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Essays in Development and Demography

by

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Abstract

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In this dissertation, I explore factors that contribute to disparities in parental beliefs about children's academic proficiency across socioeconomic lines and by child gender, drawing on evidence from India, Kenya, and the United States. In all three contexts, I find a strong correlation between socioeconomic status and parental beliefs, where high income parents and those from more privileged social groups are more likely to believe their children are above average academically compared to their lower income or less privileged peers. That these patterns exist after accounting for actual test performance suggests that disparities in beliefs outpace any gaps in performance along these same lines. Parental beliefs could be consequential to the extent they guide educational investments and so shape eventual outcomes. Viewed in this way, disparities in parental beliefs along socioeconomic lines could play some role in the persistence of disparities in educational and other outcomes along these same lines.

The first chapter of this dissertation explores the link between poverty and parental beliefs in the Indian context. I leverage the India Human Development Survey (IHDS), a nationally-representative panel dataset, to explore the link between poverty or social disadvantage and parental beliefs in detail. I find that parents in poor households and those belonging to one of India's more disadvantaged caste groups are substantially less likely to believe their children are above average academically. I also find that context plays an important role; parental beliefs tend to be more positive in high-mobility or low-poverty districts, and even more so for wealthy than for poor parents. Finally, I find that parental beliefs respond negatively to exogenous negative income shocks driven by adverse rainfall events. These findings suggest that the observed link between socioeconomic status and parental beliefs may be more than purely correlational. Instead, poverty and other forms of disadvantage may fundamentally shape beliefs, leading beliefs to take on a negative bias.

In the second chapter, I replicate, validate, and extend these findings in the Kenyan contexts. Using a mix of existing data and original data collected within from the Kenya Life

Panel Survey (KLPS), I explore further the link between household income and parental beliefs. I again find that parents in higher-income households are more likely to hold above-average beliefs. I also find that parental beliefs are higher among recipients of a randomized early-life health intervention that itself led to substantial improvements in household economic circumstances. Together, these findings suggest that parental beliefs may not only respond negatively to negative shocks to income, but may also respond positively to exogenous improvements in economic circumstances. I also explore other factors that correlate with parental beliefs, finding that self-efficacy and elevated aspirations correlate positively, while depression and stress correlate negatively.

The third chapter explores related patterns among parents in the United States. Here I draw on data from the Early Childhood Longitudinal Study-Kindergarten Class of 1998-99 (ECLS-K) study. I again find that household income correlates positively with parental beliefs, consistent with the evidence from India and Kenya. However, I also find evidence for disparities in parental beliefs across math and reading domains for male and female children. Specifically, while parents are more likely to believe their female children are above average overall, they are also more likely to believe their male children are above average in math and their female children are above average in reading, patterns that closely mimic prevailing gender-based stereotypes and norms. I also find suggestive evidence that mixed-sex sibling compositions within families may foster even stronger gender-based patterns. To the extent that parental beliefs shape the nature of investments parents make and which fields they encourage their children to pursue, these early-life gender-based disparities could play some role in shaping later-life gaps across males and females in terms of participation in Science, Technology, Engineering and Math (STEM) fields.

Taken together, this research sheds light on how disparities in economic circumstances and gender-based social norms may fundamentally shape parental beliefs. To the extent that these parental beliefs serve as a key input to subsequent educational investment decisions or directly influence child motivation and effort, such disparities could contribute to deepening disparities in outcomes across socioeconomic or gender lines.

To Mom and Dad,
for always believing in me.

And to Rohit,
for a lifetime ahead.

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Acknowledgments

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Chapter 1

Poverty and Parental Beliefs: Evidence from India

1.1 Introduction

Poverty and other forms of disadvantage may impose internal constraints that negatively influence educational investment decisions, over and above material constraints. Negatively biased beliefs related to child academic proficiency may be one such internal constraint; if parents believe their child performs lower than they actually do, they may underestimate child-specific returns to academic effort or additional schooling, and so underinvest in their child's education.

In this paper I document and explore a robust relationship between lower socioeconomic status and negatively biased beliefs about child academic proficiency among parents in India. I provide suggestive evidence for a causal link between household economic circumstances and beliefs, and discuss several mechanisms that could give rise to these observed patterns.

Using data from the India Human Development Survey (IHDS), I first document how parental beliefs about their children's academic proficiency differ along two dimensions: household consumption (as a proxy for income) and caste group identity. Parental beliefs are characterized according to whether parents report they believe their child is an average, below average, or above average student, and then paired with a wealth of household and contextual characteristics captured in the dataset.

This cross-sectional analysis reveals a striking relationship: low income parents and those belonging to one of India's historically disadvantaged caste groups (Scheduled Castes or Scheduled Tribes, SCST) are substantially more likely to believe their children are below average compared to their more advantaged peers.

These patterns persist after controlling for household characteristics, actual test performance, and performance relative to peers within the same village, suggesting that gaps in parental beliefs along income or caste lines outpace any gaps in performance along the same lines. In other words, the disproportionate incidence of below-average beliefs among the poor

and socially disadvantaged reflects what could be considered systematic underestimation, or a systematic negative bias.

I next explore how household socioeconomic status interacts with context, and find that gaps between the rich and the poor are even greater in certain contexts or environments. Above-average beliefs are more common in favorable contexts such as high mobility or low poverty districts, but less so for the poor or for SCST parents. In unfavorable contexts such as low mobility or high poverty districts, below-average beliefs are more common, and even more so for the poor.

Taken together, these results suggest that parents facing various forms of disadvantage – those living in poverty or belonging to a more disadvantaged caste group, and particularly those in low mobility or high poverty contexts – are more likely to underestimate their children than their more advantaged peers.

If underestimating academic proficiency equates with underestimating child-specific returns to academic effort and educational investment, then negatively-biased beliefs could lead to suboptimal investment decisions made on the basis of these beliefs. Negatively biased beliefs could also be harmful if their expression directly impacts child motivation and effort[1], or triggers self-fulfilling prophesies that impede learning.[2]

The final piece of the cross-sectional analysis confirms that beliefs relate to actual educational investments, even after accounting for various household and child characteristics that also shape investments. This relationship is purely correlational, and likely reflects some degree of reverse causality, where parents who are able to invest more in their children hold elevated beliefs as a result. Nevertheless, this evidence supports the idea that these measured beliefs may truly matter in terms of shaping actual educational investment behavior.

In the next piece of the analysis, I explore whether the observed cross-sectional relationship reflects in some part a causal link between household economic circumstances and beliefs. Exploiting exogenous rainfall events and using a household fixed effects estimation strategy, I find evidence that beliefs do shift in response to rainfall-driven income shocks. Adverse rainfall events lead to a substantial decline in farm income, along with a decline in above-average beliefs and an increase in below-average beliefs. Positive shocks have little impact on parental beliefs, and I rule out that rainfall-related performance declines drive the observed decline in parental beliefs. Instead, this evidence is consistent with the idea that a worsening of economic circumstances can cause beliefs to become more negative.

I next take a different approach and explore how more permanent shifts in context may influence beliefs. I focus on a (selected) sample of children in households who moved from a rural to an urban location and exploit variation in the recency of those moves to test whether beliefs differ according to how novel or familiar the urban context may be. Urban contexts

[1]Related literature explores how positive beliefs can encourage confidence, motivation, and effort (Bénabou and Tirole, 2002, 2016). While overestimation could have productive benefits or foster positive complementarities with other investments, underestimation likely features the reverse.

[2]A range of evidence supports the role of self-fulfilling prophesies based on teacher expectations and beliefs; parental beliefs and expectations likely exert a similar direct influence on their children (Papageorge et al., 2020; Hill and Jones, 2021).

in India offer more employment opportunities, higher wages, and greater access to quality education, and so could represent a more favorable context along these dimensions (Munshi and Rosenzweig, 2016; Azam, 2017; Ghosh et al., 2021). I find an increase in above-average beliefs among parents in households that more recently moved to an urban location (and so for whom the advantages of an urban environment may be more salient or novel) compared to those whose moves were more distant. While purely suggestive, this analysis supports that an improvement in circumstances or context could lead to more positive beliefs and further, that one's context may fundamentally shape one's beliefs.

Turning to potential mechanisms, I next outline and discuss several possible channels that may give rise to the observed negative bias. In the first of these, I outline a simple framework where parents incorporate both child-specific sources of information and external, group-based sources of information to inform beliefs. Guided by the structure of this framework, I characterize the conditions that would lead parents to hold negatively biased beliefs and outline how poverty and social disadvantage could trigger or worsen these conditions.

I then discuss how poverty and social disadvantage may constrain the set of outcomes parents believe their children can attain, so that underestimation reflects beliefs that are consistent with those future expectations. As an alternative explanation, parents may fail to internalize complementarities between income and investments in determining educational outcomes (such as test performance or school grades), and so attribute a disproportionate share of eventual outcomes to their child's proficiency, rather than to the role of economic circumstances or contextual constraints. Finally, I touch on other potential mechanisms such as poverty-induced depression, hopelessness, and negative affect.

This research contributes to several areas of the literature. First, I build on the research exploring factors that may negatively influence educational investment decisions. Much of this research focuses in particular on gaps in investments along socioeconomic lines (Guryan et al., 2008; Kalil et al., 2012; Kalil, 2015; Dotti Sani and Treas, 2016) and the myriad ways poverty may influence investment decisions (see Attanasio et al. (2021) for an excellent review). This research demonstrates how misperceptions about the returns to education (Jensen, 2010), the shape of the production function (Cunha et al., 2013; Cunha, 2014), or the importance of early childhood investments (List et al., 2021) can contribute to under-investment in education among more disadvantaged parents. I build on this literature by suggesting negatively biased beliefs about child academic proficiency as another factor that may contribute to underinvestment among disadvantaged parents.

