0.0200)		(0.0209)
Sch. Tribe		-0.0118		0.0109
		(0.0151)		(0.0153)
Child Mortality = 1, Yes		0.0246		-0.00728
		(0.0161)		(0.0156)
No Exp. Radio		-0.0434**		-0.0219
		(0.0197)		(0.0224)
No Access Mobile Ph.		0.0175		0.0376***
		(0.0133)		(0.0108)
No Exp. Television		-0.0578***		-0.0315**
		(0.0129)		(0.0127)
No Home Own.		-0.0148		0.00900
		(0.0139)		(0.0122)
Young Mother (<27 yrs)		-0.0107		0.00851
		(0.0102)		(0.00869)
Observations	5,186	5,131	3,442	3,406
R-squared	0.021	0.030	0.033	0.048
Block F.E.	Yes	Yes	Yes	Yes
Mean Child Age	2.763	2.765	3.474	3.476

Notes: (Bootstrapped standard errors clustered at the village level are reported). The table presents the correlation of the estimated ambiguity attitude parameter and the estimated coefficient of risk aversion parameter on mother's food investment of their children. The sample consists of two youngest children of surveyed mothers. The outcome variable is an indicator that takes the value 1 if the food product given to the child the day before the survey either during day or at night is vegetables including pumpkin, carrots, squash, or sweet potatoes that are yellow or orange inside, white potatoes, white yams, manloc, cassava or other root products, or other vegetables or fruits such as ripe mangoes, papayas, grapes, muskmelon or other fruits. Ambiguity attitude and coefficient of risk aversion variable are normalized for comparability with each other. Child mortality is a variable that takes the value 1 if the respondent says yes to the following question:" Have you ever given birth to a boy or girl who was born alive but later died?". Cant Read is a dummy variable that takes the value 1 if the respondent cannot read at all. Hindu and Scheduled Caste/Tribe are dummies for Hindu religion and Scheduled Caste/Tribe community respectively. Other socioeconomic controls include whether the mother was exposed to television, radio, has access to mobile phones, owns house. Young mother is an indicator if the mother is less than 27 years old.

TABLE A.IV. Risk-Ambiguity Parameter Predicting Investment in Children

	(1)	(2)	(3)	(4)
Dep. Var: Juice and Other Drinks (Yes=1)	Child 1	Child 1	Child 2	Child 2
Amb. attitude (in std. dev.)	0.0179***	0.0162***	0.0299***	0.0277***
	(0.00504)	(0.00487)	(0.00778)	(0.00751)
Coeff. of risk aversion (in std. dev.)	0.0188***	0.0191***	0.0226***	0.0226***
	(0.00472)	(0.00473)	(0.00694)	(0.00675)
Married liv./w partner		-0.00260		-0.00980
		(0.0122)		(0.0134)
Cant Read		-0.00760		-0.0188*
		(0.00837)		(0.00980)
Hindu		-0.0405		0.00985
		(0.0530)		(0.0398)
Sch. Caste		-0.0549***		-0.0650***
		(0.0160)		(0.0213)
Sch. Tribe		-0.0257**		-0.0277*
		(0.0118)		(0.0152)
Child Mortality = 1, Yes		-0.00575		-0.0189
		(0.00990)		(0.0124)
No Exp. Radio		-0.129***		-0.138***
		(0.0332)		(0.0451)
No Access Mobile Ph.		-0.0163**		0.00425
		(0.00685)		(0.00940)
No Exp. Television		-0.0166*		-0.0176*
		(0.00871)		(0.0103)
No Home Own.		-0.0799***		-0.0744***
		(0.0126)		(0.0154)
Young Mother (<27 yrs)		0.00230		-0.00386
		(0.00630)		(0.00864)
Observations	5,478	5,418	3,590	3,550
R-squared	0.021	0.056	0.034	0.066
Block F.E.	Yes	Yes	Yes	Yes
Mean Child Age	2.826	2.829	3.467	3.469

Notes: (Bootstrapped standard errors clustered at the village level are reported). The table presents the correlation of the estimated ambiguity attitude parameter and the estimated coefficient of risk aversion parameter on mother's food investment on their children. The sample consists of two youngest children of surveyed mothers. The outcome variable is an indicator that takes the value 1 if the food product given to the child the day before the survey either juice drinks or clear broth other than plain water. Ambiguity attitude and coefficient of risk aversion variable are normalized for comparability with each other. Child mortality is a variable that takes the value 1 if the respondent says yes to the following question:" Have you ever given birth to a boy or girl who was born alive but later died?". Cant Read is a dummy variable that takes the value 1 if the respondent cannot read at all. Hindu and Scheduled Caste/Tribe are dummies for Hindu religion and Scheduled Caste/Tribe community respectively. Other socioeconomic controls include whether the mother was exposed to television, radio, has access to mobile phones, owns house. Young mother is an indicator if the mother is less than 27 years old.