Second, this research relates closely to the literature focused on the role of beliefs about academic proficiency. Guyon and Huillery (2021) argue that underestimation of own ability (along with lack of information about educational opportunities themselves) leads low socioeconomic status students in France to aspire to lower levels of education. Kinsler and Pavan (2021) explore how information frictions related to teacher evaluations can distort beliefs among parents in the US, and Dizon-Ross (2019) shows that information frictions can lead to inaccurate beliefs among Malawian parents, particularly for those with lower levels of education. I build on this literature by exploring other factors aside from informational frictions that can lead to negatively-biased beliefs among the poor and disadvantaged.

This literature also demonstrates that beliefs can be malleable, with important consequences for investments. In Jensen (2010), correcting misperceptions about the returns to education leads to higher educational attainment, while in List et al. (2021), providing information and training related to the role and importance of early investments leads to increased investments and improvements in child outcomes. Evidence also shows that providing clear information about child performance can alleviate information frictions and influence the level and nature of investments parents make among parents of younger children in Malawi (Dizon-Ross, 2019) and of college-bound young adults in China (Gan, 2021).

Finally, this research adds more broadly to the literature exploring how poverty and other forms of disadvantage impose internal constraints that can magnify existing structural constraints and shape outcomes. A large body of literature explores how poverty may contribute to reduced aspirations (Appadurai, 2004; Genicot and Ray, 2020; Dalton et al., 2016; Ray, 2006; La Ferrara, 2019), diminished self-efficacy (Wuepper and Lybbert, 2017), higher rates of depression (De Quidt and Haushofer, 2016; Ridley et al., 2020), and greater hopelessness (Lybbert and Wydick, 2018; Duflo, 2012), each of which may lead individuals to underinvest or to apply too little effort and so make it difficult to escape poverty (Haushofer and Fehr, 2014). Less attention has been paid to the role of beliefs about child academic proficiency. I contribute to this literature by arguing that – whether as a consequence of lower aspirations, diminished self-efficacy, depression, hopelessness, or some other feature of poverty or social disadvantage – systematic underestimation of child academic proficiency can similarly constrain aspirations, goals, and effort, and contribute to a negative feedback loop.

1.2 Data

Data for this analysis come primarily from the India Human Development Survey (IHDS), a nationally-representative panel dataset covering urban and rural areas across 33 Indian states. Over 200,000 individuals from over 40,000 households were surveyed in the first and second waves (from November 2004 to October 2005 and November 2011 to November 2012, respectively), with a resurvey rate of 83% of households.

The IHDS provides many of the key measures used for this analysis. Individual and household questionnaires provide measures of parental beliefs about child academic proficiency, child test performance, educational investments, and a wealth of household characteristics. Questionnaires conducted at the village level provide information about local schools and characterize the local context. District-level characteristics are constructed using the IHDS data, and supplemented with external data sources capturing district level educational mobility and precipitation. Each of these are described in more detail below.

The sample

Measures of child test performance and parental beliefs related to child academic proficiency were collected for up to two children per household between 8 and 11 years of age.

The resulting set of 22,726 children across 17,452 households make up the primary sample used in the analysis. Note that because children aged out of the 8 to 11 years age range in between waves of data collection, the same children are never observed in both waves. In contrast, certain households do appear in both waves: 1,870 households (with 4,456 distinct children) are observed in both waves. Much of the cross-sectional analysis that follows pools the data across waves, while the section exploring the impact of rainfall shocks restricts the sample to a balanced panel of rural households observed in both waves.

Table A1 provides summary statistics characterizing the children and households included in the main sample.

Parental beliefs

Parental beliefs corresponding to each child in the sample come from the response of a knowledgeable adult, typically a female between the ages of 15 to 49 years, to the question:

> Is/was [name] an average student, better than average or below average?

This question is useful in its simplicity, but does present several limitations or shortcomings. First, this question was not asked specifically in relation to the child's test performance, but rather in relation to their educational or academic career overall. As such, I treat this as a measure of academic competency or proficiency broadly defined rather than representing parental beliefs about academic performance in a particular school term or on a particular test (as in Dizon-Ross (2019), for example).

Second, parents were asked to make a relative comparison without clearly specifying a reference group against which to make such a comparison. Third, this question asks about academic performance in general, and so doesn't capture beliefs about proficiency across subjects.[3] One of the next steps in this research agenda has been to more carefully and accurately measure parental beliefs. In chapter two, I describe improvements in these measures along these three dimensions using original data collection in Kenya as part of the Kenya Life Panel Survey (KLPS).

Child performance

Measures of child performance on a simple assessment provide a proxy for academic proficiency that can be compared with reported beliefs. Each child in the sample took a simple assessment designed to capture basic proficiency in math, reading, and writing. These assessments were developed in collaboration with the organization Pratham, and are very similar to those used for India's Annual Status of Education Report (ASER) survey. Assessments were administered in the appropriate language concurrent with survey administration. For

[3]This does present the advantage of avoiding any potential confounding associated with domain-specific gender biases; In chapter three, I present evidence of domain-specific gender biases in parental beliefs among parents in the USA using the Early Childhood Longitudinal Studies Program (ECLS-K).

the purposes of this analysis, I focus on math and reading. These assessments are scored according to the following scale:

Math:	Level 0: Beginner (No recognition of double digit numbers)
	Level 1: Can recognize double digit numbers
	Level 2: Can solve subtraction problem
	Level 3: Can solve division problem
Reading:	Level 0: Beginner (No recognition of letters)
	Level 1: Can recognize letters
	Level 2: Can read words
	Level 3: Can read paragraph
	Level 4: Can read story

I construct two primary composite measures of child performance. First, I divide each of the math and reading scores by their maximum possible score, then take an equally-weighted average of these two components to construct raw composite scores ranging from 0 to 1.

In the second measure, I normalize math and reading scores relative to scores among children within the same age, district, and urban status (hereafter referred to as sector), then sum across each component and normalize the resulting composite score in the same way. In contrast to the raw composite score, this measure characterizes performance relative to a group of children who may face similar circumstances in terms of educational and other resources common to those in that same district and sector. This measure also attempts to characterize the reference group that may best approximate the set of peers against whom parents are likely to assess their child's relative performance. All findings are robust to instead normalizing with respect to same-age children throughout all of India.

Finally, I use these normalized measures of performance to construct granular measures of relative performance that can be directly compared to parental beliefs expressed in an analogous way. Composite scores within one standard deviation of the age-district-sector average are classified as "average," while those at least one standard deviation above or below are characterized as "above average" or "below average" respectively. These measures capturing actual performance can then be directly compared with these parental beliefs to characterize those beliefs as accurate, underestimates, or overestimates.

In most of the analysis to follow, I use raw versions of each of these beliefs measures (whether parents believe their children are average, below average, or above average students instead of whether those beliefs are accurate, underestimates, or overestimates) as a more conservative and transparent approach, but show that the main results are robust to using these constructed measures of belief accuracy.

Educational investments

Various sources of data are used to characterized education-related investments for each child in the sample. A measure of total annual spending on education-related activities sums over reported spending on school fees, materials, transportation, and tutoring. Time spent on educational activities comes from summing over the typical number of hours dedicated each week to instruction time, homework, and tutoring. The data also include information on whether the child receives any private tutoring, attends a private school, and the number of days absent over the last 30 days.

Finally, outcomes recorded in wave 2 (when the children are no longer in the 8 to 11 year old age range, but may still be present in the household roster), can be paired with children observed in wave 1 to construct prospective measures such as whether the child goes on to complete any secondary school and whether the child selects a technical subject in senior secondary school (including one of commerce, science, engineering, or another technical or vocational subject).

Household characteristics

The primary data used to characterize households include per capita household consumption, urban status, household size, and parental years of education. Per capita consumption aggregates over approximately 50 consumption categories, using a module similar to that used in the National Sample Survey (NSS). Per capita consumption is expressed in 2005 Rupee terms for consistency. Per capita household consumption serves as a proxy for household income, and I use these terms interchangeably throughout[4]. To examine distributional impacts, I construct per capita consumption quartiles within the same wave, district, and sector to reflect each household's placement in the relevant distribution. Completed years of education are collected for all resident and non-resident household members, and I assign values for maternal and paternal years of education to each child using the structure indicated by the household roster.

School, village, and district characteristics

Questionnaires conducted at the school and village levels provide information to help characterize the local context, including presence of public and private schools in the village, quality of schools in the village, composition of social or caste groups in the village, distance to the nearest town, and whether any members of the village panchayat occupy a seat reserved for individuals belonging to a particular social caste.[5]

[4]IHDS documentation confirms that per capita household consumption effectively captures a household's economic status or standard of living, stating "the total expenditure is often used as the best measure of the household's current economic level."

[5]School surveys were usually conducted with a school principal or teacher. Village questionnaires were typically conducted with a general member of the public, but with a Panchayat member or member of the local government in about a quarter of cases.

Other village-level characteristics and district-level measures are constructed by aggregating over households or individuals in the data (including those without a child in the 8 to 11 year age range included in the primary sample) to the appropriate administrative unit.

Other data sources

District-level male educational mobility data made available by Asher et al. (2021) are merged with the IHDS data at the district level, the smallest administrative unit at which the IHDS data are identified and so can be merged with external data sources.

Finally, precipitation data from the Center for Climatic Research at the University of Delaware provide measures of historical and recent rainfall at the district level to identify positive and negative rainfall shocks using the procedure described in Section 1.3.

1.3 Results

This section presents the main results in detail. I first discuss the key patterns present in the data, focusing particular attention on individual and household characteristics such as consumption and caste group membership. I then explore how these measures of relative advantage or disadvantage interact with the local context (child performance relative to same-age peers) and the broader environment (district-level mobility and poverty). Next, I provide suggestive evidence that these beliefs relate to actual educational investments. Finally, I exploit two sources of plausibly exogenous variation to test whether the observed link between household consumption and beliefs points towards a causal relationship.

Evidence from cross-sectional analysis

Consumption and caste: Raw patterns

Figures 1.1 and 1.2 depict two patterns that motivate the remaining cross-sectional analyses. Figure 1.1 plots local linear regressions of above average (top panel) and below average beliefs (bottom panel) on log household consumption, separately for children of below average, average, or above average actual performance. The upward shift across performance categories indicates that parental beliefs do align with actual performance. (As an example, for all levels of consumption, parents are most likely to believe above-average performers are above average, and least likely to believe below-average performers are above average). The upward-sloping relationship for above-average beliefs (top panel) highlights that beliefs become more positive as consumption rises for all performance categories. Similarly, the downward-sloping relationship for below-average beliefs (bottom panel) highlights that negative beliefs are concentrated among the poorest parents.

In Figure 1.2, local linear regressions are of beliefs on normalized scores with histograms of the corresponding composite raw scores for simplicity (each number 0-7 corresponds to

an approximate one-level increase in performance, for example, moving from the "recognize letters" to the "recognize words" level). Panels A and B show that for all levels of performance, low consumption households are less likely to hold above average beliefs, while high consumption households are more likely to hold above average beliefs.

Panels C and D of Figure 1.2 paint a similar picture with respect to caste. Here we see that for all levels of performance, parents belonging to one of India's Scheduled Tribe or Scheduled Caste groups (SCST) are less likely to hold above-average beliefs and more likely to hold below-average beliefs. These stark consumption-based and caste-based disparities make clear the relationship between these two forms of socioeconomic disadvantage and parental beliefs. I next turn to regression analysis to explore these raw patterns and show that they persist after taking into account other household and contextual factors.

Consumption and caste: Regression analysis

The main cross-sectional analysis uses regressions of the form

$$Beliefs_{ihdw} = \alpha + \beta_1 X1_h + \beta_2 X2_i + \delta_d + \phi_w + \varepsilon_{ihdw} \tag{1.1}$$

are estimated using OLS, where $Beliefs_{ihdw}$ are belief-related outcomes corresponding to child i in household h in district d and wave w. $X1_h$ represents a vector of household characteristics (log consumption, urban status, caste status, and household size) and $X2_i$ represents a vector of child characteristics (normalized composite score and indicators for age 9, 10, 11, whether the child is female, and first child status). δ_d are district fixed effects which account for time-invariant district characteristics, while ϕ_w are wave fixed effects to account for year-specific shocks common across districts.[6] Standard errors are clustered at the village level, and all regressions include appropriate sampling weights. The first two columns of Table 1.1 present estimated coefficients from regressions with raw beliefs as dependent variables, while the final three columns use belief accuracy, underestimation, and overestimation as dependent variables.[7]

The first observation is that parental beliefs do appear to align with actual test performance. 74% of parents whose children perform average on the test correctly report their children to be of average proficiency. Approximately 13% of parents of average performers instead believe that their child is either above or below average. The coefficient estimates show that each one standard deviation increase in test performance is associated with a 3

[6] Results are robust to instead including year fixed effects; close to 90% of the full sample and 85% of the children sample were surveyed in 2005 instead of 2004 (for wave 1) and 2012 instead of 2011 (for wave 2)

[7] As discussed in the data section, composite scores are normalized relative to all children of the same age in the same district and sector. Scores at least one standard deviation below the mean are classified as below average, scores within one standard deviation of the mean as average, and scores one standard deviation above the mean as above average. Beliefs can then be compared directly to actual performance to be characterized as accurate, underestimates, or overestimates.

percentage point increase in the likelihood of believing their child to be above average, and an 8 percentage point decrease in the likelihood of believing their child to be below average.[8]

The regressions in Table 1.1 confirm that the raw patterns observed in the data persist after accounting for individual and household characteristics (with the inclusion of controls) and time-invariant district characteristics (with the inclusion of district fixed effects). Even with the inclusion of these controls, parental beliefs correlate strongly with household consumption and with caste group. Each 10% increase in household consumption is associated with a 0.4 percentage point increase in the likelihood of above average beliefs, with a similar decrease in the likelihood of below average beliefs. These figures equate to a 4 percent increase in above-average beliefs relative to a mean of 13%, and a 3 percent decrease in below-average beliefs relative to a mean of 15%. Using below poverty line status in place of household consumption (as per column 2 of Appendix Table A2) reinforces this finding. Here we can see that parents in below poverty line households are 2 percentage points (15%) less likely to believe their children are above average and nearly 6 percentage points (nearly 40%) more likely to believe their children are below average.

Second, SCST parents are roughly 2 percentage points less likely to believe their children are above average, and 2 percentage points more likely to believe their children are below average. This being in addition to the basic consumption result highlights the link between belonging to a more disadvantaged caste group and more negatively-biased beliefs, over and above any material disadvantage in terms of household consumption or poverty status.

Patterns related to household consumption and caste are similar for overestimation and underestimation as shown in the final two columns of Table 1.1; going forward, I focus on above average and below average beliefs in the analysis, but refer to these as overestimation and underestimation interchangeably.

Table A2 explores robustness of these findings to using alternate measures to capture household consumption and child performance, to including school fixed effects (for the subsample of children that could be linked to a specific school in the village), and to restricting the sample to urban, rural, wave one, or wave two households only. The main results related to household consumption and caste are robust across each of these robustness checks.

The next piece of the analysis highlights an interaction between context (urban status) or social identity (caste) and household consumption, which motivates much of the remaining cross-sectional analysis. Table 1.2 presents regression estimates where all controls are interacted with either caste group identity or urban status. For SCST parents, the link between consumption and above-average beliefs is weaker than for non-SCST parents, while for urban parents, the link between consumption and above-average beliefs is stronger than for rural parents. No significant interactions appear for below-average beliefs.

[8]Note that test performance correlates mechanically with overestimation and underestimation as shown by the counterintuitive sign on the normalized score coefficients in columns (4) and (5); for example, a higher score reflects a greater likelihood that a child actually is above average, and hence a smaller chance that their parents would overestimate.

Performance relative to peers

I next turn to exploring how these basic consumption-based and caste-based relationships interact with the local context. To start, I explore how consumption and caste interact with performance relative to peers in the same village or school.[9] I first compute age group-specific village and school average raw composite scores, leaving out each child's own contribution to the mean. I require there to be at least two same-age group "peers" within the same village or school; to minimize data loss, 8 and 9 year olds are grouped and 10 and 11 year olds are grouped together. Using this procedure, peer performance is defined for approximately 75% of the sample at the village level and 55% at the school level (the latter within the subsample of children that can be linked to schools).[10] I then compute the gap between each child's raw composite score and the village or school average score to capture each child's performance relative to peers in their local context. This strategy may also have the benefit of approximating the set of other children to which parents would be most exposed, and hence who the set of children they might have in mind when assessing their child's relative performance.

For this analysis, regressions are of the form

$$\begin{aligned} Beliefs_{ihdgw} = \alpha + \gamma_1 Gap_i + \gamma_2 Gap \times LowCons_i + \gamma_3 Avg_g \\ + \beta_1 \widetilde{X1}_h + \beta_2 \widetilde{X2}_i + \delta_d + \phi_w + \varepsilon_{ihdgw} \end{aligned} \tag{1.2}$$

where Gap_i is the gap between child i's score and peer group g's average score, Avg_g. All controls and fixed effects are as before, though $\widetilde{X1}_h$ includes an indicator for low (below median) consumption rather than the continuous measure and $\widetilde{X2}_i$ does not include child performance. Gaps are measured in terms of raw composite scores and scaled to range from 0 to 7 so that each raw score unit represents approximately a one-level increase in performance (moving from "recognize letters" to "recognize words," for example).

The results in Table 1.3 demonstrate that parental beliefs align with performance relative to local peers, and reinforce the interactions between consumption, caste, and context as suggested in the previous subsection.

The first two columns of panel A show that above-average beliefs relate strongly to relative performance, but this relationship attenuates for low consumption (below median consumption) households at both the village and school levels. Wealthy parents of a child who scores one level higher than peers in her village are 2.3 percentage points more likely to hold above-average beliefs; this declines by a percentage point for poor parents, with similar patterns for the within-school comparisons. Panel B of Table 1.3 replicates this exercise with caste-group interactions. Again, parental beliefs relate positively to relative performance, with a weaker relationship for SCST parents.

[9] For just over 70% of the sample, children can be linked to local schools covered in the school questionnaire. The sample of children that can be linked to schools shows imbalance across waves: In wave 1, 98% of the sample can be linked to a school while in wave 2, only 42% of the sample can be linked to a school.

[10] For cases where the village or school mean cannot be computed, I set the village or school mean to 0 and include indicators for missing mean in the regression analysis.

Moving to below-average beliefs in columns 3 and 4 of Table 1.3, I flip the sign on gaps for ease of interpretation; now gaps can be interpreted as the number of levels *below* the village or school average a child scores. Consistent with the findings for above-average beliefs, scoring one level below the village average is associated with a 3.6 percentage point increase in the likelihood that high consumption parents believe their children are below average; this relationship is even stronger for poor parents. In panel B, we see little difference in the relationship between negative gaps and below-average beliefs for SCST versus non-SCST households.

District mobility and district poverty

I next turn to exploring how the broader context in terms of district poverty and mobility may influence the relationship between household consumption or caste with parental beliefs. District poverty is captured by the fraction of households living below the poverty line as per the IHDS data. District mobility is captured using measures of district-level upward mobility as per Asher et al. (2021), who develop a method appropriate for computing educational mobility ("bottom half mobility") in a context like India where low levels of educational attainment may be common among older cohorts. These researchers graciously made available both their code to construct these measures as well as computed measures of urban and rural mobility at the district level in India; I make use of the latter for the purposes of this research, averaging across urban and rural mobility measures. Districts are then classified as either high or low poverty and high or low mobility according to whether each measure is above or below the median across all districts.

This analysis estimates regressions of the form

$$\begin{aligned} Beliefs_{ihdsw} = \alpha + \pi_1 DistChar_d + \pi_2 DistChar \times LowCons_{id} \\ + \beta_1 \widetilde{X1}_h + \beta_2 X2_i + \delta_s + \phi_w + \varepsilon_{ihdsw} \end{aligned} \tag{1.3}$$

where $DistChar_d$ is an indicator for whether district d is classified as high or low in terms of mobility and poverty rates, and $DistChar \times LowCons_{id}$ represents the interaction between the relevant district characteristic and household consumption status. Controls are similar to the usual controls, only $\widetilde{X1}_h$ now includes an indicator for low (below median) consumption rather than the continuous measure, and fixed effects δ_s are at the state level.