TABLE A.V. Risk-Ambiguity Parameter Predicting Investment in Children

	(1)	(2)	(3)	(4)
Dep Var: Months of Breast-Feeding	Child 1	Child 1	Child 2	Child 2
Amb. Averse (=1)	0.981***	1.044***	-0.170	-0.146
	(0.315)	(0.315)	(0.345)	(0.350)
High Coeff. of Risk Aver (=1)	1.278***	1.266***	0.457	0.430
	(0.306)	(0.301)	(0.286)	(0.290)
Married liv./w partner		0.810		0.473
		(0.511)		(0.561)
Cant Read		0.291		-0.300
		(0.273)		(0.314)
Hindu		-0.380		-0.857
		(1.102)		(1.496)
Sch. Caste		-1.246**		-0.979
		(0.489)		(0.643)
Sch. Tribe		0.227		-0.149
		(0.365)		(0.516)
Child Mortality = 1, Yes		0.546		0.830*
		(0.399)		(0.454)
No Exp. to Radio		0.661		0.823
		(0.732)		(0.850)
No Exp. to Mobile		0.123		-0.105
		(0.265)		(0.302)
No Exp. to Television		-1.304***		0.0548
		(0.333)		(0.336)
No House Own.		-0.391		-1.561***
		(0.291)		(0.313)
Young Mother (<27 yrs)		-2.308***		-0.0994
		(0.231)		(0.271)
Observations	6,472	6,472	3,625	3,625
R-squared	0.038	0.059	0.012	0.021
Block F.E.	Yes	Yes	Yes	Yes
Mean Child Age	2.938	2.938	3.477	3.477
Mean mths of Breast-Feeding	17.04	17.04	17.95	17.95

Notes: (Bootstrapped standard errors clustered at the village level are reported). The table presents the correlation of the estimated ambiguity attitude parameter and the estimated coefficient of risk aversion parameter on mother's food investment on their children. The sample consists of two youngest children of surveyed mothers. The outcome variable is total number of months of breast-feeding for mothers. Ambiguity aversion is a dummy variable that takes the value 1 if the ambiguity attitude parameter is above 0.5. High Coefficient of Risk Aversion takes the value 1 if the coefficient of risk aversion of the mother is above the sample median. Block (administrative unit) fixed effects are included in all specifications. Child mortality is a variable that takes the value 1 if the respondent says yes to the following question:" Have you ever given birth to a boy or girl who was born alive but later died?". Cant Read is a dummy variable that takes the value 1 if the respondent cannot read at all. Hindu and Scheduled Caste/Tribe are dummy variables for Hindu religion and Scheduled Caste/Tribe community respectively. Other socioeconomic controls include whether the mother was exposed to television, radio, has access to mobile phones, owns any house or houses. Young Mother is an indicator for the mother being less than 27 years old.

TABLE A.VI. Risk-Ambiguity Parameter Predicting Investment in Children

Nutrition Intake	(1) Child-1 Male	(2) Child-1 Female	(3) Child-2 Male	(4) Child-2 Female
Amb. Averse (=1)	0.0932***	0.0887**	0.128***	0.142***
	(0.0357)	(0.0371)	(0.0444)	(0.0418)
High Coeff. of Risk Aver (=1)	0.115***	0.0782**	0.119***	0.126***
	(0.0345)	(0.0318)	(0.0389)	(0.0434)
Married liv./w partner	0.0282	0.0222	0.0784	0.120*
	(0.0539)	(0.0558)	(0.0668)	(0.0675)
Cant Read	-0.0789**	-0.133***	-0.0171	-0.138***
	(0.0333)	(0.0318)	(0.0353)	(0.0361)
Hindu	-0.167	0.131	0.160	-0.118
	(0.109)	(0.144)	(0.154)	(0.222)
Sch. Caste	-0.175***	-0.255***	-0.169**	-0.175**
	(0.0458)	(0.0589)	(0.0783)	(0.0684)
Sch. Tribe	-0.194***	-0.195***	-0.132**	-0.137***
	(0.0440)	(0.0428)	(0.0531)	(0.0495)
Child Mortality = 1, Yes	0.0414	0.0229	0.0194	0.0233
	(0.0371)	(0.0438)	(0.0495)	(0.0497)
No Exp. to Radio	-0.284***	-0.242***	-0.418***	-0.232**
	(0.0807)	(0.0797)	(0.125)	(0.116)
No Exp. to Mobile	-0.0250	-0.0545	0.00147	0.0635
	(0.0310)	(0.0388)	(0.0375)	(0.0397)
No Exp. to Television	-0.177***	-0.147***	-0.165***	-0.0934**
	(0.0364)	(0.0368)	(0.0418)	(0.0366)
No House Own.	-0.157***	-0.253***	-0.156***	-0.202***
	(0.0402)	(0.0468)	(0.0502)	(0.0441)
Young Mother (<27 yrs)	-0.0358	0.0315	-0.00652	0.0165
	(0.0292)	(0.0305)	(0.0326)	(0.0279)
Observations	2,637	2,374	1,673	1,668
R-squared	0.111	0.127	0.094	0.103
Block F.E.	Yes	Yes	Yes	Yes
Mean Child Age	2.847	2.678	3.548	3.391