Columns 1 and 2 of panel A in Table 1.4 indicate that above-average beliefs are concentrated among high consumption households in high mobility and low poverty districts, with no such advantage for poor parents in these same types of districts. High consumption parents are 4 percentage points more likely to hold above-average beliefs in high mobility districts and 3 percentage points more likely to hold above-average beliefs in low poverty districts. These level shifts reverse for poor parents; p-values from an F-test reported in the notes panel of the table indicate that the link between high mobility or low poverty contexts and above-average beliefs all but disappears for these poor households.

In contrast, columns 3 and 4 of panel A in Table 1.4 highlight that below-average beliefs are more common among poor parents in low-mobility or high-poverty contexts. In low

mobility districts, high consumption parents are no more likely to hold below-average beliefs. In high poverty districts, even these wealthier parents are 5 percentage points more likely to believe their children are below average and this nearly doubles for low consumption parents.

Panel B provides some evidence that above-average beliefs are marginally lower among SCST relative to non-SCST parents in high mobility and low poverty districts (columns 1 and 2), with no clear differences or patterns for below-average beliefs.

Taken together, the analysis thus far supports a strong link between household wealth and positive beliefs, suggesting that a favorable climate with respect to district-level mobility and poverty seems to strengthen this relationship for wealthy parents, but not for the poor. Perhaps more strikingly, the analysis thus far also reveals a strong link between household poverty and negative beliefs. An unfavorable climate in terms of living in a low mobility or high poverty district correlates more strongly with below-average beliefs for poor compared to more wealthy parents.

Gender and birth order

Though not the primary focus of this paper, I next discuss several analyses that explore differences in the relationship between consumption and beliefs by gender and birth order.

Perhaps surprisingly given differences across genders in terms of educational and other investments as documented in the literature (Azam and Kingdon, 2013; Barcellos et al., 2014; Kingdon, 2005) and explored in the next section, there do not appear to be meaningful differences in the nature of parental beliefs across male and female children. The main specification in Table 1.1 suggests that parents are more likely to believe their female children are above average *and* more likely to believe their female children are below average.[11] That parental beliefs are more dispersed for female than for male children (parents are less likely to classify their female children as average) can explain these seemingly contradictory findings.[12]

Figure A1 makes clear the lack of substantial disparities by gender. For all levels of consumption (top panel) and performance (bottom panel), there are few differences in the likelihood of above-average or below-average beliefs across male and female children.

Table A3 tests for differences in the strength of the relationship between household and consumption by gender. This table presents regression estimates where all controls are interacted with either an indicator for female (columns 1 and 3) or first child status (columns 2 and 4). There does not appear to be a difference in the strength of the relationship between household consumption and beliefs by gender, though there is some evidence that the link between consumption and above-average beliefs is stronger for first children. One interpretation of this has to do with learning; if high consumption households are predisposed to overestimate their children, this tendency could be greatest with respect to their eldest children before they are exposed to other children or siblings and get a better sense for how their child truly compares.

[11] These patterns do not persist when moving to over and underestimation in columns 4 and 5 of Table 1.1.

[12] In the raw data, parents are 1.5 percentage points less likely to classify their female children as average than they are their male children (73.5% versus 71.9%).

Turning to interactions with district characteristics, Table A4 shows that above-average beliefs are more common for female children in a low poverty context, while below-average beliefs are more common for female children in a high poverty context. While only suggestive, these results hint that context may matter more (or at least, differently) for female than for male children with respect to beliefs.

Finally, the outcomes explored here reflect beliefs about overall academic ability rather than beliefs related to specific domains. A lack of clear disparities in beliefs by gender could mask the existence of disparities in beliefs across domains, something I explore in other research in contexts where beliefs are available separately for math and reading. Any such disparities in parental beliefs would be consistent with well-documented domain-specific gender gaps in perceived math ability among teachers and students themselves. For example, evidence from Chile indicates that female students tend to be much less confident in their math competency compared to equally-performing male peers (Bharadwaj et al., 2016). In India, female students are much less likely to continue on to a STEM-related track in secondary school (Sahoo and Klasen, 2021), and their math performance declines when taught by a more gender-biased teacher (Rakshit and Sahoo, 2020).

Investments

Beliefs only matter in terms of shaping educational outcomes to the extent they either directly influence the investments parents make towards their children's education or indirectly influence outcomes (by shaping motivation, effort or through self-fulfilling prophecies, for example). Here I provide evidence showing that beliefs do seem to relate to actual investments in this context.

Table 1.5 presents regressions of various current and forward-looking investments on beliefs and the same controls as per regression equation (1.1). Controlling for household income, urban context, child performance, and other relevant factors, investments correlate positively with above-average beliefs, and negatively with below-average beliefs. Relative to parents who believe their children are average, parents with above-average beliefs spend 3.4 percentage points more on their children's education (nearly 25% higher relative to the sample mean), are more likely to invest in tutoring or private school, and their children dedicate an additional hour on educational activities each week. Educational spending is 2.5 percentage points lower among parents who believe their children are below average, and their children spend dedicate an hour less time to educational activities each week, are more likely to be absent, and are over 10 percentage points less likely to continue on to secondary school. Investments tend to be lower for female children, even when accounting for performance, household characteristics, and parental beliefs.

These findings are purely correlational. There are likely myriad omitted factors that influence both beliefs and investments, and it is likely that reverse causality is at play if parents who are able to invest more in their children's education hold elevated beliefs as a result. Table A5 replicates the main cross-sectional analysis in columns 1 and 3, adding a suite of investment-related controls in columns 2 and 4. With the inclusion of these

controls, the relationship between household consumption or caste and beliefs attenuates, but persists. While far from conclusive, these results some alignment between beliefs and investments, and are consistent with other evidence showing a causal link between beliefs and investments (Dizon-Ross, 2019; List et al., 2021).

Evidence from exogenous rainfall shocks

The cross-sectional analysis presented thus far shows a striking relationship between household consumption, caste, and parental beliefs. The next two pieces of the analysis use two different sources of plausibly exogenous variation that could shift household economic circumstances to test whether parental beliefs respond to these shifts.

In the first analysis, I exploit the panel nature of the dataset with a household fixed effects identification strategy to test whether parental beliefs among rural households shift in response to positive or negative rainfall events. For the purposes of this analysis I focus on rural households present in both waves of the survey.

This approach rests on the idea that for rural or primarily agricultural households who rely on rainfall for crop irrigation during the rainy or "kharif" season, the level of rainfall strongly influences agricultural production and household income. Several papers in the literature make use of a similar empirical strategy, exploiting exogenous rainfall conditions to test for impacts on wages (Jayachandran, 2006), wage rigidity (Kaur, 2019), consumption (Hossain and Ahsan, 2018), sectoral allocation (Emerick, 2018), children's educational performance and schooling attainment (Shah and Steinberg, 2017), and myriad later life outcomes (Maccini and Yang, 2009). All but the latter adopt this strategy for the Indian context, and several provide direct evidence for the link between rainfall and crop production or agricultural output (Jayachandran, 2006; Shah and Steinberg, 2017; Emerick, 2018).

Rainfall shocks are defined to capture positive or negative deviations from district-level historical average rainfall. I first compute total rainfall in the preceding rainfall year (from the previous year's June to the current year's May, instead of from January to December) for each household ("recent rainfall") and the distribution of rainfall over the period from 1969 to 2003 ("historical rainfall"). I then define a positive rainfall shock as when recent rainfall exceeds the 80th percentile of historical rainfall, and a negative rainfall shock as when recent rainfall is less than the 20th percentile of historical rainfall, similar to the process used in Jayachandran (2006) and Kaur (2019). In an alternate definition, rainfall shocks are based on rainfall in the preceding wet season (June to November), and I control for rainfall in the preceding dry season (December to May) in the analysis, somewhat similar to the process used in (Emerick, 2018). These binary measures capture cases where rainfall is particularly favorable or unfavorable in a certain year, relative to the amount of rainfall a district typically receives. Appendix Figure A2 maps the spatial distribution of rainfall shocks, pooling 2004 with 2005 and 2011 with 2012.

Table 1.6 presents estimates from a series of regressions to test the link between rainfall and farm income, and the reduced form relationship between rainfall and beliefs. In the final regression, I test whether rainfall shifts actual performance; if there are short-term impacts

on test scores (through changes in nutrition, school attendance, etc.), these could account in some part for any observed shifts in beliefs. These regressions include

$$FarmIncome_{hdy} = \alpha + \lambda_1 PRS_{dy} + \lambda_2 NRS_{dy} + \theta_h + \phi_y + \varepsilon_{hdy} \quad (1.4)$$

$$Beliefs_{ihdy} = \alpha + \lambda_1 PRS_{dy} + \lambda_2 NRS_{dy} + \beta_2 X2_i + \theta_h + \phi_y + \varepsilon_{ihdy} \quad (1.5)$$

$$Score_{ihdy} = \alpha + \lambda_1 PRS_{dy} + \lambda_2 NRS_{dy} + \beta_2 \widetilde{X2}_i + \theta_h + \phi_y + \varepsilon_{ihdy} \quad (1.6)$$

where PRS_{dy} and NRS_{dy} indicate positive and negative rainfall shocks in district d and year y. All regressions include household fixed effects θ_h to account for time-invariant household characteristics and year fixed effects ϕ_y to account for year-specific shocks, with standard errors clustered by district and year to allow for correlation within districts in a particular year.[13] Beliefs regressions include the usual child-level controls $X2_i$, while the performance regressions include a modified set of child characteristics $\widetilde{X2}_i$ without child scores. Farm income includes earnings from crop production, animal husbandry, rented land, etc. net of input costs. For this outcome, I use the full sample (including households without children in the main sample), but restrict to rural households observed in both waves. Child-level regressions restrict to rural households in the main child sample observed in both waves. λ_1 and λ_2 capture how outcomes vary in response to a positive or negative rainfall shock in a particular district and year, holding constant other household-specific factors that may shape farm income, beliefs, or child performance.

The results are striking, and suggest a causal link between transient negative shocks and beliefs. First, the results indicate that a negative rainfall event reduces farm income by 40-55%, a dramatic decrease that supports the hypothesized link between rainfall conditions and agricultural earnings for rural households in India. The same negative rainfall shocks lead to a 6 percentage point decline in the likelihood that parents believe their children are above average – a nearly 75% decline relative to the mean. Similarly, a negative rainfall shock leads to an 8 percentage point increase in the likelihood that parents believe their children are below average (a roughly 40% increase relative to the mean).

The final column helps rule out short-term changes in performance in response to negative rainfall shocks, indicating that the strong beliefs response comes not from a shift in performance as a result of rainfall conditions, but from something else. These results are robust to using normalized composite scores instead of raw composite scores as the dependent variable.

In summary, transient negative rainfall shocks reduce farm income and lead parents to express more negative beliefs about their children's academic proficiency. Negative rainfall shocks could impact beliefs purely through economic channels, but could also trigger psychological or other mechanisms that account for some portion of the response, something I discuss in Section 1.4.

Finally, responses to transient negative rainfall shocks could be harmless if they simply represent short-term fluctuations in beliefs that eventually revert without any tangible

[13] All three regressions are robust to using year and month, year by month, year and season, or year by season fixed effects, where the month and season fixed effects account for seasonality.

consequences in terms of investments. Given the set up, an analysis of the link between negative rainfall shocks and investments cannot distinguish changes in investments due to income-related channels versus beliefs-related channels.

Evidence from urban movers

While the previous section explored the impact of temporary changes to a household's economic circumstances, this section provides suggestive evidence exploring how a more permanent shift in context may shape parental beliefs. The cross-sectional analysis in Table 1.1 indicates that urban parents are significantly more likely to hold above-average beliefs, and significantly less likely to hold below-average beliefs. Urban areas in India may offer many advantages, among them better employment opportunities, higher wages (Munshi and Rosenzweig, 2016), greater educational mobility (Asher et al., 2021), proximity to secondary and tertiary education (Azam, 2017), and higher levels of consumption (Ghosh et al., 2021). Urban children also tend to perform better on the assessment as part of the IHDS, scoring nearly a half a level higher in each of math and reading compared to their rural counterparts. Even accounting for performance, household income, and the like, urban parents still hold elevated beliefs. Columns 4 and 5 of Table 1.1 make this clear, where expressed in terms of overestimation and underestimation, the "urban advantage" becomes even stronger than when expressed in terms of raw beliefs.

In this analysis, I focus on a sample of rural to urban movers to explore how recent exposure to an urban environment impacts parental beliefs. While the IHDS does not include a migration panel or track migration between waves, surveyed households were asked how recently their household moved to their current location, and whether their previous location was urban or rural. Current urban households can thus be classified as either always urban or as rural to urban movers, and characterized by recency of the move if the latter.

As urban movers may be differently selected than urban non-movers along a number of dimensions, I restrict attention to the sample of urban movers who moved within the last 50 years[14] and exploit variation in the length of time since the move to compare those who moved within the last three, five, or ten years to those who moved within the last 50. This analysis uses regressions of the form

$$Beliefs_{ihdw} = \alpha + \pi_1 Move0toY_h + \beta_1 X1_h + \beta_2 X2_i + \delta_d + \phi_w + \varepsilon_{ihdw} \tag{1.7}$$

where controls and fixed effects are as before, but where $Move0toY$ indicates whether household h moved within the last three, five, or ten years ($Y \in \{3, 5, 10\}$).

This analysis identifies the causal effect of move recency under the assumption that conditional on being the type of household to move, the timing of that move (three, five, or ten

[14]Results are robust to several alternative cutoffs between 45 and 55 and robust to dropping approximately 100 children in households where the parents themselves were potentially born after the move (specifically, if the move was 10 or more years before the youngest of the two parents was born; since ages and years since move are clustered at 10, 20, 30, 40, 50, etc., the 10 year buffer allows for approximation in either of the two). The main results opt for the fixed rather than household-specific cutoff for transparency.

years prior) relative to the timing of the survey is as good as random. This procedure could lead to biased estimates if there were year-specific factors that impacted the composition of urban movers in any given year, or if those who moved urban many years ago and now have a child between 8 to 11 years old differ systematically from those who moved more recently and have a child between 8 to 11 years old. The use of several time horizons (three, five, and ten years) and pooling across two waves (so that "within the last three years" refers to a different time period for those surveyed in the first and second waves) helps to obviate these concerns. Even so, this analysis should be considered as purely suggestive.

Appendix Table A7 assesses balance between the recent movers and less recent movers on a range of relevant characteristics. Importantly, there are no significant differences in terms of household consumption or child performance. Recent movers are slightly more well educated (this difference disappears when comparing those who moved within versus outside of 10 years), less likely to be SCST, and much less likely to be observed in wave 2.[15]

Table 1.7 presents the main results from this analysis. Recent urban movers, whether within the last three, five, or ten years, are 4 to 7 percentage points more likely to believe their children are above average compared to those who moved less recently (though only significant at the 10% level). The largest effects are observed among those who moved within the last 3 years, which could represent those for whom the urban environment might be the most novel. Effects on below average beliefs are negative, but not significant.

While this analysis is purely suggestive and the results should be interpreted with caution, these findings are consistent with the evidence presented until now. Those who more recently moved to an urban environment appear to positively update beliefs about their children. Whether this comes from some material aspects associated with an urban environment (for example, higher earnings and consumption), from access to higher quality schooling, from a shift in expectations for the child's future employment opportunities, or from something else is unknown. Taken together with the context-related results presented earlier, this exercise supports the idea that context matters for shaping parental beliefs (over and above observable, material considerations), and that beliefs shift in response to a change in context.

1.4 Discussion of Mechanisms

The results presented so far show a strong cross-sectional relationship between household economic circumstances, social identity, and beliefs, with evidence that beliefs respond negatively to negative income shocks and positively to shifts towards a more favorable environment. Taken together, these results suggest the cross-sectional relationship could be more than correlational. Rather, there could be certain features of poverty or of belonging to a disadvantaged caste group that lead parents to underestimate their children. In other words, poverty or social disadvantage may themselves lead to negatively-biased beliefs. Though not

[15]The imbalance across waves is mechanical, since that individuals in the sample at the time of wave 1 who would have moved urban before wave 2 are more likely to attrit from the sample precisely due to that move.

equipped to definitively test any of these in this paper given the data setting, I outline and discuss several candidate mechanisms that could explain this link to explore in future work.

Individual- and group-based belief formation

Parental beliefs could take on a negative bias if parents look to external cues to inform beliefs about their children, and if those external cues tend to be disproportionately negative. When available, parents incorporate direct information and feedback from teachers, tutors, and their own observations about their child's performance. In the absence of complete information, parents may turn to external sources of information, by directly observing outcomes among individuals within a shared identity or context or drawing inspiration from role models.

Empirical evidence supports that individuals' aspirations are fundamentally shaped by one's peers and surroundings, for example, through exposure to role models with similar characteristics in terms of socioeconomic status or gender (Nguyen, 2008; Beaman et al., 2012; Tanguy et al., 2014) or through exposure to geographically-proximate high-performing peers (Fernández, 2021). In a similar way, outcomes among those of a shared identity or context may influence beliefs about individual members associated with that same identity or context[16]. In other words, role models and exposure to successful peers may "work" by not only suggesting new or higher goals (elevating aspirations), but also and by showing that individuals from a similar background also have the capability of attaining those higher goals (elevating beliefs). A corollary of these findings would seem to be that absent exposure to role models or successful peers, aspirations and/or beliefs about ones capabilities may be too low.

This framework makes clear how various forms of disadvantage could lead to a systematic negative bias in beliefs. Lack of exposure to role models, harmful group-based stereotypes, or observing worse outcomes among peers could all negatively influence the external sources of information available to parents, lending those own-child beliefs a more negative bias when parents incorporate this information. In turn, parents could rely more on such external sources of information when child-specific information is unavailable in the presence of information frictions. Poverty or social disadvantage could worsen both mechanisms: informational frictions and a lack of role models may be more severe among the poor, the structural constraints of poverty may worsen observable outcomes among peers, and negative group-based stereotypes may be more salient or consequential for low income or SCST individuals (Hoff and Pandey, 2006; Mukherjee, 2017; Farfan Bertran et al., 2021).

[16] Ray (2006) argues in the context of aspirations formation that "there is no experience quite as compelling as the experience of your immediate family, and more broadly, those in your socio-economic and spatial neighborhood." In the same way that "individuals look at others around them, and their experiences and achievements shape their desires and goals" (Genicot and Ray, 2020), individuals may look to outcomes among those around them to inform beliefs about their own and their children's ability.

Feedback between pathway constraints and beliefs

Parents may also internalize the opportunities or constraints associated with their level of income and their environment, so that current beliefs reflect expectations of child proficiency after having progressed through the education system. Low income parents may expect that the investments they will be able to provide may limit their children from reaching their true potential. If parents incorporate these future expectations into current assessments of proficiency, this could translate into a negative bias. In contrast, high consumption households may hold elevated beliefs in expectation of their child continuing to learn and progress with ample educational investments and support.

Such a phenomenon would not only be consistent with the observed correlation between consumption and beliefs, but also with the observed interactions between consumption and the broader environment. Parents in high mobility or low poverty contexts may expect that their children will have access to high quality schooling and supportive and well-trained teachers to support their child's learning throughout their education. They may also expect there will be more opportunities available when children complete their education. That high consumption parents exhibit even higher beliefs in these contexts could reflect that these parents know they will be able to complement high quality schooling with additional investments and inputs.

In contrast, parents in low mobility or high mobility contexts may internalize the constraints associated with those environments and so hold less positive beliefs. That beliefs are even more negative among the poor in these unfavorable contexts could reflect that these constraints are even more binding among the poor.