Notes: (Bootstrapped standard errors clustered at the village level are reported). The table presents the correlation of the estimated ambiguity aversion and the estimated coefficient of risk aversion parameter on mother's food investment on their children. The sample consists of two youngest children of surveyed mothers. Column-1 and 3 consists of male children and column 2 and 4 consist of female children. The outcome variable is a categorical variable that ranges from 1 to 3 , where the value 3 indicates that food products belonging the all three categories including milk products, vegetables and fruits and beverages other than plain water was given to the child the day before the survey. Block (administrative unit) fixed effects are included in all specifications. Ambiguity Aversion is an indicator variable for ambiguity parameter of the mother being higher than 0.5. High Coeff. of Risk Aversion is an indicator for coefficient of risk aversion of the mother being higher than the median value of the sample. Child Mortality is an indicator if the mother responded yes to the survey question "Have you ever given birth to a boy or girl who was born alive but later died?". Cant Read is a dummmy if the mother cannot read at all. Hindu and Scheduled Caste/Tribe are dummy variables are dummies for Hindu religion and Scheduled Caste/Tribe community respectively. Other socioeconomic controls include whether the mother was exposed to television, radio, has access to mobile phones, owns any house or houses. Young Mother is an indicator for the mother being less than 27 years old.

TABLE A.VII. Risk-Ambiguity Parameter Predicting Children's Non-Cognitive Skill

Dep Var: in Std. Dev.	(1) Spatial Conflict	(2) Clancy Blair
Amb. attitude (in std. dev.)	0.109***	0.113***
	(0.0122)	(0.0213)
Coeff. of risk aversion (in std. dev.)	0.0481***	0.0423**
	(0.0143)	(0.0201)
Married liv./w partner	0.0765	-0.0148
	(0.0537)	(0.0460)
Cant Read	-0.0576**	-0.0864***
	(0.0278)	(0.0330)
Hindu	0.231	0.000611
	(0.148)	(0.149)
Sch. Caste	0.00210	-0.117*
	(0.0533)	(0.0697)
Sch. Tribe	-0.00593	-0.0339
	(0.0426)	(0.0429)
Child Mortality = 1, Yes	0.00817	-0.0212
	(0.0395)	(0.0324)
No Exp. Radio	-0.0930	-0.0728
	(0.0703)	(0.0894)
No Access Mobile Ph.	-0.0705**	-0.0699**
	(0.0290)	(0.0295)
No Exp. Television	-0.0582*	-0.0758**
	(0.0315)	(0.0366)
No Home Own.	-0.515***	-0.505***
	(0.0421)	(0.0469)
Young Mother (<27 yrs)	-0.134***	-0.0858***
	(0.0267)	(0.0254)
Observations	6,482	6,482
R-squared	0.118	0.091
Block F.E.	Yes	Yes