This channel would also be consistent with the evidence presented earlier that beliefs shift positively in response to a recent urban move. This result was interpreted as potentially reflecting that the urban environment would be more novel or salient for recent movers, but it could also represent that in response to a shift to a favorable context, parents at once positively update beliefs based on the quality of schooling and other educational inputs they will now be able to provide.

Table 1.8 provides some limited evidence related to this potential channel. While low consumption, rural, and SCST children are more likely to attend a government school (as per column 1), members of their household tend to report less confidence in private schools, and more confidence in government schools to provide a good education (columns 2 and 3).[17] In other words, low income and SCST parents are more likely to send their children to government schools, but do not appear to be more dissatisfied with the quality of these schools compared to more expensive private schools (at least according to these self-reported measures, which could have some limitations).

[17]The primary survey respondent was asked to report whether they have "a great deal of confidence," "only some confidence," or "hardly any confidence at all" in a number of institutions, among them government and private schools. Responses were compared across questions to determine whether respondents had more confidence in private schools, government schools, or equal confidence in the two. This question was only asked in this form in wave 2

Complementarities between income and investments

An alternative explanation could be if there are complementarities between household income and educational investments in terms of shaping outcomes, but parents do not fully internalize these complementarities. This could occur if, for example, high income parents are able to provide more nutritious food, which helps children learn and focus in school. Or, if high income parents are able to invest in education at the preschool level, which sets their children on a steeper learning trajectory when they do start school compared to children from more disadvantaged backgrounds.

If parents do not fully internalize these complementarities but infer their child's ability from the relationship between past investments and outcomes, this could lead high income parents to attribute positive outcomes (for example, higher test scores) associated with a particular level of investment to their child's ability rather than to the complementarity between income and investments. If children of low income parents attain lower scores given the same level of investment (given that there exist complementarities between income and investments), and parents consider these lower scores as indicative of their child's ability rather than due to the influence of economic or other factors, this could lead low income parents to underestimate their children.

Depression, hopelessness, and negative affect

Finally, negatively biased beliefs among the poor and disadvantage could simple reflect greater rates of depression, hopelessness, or negative affect among these groups. Evidence supports a link between poverty and depression (De Quidt and Haushofer, 2016; Ridley et al., 2020) or hopelessness (Lybbert and Wydick, 2018; Duflo, 2012), and parents living in poverty may exhibit more negative beliefs as an expression of these outcomes.

I defer a more thorough discussion of these potential causes to future work, but present some limited evidence from this context to support a greater tendency towards expressing negative perceptions and assessments in general among the poor. This comes from comparing how individuals characterize the same relative change in consumption over time as a function of their economic standing in wave 1.

Respondents were asked in wave 2 whether they consider their household's current economic status to be better, worse, or the same as it was during wave 1. Within households who all experienced consumption growth of 50 to 100% between waves, the likelihood that respondents report their economic circumstances are better than in wave 1 increases steadily along the initial wave 1 consumption distribution, as shown in Figure 1.3. To illustrate, a household at the 75th percentile was nearly twice as likely to report better economic circumstances than a household at the 25th percentile of the wave 1 consumption distribution given that both experienced a 50% to 100% increase in consumption over time. Similar patterns are evident among households that all experienced actual consumption growth of up to 50% or of over 100% between waves.

This analysis is purely suggestive, since impressions of economic circumstances are necessarily interrelated with actual economic circumstances, and the same relative change in consumption may have very different meanings for poor versus non-poor households. However, this evidence at least suggests that there could be a gradient in belief optimism along the income spectrum, which you could expect to see if the poorest households are more likely to experience depression, hopelessness, or negative affect as a consequence of poverty.

1.5 Conclusion

This paper documents a robust relationship between socioeconomic status and parental beliefs about children's academic proficiency and provides evidence to support that this relationship may indeed be causal.

Cross-sectional analysis reveals that parents in low consumption households or those belonging to one of India's more historically disadvantaged castes are significantly less likely to hold above-average beliefs, and significantly more likely to hold below-average beliefs. That these results persist after accounting for actual performance suggests that these patterns may reflect systematic underestimation or negative bias among disadvantaged parents. The evidence presented also suggests that parental beliefs correlate with the broader context. Beliefs tend to be lower in low mobility or high poverty contexts, and even more so for low income parents.

The evidence presented suggests that parental beliefs respond to changes in household economic circumstances, which points towards a causal relationship between these economic circumstances and beliefs. Parental beliefs respond negatively to negative income shocks driven by adverse exogenous rainfall events, and positively in the earlier years of a move to a more favorable (urban) environment. Taken together, these findings suggest that household economic circumstances and context may fundamentally shape parental beliefs about their children's academic proficiency.

Worth noting is that whichever features of poverty or social disadvantage contribute to a negative bias in beliefs about academic proficiency could also foster negative beliefs in other domains which then influence other important areas of economic decision-making. For example, decisions about whether to migrate to an urban center in search of better employment opportunities may depend on beliefs about expected wage gains, and decisions about whether to invest in a new agricultural technology rely on perceived or expected productivity gains.

Turning back to parental beliefs, such beliefs are only consequential to the extent they shape educational investment decisions or directly impact children through motivational or related channels. While I only show a correlational relationship between beliefs and investments, theoretical arguments and empirical evidence support that important investment decisions may be made on the basis of such beliefs.

To the extent that the poor and disadvantaged systematically underestimate their children's academic proficiency, this could lead to underinvestment in education, and ultimately

to the intergenerational persistence of poverty on an individual level and to missed opportunities for growth on an economy-wide level (Bell et al., 2019; Hsieh et al., 2019).

A large body of research makes clear the paramount role that parents play in shaping their children's educational outcomes, and demonstrates the efficacy of various policies and programs designed to support parents in their roles. The results presented in this and other research suggest a role for interventions that may equip parents not only with the material resources, but also with the psychological resources, to best support their children's learning. Interventions targeted at reducing harmful underestimation and positively shifting parental beliefs may represent one as-yet untapped way of effectively supporting parents towards that end.

Tables

Table 1.1: Correlates of Parental Beliefs

	Raw beliefs		Beliefs relative to performance		
	Believe above average	Believe below average	Accurate	Overestimate	Underestimate
	(1)	(2)	(3)	(4)	(5)
Log consumption	0.0438***	-0.0428***	-0.00224	0.0408***	-0.0385***
	(0.007)	(0.008)	(0.011)	(0.008)	(0.009)
Urban	0.0209*	-0.0228**	0.0316**	0.0220**	-0.0536***
	(0.011)	(0.010)	(0.014)	(0.011)	(0.010)
Parental education	0.00560***	-0.00340***	-0.00253**	0.00573***	-0.00320***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
SCST	-0.0204***	0.0181**	0.00918	-0.0250***	0.0158*
	(0.006)	(0.009)	(0.011)	(0.007)	(0.009)
Child female	0.0125**	0.0147**	-0.0169*	0.00931	0.00759
	(0.006)	(0.007)	(0.009)	(0.007)	(0.007)
Composite Z-Score	0.0301***	-0.0770***	-0.00407	-0.172***	0.176***
	(0.003)	(0.004)	(0.006)	(0.004)	(0.004)
Sample	Full	Full	Full	Full	Full
Fixed Effects	District	District	District	District	District
Mean for Below Average Child	0.0709	0.303	0.303	0.697	0
Mean for Average Child	0.120	0.150	0.730	0.120	0.150
Mean for Above Average Child	0.178	0.0847	0.178	0	0.822
Overall Mean	0.121	0.163	0.585	0.188	0.227
R-squared	0.109	0.164	0.0419	0.206	0.220
Observations	22726	22726	22726	22726	22726

Additional controls (with coefficients not displayed) include indicators for age 9, 10, or 11 years of age, whether the child is a first child, household size, and indicators for missing consumption, parental education, or first child status. Includes district and wave fixed effects. Includes appropriate sampling weights. Standard errors clustered by village/neighborhood.

Table 1.2: Correlates of Parental Beliefs: Caste and Urban Status

	Believe above average		Believe below average	
	(1)	(2)	(3)	(4)
Log consumption	0.0505***	0.0314***	-0.0395***	-0.0485***
	(0.008)	(0.008)	(0.009)	(0.010)
Log consumption × SCST	-0.0247**		-0.0119	
	(0.011)		(0.014)	
Log consumption × Urban		0.0401***		0.0172
		(0.013)		(0.011)
Sample	Full	Full	Full	Full
Fixed Effects	District	District	District	District
Mean for Average Child	0.120	0.120	0.150	0.150
R-squared	0.110	0.111	0.165	0.167
Observations	22726	22726	22726	22726

All controls fully interacted with either caste group (in columns (1) and (3)) or urban status (in columns (2) and (4)). Additional controls (with coefficients not displayed) include indicators for age 9, 10, or 11 years of age, whether the child is a first child, household size, and indicators for missing consumption, parental education, or first child status. Includes district and wave fixed effects. Includes appropriate sampling weights. Standard errors clustered by village/neighborhood.

Table 1.3: Beliefs and Performance Relative to Peer Groups

	Believe above average		Believe below average	
	Ref group: Same village	Ref group: Same school	Ref group: Same village	Ref group: Same school
Panel A: Consumption Interactions	(1)	(2)	(3)	(4)
Low consumption	-.0174**	-.00705	.0235**	.0198
	(.007)	(.008)	(.010)	(.012)
Gap with with peer group mean	.0226***	.0194***	.0362***	.0352***
	(.003)	(.004)	(.003)	(.005)
Low consumption × Gap with with peer group mean	-.0102***	-.00711*	.00963***	.0142***
	(.004)	(.004)	(.004)	(.005)
Fixed Effects	District	District	District	District
Pvalue Gap + Gap * Low Cons = 0	0.000	0.000	0.000	0.000
Observations	22726	16094	22726	16094
Panel B: Caste Group Interactions				
SCST	-.0154**	-.0210**	.00919	.00190
	(.007)	(.008)	(.009)	(.012)
Gap with with peer group mean	.0169***	.0162***	.0416***	.0450***
	(.002)	(.003)	(.003)	(.004)
SCST × Gap with with peer group mean	-.00592**	-.00774**	-.000213	-.00456
	(.003)	(.004)	(.005)	(.006)
Fixed Effects	District	District	District	District
Pvalue Gap + Gap * SCST = 0	0.000	0.005	0.000	0.000
Observations	22726	16094	22726	16094

Reference groups include either other children of the same age group (8 or 9 versus 10 or 11) within the same village (columns (1) and (3)) or school (columns (2) and (4)). Gaps with reference group average as per columns (3) and (4) are negative gaps for ease of interpretation (negative gaps capture distance below the reference group mean). Includes reference group mean score. Columns (2) and (4) restrict attention to the subset of children who can be linked to a particular school. Additional controls (with coefficients not displayed) include indicators for age 9, 10, or 11 years of age, whether the child is a first child, household size, and indicators for missing consumption, parental education, or first child status. Includes district and wave fixed effects. Includes appropriate sampling weights. Standard errors clustered by village/neighborhood.

Table 1.4: Beliefs and District Mobility and Poverty

	Believe above average		Believe below average	
	District char: High mobility	District char: Low poverty	District char: Low mobility	District char: High poverty
Panel A: Consumption Interactions	(1)	(2)	(3)	(4)
Low consumption	-.00692	-.0146*	.00743	-.00140
	(.010)	(.009)	(.010)	(.010)
District characteristic	.0399***	.0323***	.0246	.0513***
	(.014)	(.013)	(.015)	(.012)
Low consumption × District characteristic	-.0492***	-.0288**	.0415***	.0419***
	(.015)	(.014)	(.016)	(.014)
Fixed Effects	State	State	State	State
Pvalue Dist Char + Dist Char * Low Cons = 0	0.410	0.712	0.000	0.000
Observations	22726	22726	22726	22726
Panel B: Caste Group Interactions				
SCST	-.0160*	-.0132*	-.00472	.0206*
	(.009)	(.008)	(.012)	(.011)
District characteristic	.0187*	.00987	.0423***	.0704***
	(.011)	(.009)	(.014)	(.013)
SCST × District characteristic	-.0271**	-.0229*	.0276	-.00746
	(.014)	(.013)	(.019)	(.017)
Fixed Effects	State	State	State	State
Pvalue Dist Char + Dist Char * SCST = 0	0.527	0.258	0.000	0.000
Observations	22726	22726	22726	22726

Additional controls (with coefficients not displayed) include indicators for age 9, 10, or 11 years of age, whether the child is a first child, household size, and indicators for missing consumption, parental education, or first child status. Includes state and wave fixed effects. Includes appropriate sampling weights. Standard errors clustered by village/neighborhood.

Table 1.5: Parental Beliefs and Investments

	Current investments					Forward looking investments	
	Annual spending (%) (1)	Weekly minutes educational activities (2)	Any tutoring (3)	Attends private school (4)	Absence last 30 days (5)	Future secondary school (6)	Future science or tech track (if any secondary) (7)
Believe above average	3.361***	57.19**	0.0641***	0.0705***	0.0140	0.0215	0.113***
	(0.516)	(22.284)	(0.013)	(0.012)	(0.154)	(0.016)	(0.034)
Believe below average	-2.537***	-77.30***	-0.0107	-0.0633***	1.000***	-0.112***	0.0192
	(0.478)	(19.450)	(0.010)	(0.012)	(0.209)	(0.020)	(0.048)
Child female	-2.388***	-5.910	-0.0212***	-0.0532***	-0.118	0.0425***	-0.178***
	(0.332)	(11.158)	(0.007)	(0.006)	(0.095)	(0.012)	(0.030)
Composite Z-Score	2.104***	66.81***	0.0316***	0.0397***	-0.343***	0.125***	0.0483***
	(0.242)	(6.696)	(0.004)	(0.004)	(0.056)	(0.007)	(0.016)
Sample	Full	Full	Full	Full	Full	Wave 1	Wave 1
Fixed Effects	District	District	District	District	District	District	District
Mean for Believe Average	13.76	2482.4	0.206	0.360	3.526	0.615	0.432
R-squared	0.163	0.234	0.302	0.360	0.252	0.382	0.329
Observations	22372	20967	21142	22469	21906	8623	2785

Includes the same set of controls as per the main specification. These include log household consumption, urban status, caste, parental education, an indicator for whether the child is female, indicators for age 9, 10, or 11 years of age, whether the child is a first child, household size, and indicators for missing consumption, parental education, or first child status. Includes district and wave fixed effects. Includes appropriate sampling weights. Standard errors clustered by village/neighborhood.

Table 1.6: Rainfall Shocks, Consumption, and Beliefs (Rural Panel Households)

	Log farm income	Believe above average	Believe below average	Composite score
Panel A: Full Year Rainfall Shock	(1)	(2)	(3)	(4)
Positive rainshock	-.287	.00622	-.00996	.00647
	(.190)	(.022)	(.044)	(.025)
Negative rainshock	-.558***	-.0596**	.0789*	-.00259
	(.188)	(.025)	(.047)	(.038)
Panel B: Wet Season Rainfall Shock	(1)	(2)	(3)	(4)
Positive wet season rainshock	-.149	.000909	.0245	-.0127
	(.189)	(.021)	(.044)	(.026)
Negative wet season rainshock	-.412**	-.0728***	.0803*	.00134
	(.193)	(.024)	(.046)	(.034)
Sample	Full Sample Rural Panel	Child Sample Rural Panel	Child Sample Rural Panel	Child Sample Rural Panel
Unit of Observation	HH	Child	Child	Child
Fixed Effects	HH	HH	HH	HH
Mean for Rural Households	4.958	.0805	.206	.485
Observations	54290	3282	3282	3361

Positive (negative) rainfall shocks in Panel A are defined as cases when district-level rainfall over the past rainfall year (from June to May) is above the 80th the percentile (below the 20th percentile) of historical rainfall in that district. In Panel B, positive and negative rainfall shocks are defined similarly, but for rainfall during the rainy season from June to November. Regressions in Panel B include controls for normalized deviations of dry season rainfall (deviations from historical averages divided by the standard deviation of historical rainfall. Regressions in column (1) restrict to rural households observed in both waves. Regressions in columns (2) to (4) restrict to rural households in the child sample observed in both waves. Regressions in columns (2) to (4) additionally include indicators for age 9, 10, or 11, whether the child is female, and first child status. All regressions include rainfall year and household fixed effects, with standard errors clustered by district-year.

Table 1.7: Beliefs Among Urban Movers

	Believe above average			Believe below average		
	(1)	(2)	(3)	(4)	(5)	(6)
Moved within last 3 years	0.0726*			-0.0319		
	(0.040)			(0.022)		
Moved within last 5 years		0.0563*			-0.0212	
		(0.032)			(0.019)	
Moved within last 10 years			0.0400*			-0.00994
			(0.023)			(0.018)
Sample	Urban Movers	Urban Movers	Urban Movers	Urban Movers	Urban Movers	Urban Movers
Fixed Effects	District	District	District	District	District	District
Mean for Average Child	0.183	0.183	0.183	0.0799	0.0799	0.0799
R-squared	0.245	0.245	0.245	0.204	0.203	0.203
Observations	2010	2010	2010	2010	2010	2010

Sample restricted to urban movers (households who reported originating in a rural location and currently reside in an urban location), for moves within the last 50 years. Additional controls (with coefficients not displayed) include log household consumption, parental education, caste group, normalized composite score, indicators for age 9, 10, or 11 years of age, whether the child is female, a first child, household size, and indicators for missing consumption, parental education, or first child status. Includes district and wave fixed effects. Includes appropriate sampling weights. Standard errors clustered by village/neighborhood.

Table 1.8: Confidence in Schooling Quality

	Attends Government School (1)	More Confidence in Private Schools (2)	More Confidence in Government Schools (3)	Equal Confidence (4)
Low consumption	0.132***	-0.0370***	0.0336***	0.00344
	(0.010)	(0.013)	(0.011)	(0.014)
Rural	0.257***	-0.0467**	0.0155	0.0312
	(0.017)	(0.019)	(0.016)	(0.021)
SCST	0.0874***	-0.0319**	0.0290**	0.00295
	(0.011)	(0.013)	(0.013)	(0.016)
Sample	Waves 1 & 2	Wave 2	Wave 2	Wave 2
Fixed Effects	District	District	District	District
Mean for Average Child	0.357	0.311	0.140	0.548
Fraction high consumption in private school	0.499			
Fraction low consumption in private school	0.298			
Fraction non-SCST in private school	0.438			
Fraction SCST in private school	0.234			
R-squared	0.339	0.217	0.157	0.186
Observations	22458	9226	9226	9226

Regressions include controls for whether the household is a below median consumption household, rural status, caste, household size, and the highest level of education among all household members. Includes district and wave fixed effects. Includes appropriate sampling weights. Standard errors clustered by village/neighborhood.