Notes: (Bootstrapped standard errors clustered at the village level are reported). This table presents the correlation of the estimated ambiguity attitude parameter and the estimated coefficient of risk aversion parameter on non-cognitive skills of the children. In Column 1 and 2, we present predicted effect of the ambiguity and risk measures on the Spatial Conflict Score. We assessed non-cognitive skills using Spatial Conflict "Basic Arrows Task". In this test, the kids were presented with images of dogs pointing in different directions, and beads were placed on either side of the dog. The kids were asked to point to the bead that the dog is pointing to. For example: If the dog was pointing to the right, the kids were expected to touch the bead on the right with their left hand. If the dog was pointing to left then the kids were expected to touch the beads on the left with their right hand. The score is the total of correct answers by a given child on the Spatial Conflict test. In columns 3 and 4, we have the score using the Clancy Blair test. To assess executive functioning, we used Clancy Blair measures which focused on working memory, attentions shifting and operation span. In Clancy Blair test, the kids are shown images of houses with animals inside of each house. They are later shown empty houses and are asked to recall the animal that was there in the house. The score is the total of correct answers by a given child on the Clancy Blair test. Ambiguity attitude and coefficient of risk aversion variable are normalized for comparability with each other. Block (administrative unit) fixed effects are included in all specifications. Child mortality is a variable that takes the value 1 if the respondent says yes to the following question:" Have you ever given birth to a boy or girl who was born alive but later died?". Cant Read is a dummy variable that takes the value 1 if the respondent cannot read at all. Hindu and Scheduled Caste/Tribe are dummy variables that take the value 1 if the mother belong to Hindu religion and is from Scheduled Caste/Tribe community respectively. Other socio-economic controls include whether the mother was exposed to television, radio, has access to mobile phones, owns any house or houses. Young Mother is an indicator for the mother being less than 27 years old.

TABLE A.VIII. Risk-Ambiguity Parameter Predicting Children's Cognitive Skill-Woodcock Johnson III Test and Pea-Body Test

in Std. Dev.	(1) Language	(2) Quantitative	(3) Pea Body Test Score
Amb. attitude (in std. dev.)	0.0813***	0.0782***	0.125***
	(0.0160)	(0.0170)	(0.0155)
Coeff. of risk aversion (in std. dev.)	-0.0159	0.0315**	0.0442***
	(0.0141)	(0.0142)	(0.0153)
Married liv./w partner	-0.0360	-0.0765	0.0459
	(0.0448)	(0.0525)	(0.0492)
Cant Read	-0.115***	-0.138***	-0.0867***
	(0.0329)	(0.0310)	(0.0283)
Hindu	0.180	0.323*	0.146
	(0.112)	(0.165)	(0.158)
Sch. Caste	0.0957	-0.125*	-0.115**
	(0.0858)	(0.0643)	(0.0545)
Sch. Tribe	-0.146***	-0.139***	-0.108**
	(0.0476)	(0.0471)	(0.0433)
Child Mortality = 1, Yes	0.0250	0.0192	-0.0307
	(0.0380)	(0.0380)	(0.0352)
No Exp. Radio	-0.293***	-0.100	-0.162**
	(0.105)	(0.0831)	(0.0759)
No Access Mobile Ph.	-0.0683**	-0.0663**	0.0109
	(0.0273)	(0.0302)	(0.0274)
No Exp. Television	-0.0810**	-0.0699*	-0.0508*
	(0.0381)	(0.0366)	(0.0306)
No Home Own.	-0.369***	-0.615***	-0.318***
	(0.0380)	(0.0382)	(0.0454)
Young Mother (<27 yrs)	-0.152***	-0.132***	-0.0541**
	(0.0275)	(0.0256)	(0.0255)
Observations	6,482	6,482	6,482
R-squared	0.086	0.134	0.146
Block F.E.	Yes	Yes	Yes

Notes: (Bootstrapped standard errors clustered at the village level are reported). This table presents the correlation of the estimated ambiguity attitude parameter and the estimated coefficient of risk aversion parameter on cognitive skills of the children. We tested for cognitive skills of the children using Woodcock Johnson III which consists of assessments including letter word identification, spelling, number series, quantitative, applied problems. In column-1 and column-2, we included letter word identification, spelling. In column 3 and column 4 we included the score on number series, quantitative, applied problems. The score on each component is the total number of answers that were given correctly by the child. In columns 5 and 6, the outcome variable is the score on Peabody Picture Vocabulary (PPV) test. In PPV, four pictures are shown and child points to the one that corresponds to the said word. The score on each component is the total number of answers that were given correctly by the child. Ambiguity attitude and coefficient of risk aversion variable are normalized for comparability with each other. Block (administrative unit) fixed effects are included in all specifications. Child mortality is a variable that takes the value 1 if the respondent says yes to the following question:" Have you ever given birth to a boy or girl who was born alive but later died?". Can't Read is a dummy variable that takes the value 1 if the respondent cannot read at all. Hindu and Scheduled Caste/Tribe are dummy variables for Hindu religion and Scheduled Caste/Tribe community respectively. Other socioeconomic controls include whether the mother was exposed to television, radio, has access to mobile phones, owns any house or houses. Young Mother is an indicator for the mother being less than 27 years old.