Figures

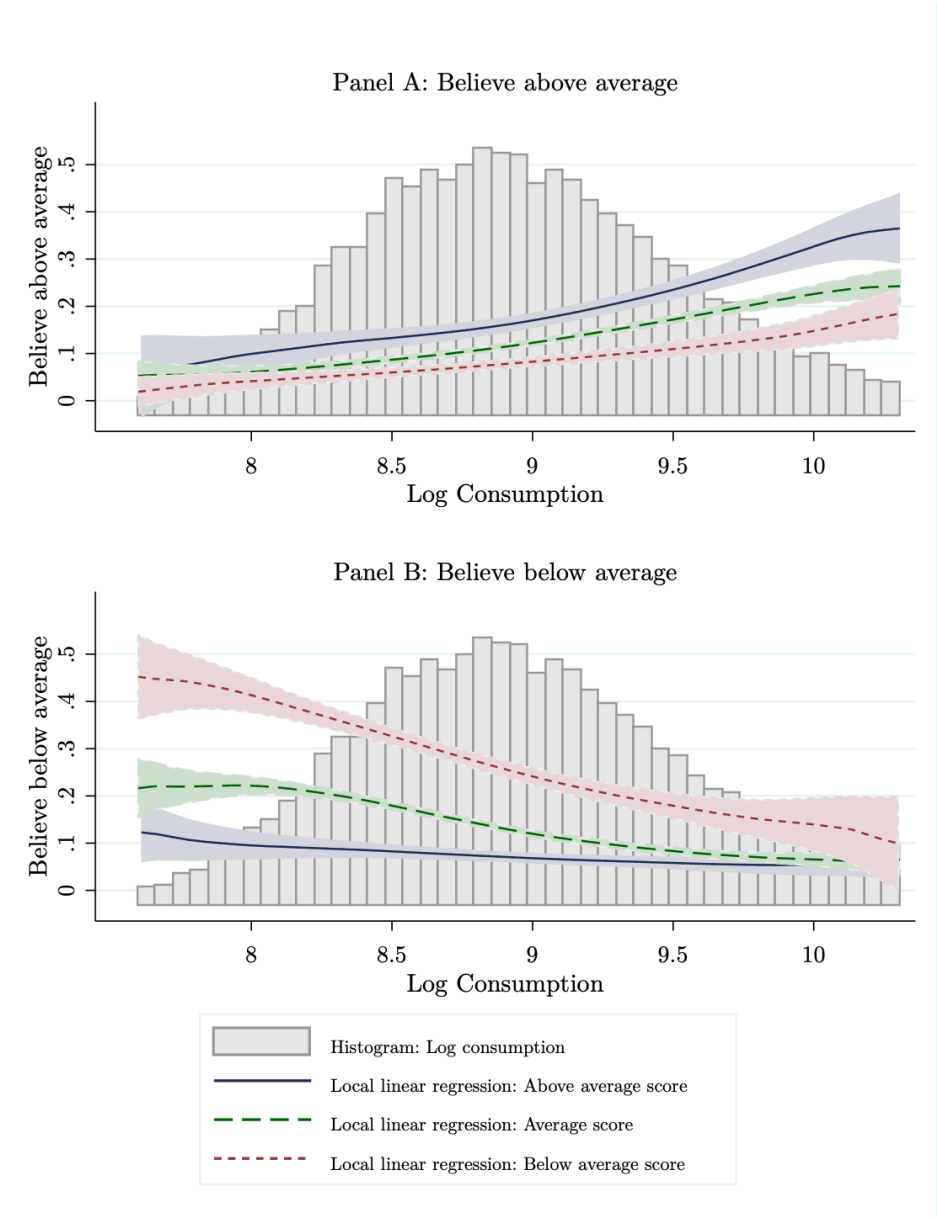

Figure 1.1: Household Consumption and Parental Beliefs

Note: This figure shows local linear regressions of parental beliefs on household consumption, separately for children with average, above average, or below average performance (classified according to the procedure described in the Section 1.2). The lightly shaded areas represent 95% confidence intervals. Data are from the Indian Human Development Survey (IHDS).

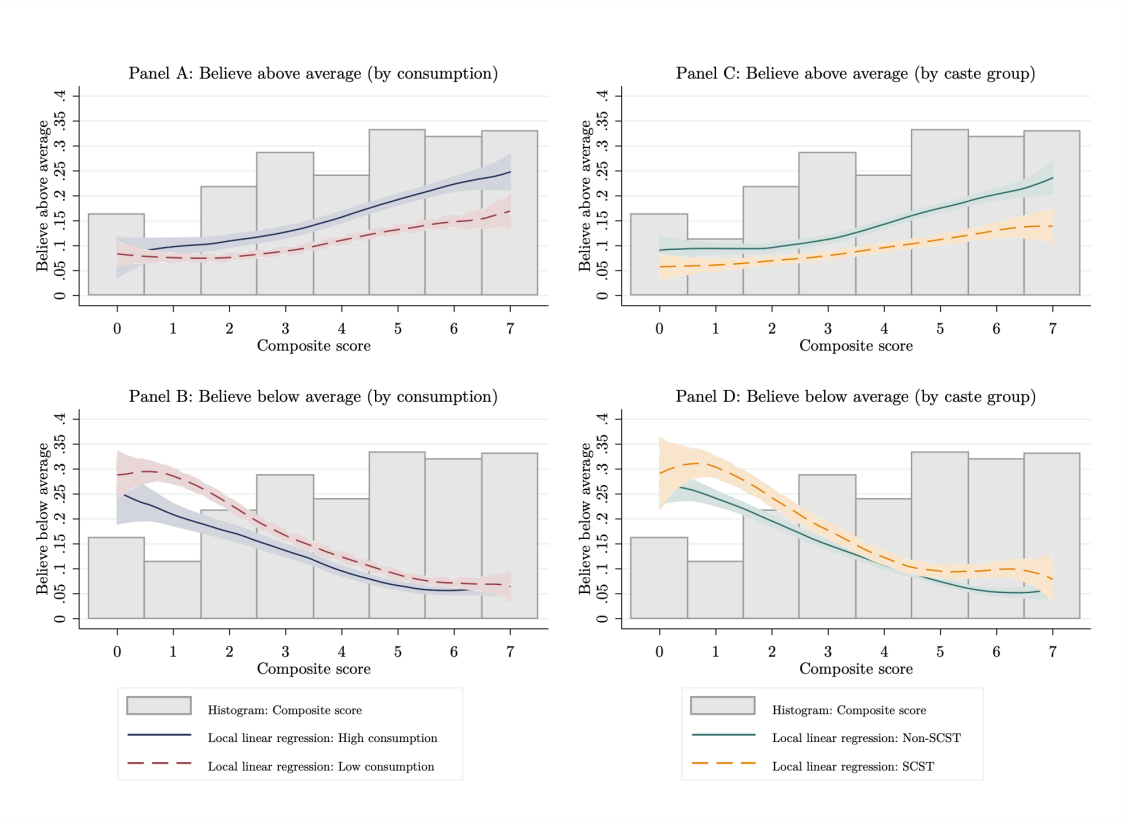

Figure 1.2: Child Performance and Parental Beliefs by Consumption Level and Caste Group

Note: This figure shows local linear regressions of parental beliefs on child performance, separately for high and low consumption households in panels A and B (defining high consumption households as those with above median household consumption) and for SCST and non-SCST in panels C and D. The lightly shaded areas represent 95% confidence intervals. Local linear regressions use scores normalized while respect to children of the same age in the same district and sector, while the histogram depicts the distribution of raw composite scores. Data are from the Indian Human Development Survey (IHDS).

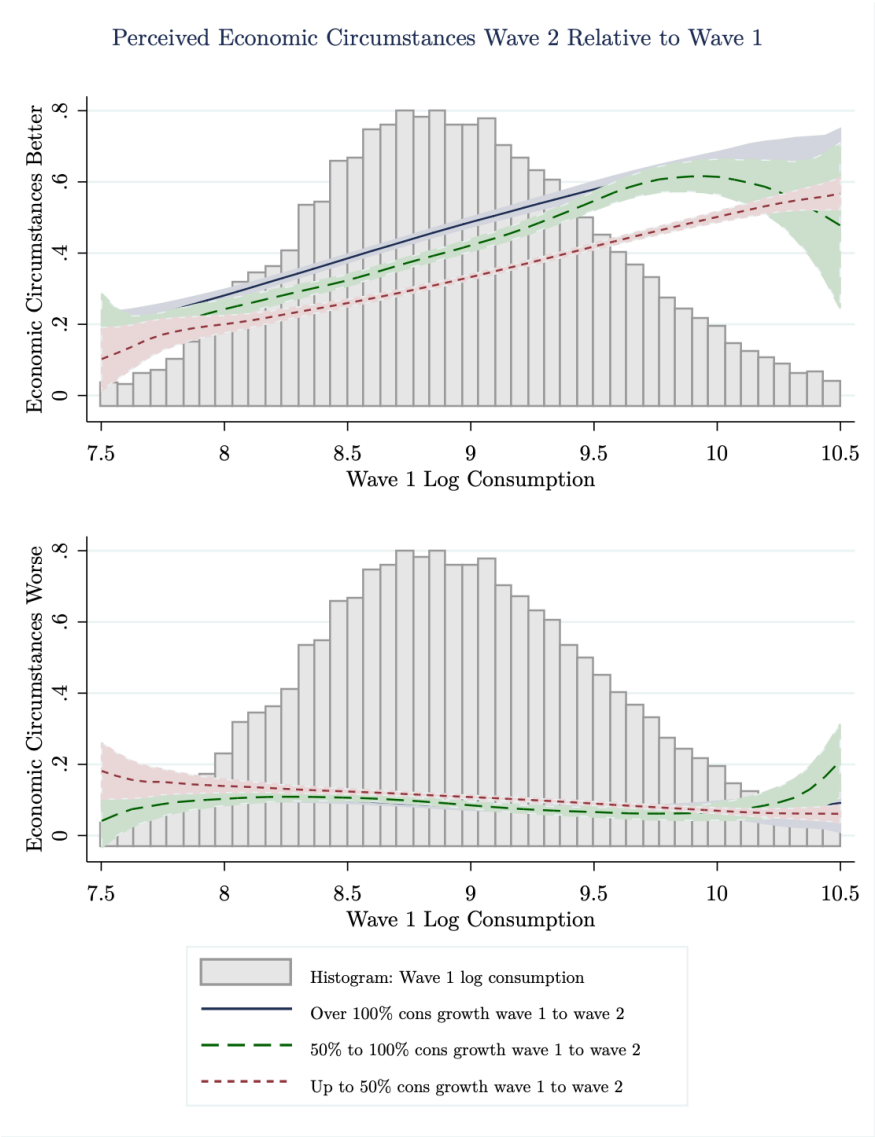

Figure 1.3: Perceived Change in Economic Circumstances, by Wave 1 Consumption Quintile

Note: This figure shows local linear regressions of perceived change in economic circumstances between wave 1 and wave 2 on wave 1 log consumption, separately for households that experienced up to 50% growth, between 50% and 100% growth, or greater than 100% growth in consumption between waves 1 and 2. The lightly shaded areas represent 95% confidence intervals. Data are from the Indian Human Development Survey (IHDS).

Chapter 2

Exploring Parental Beliefs: Evidence from Kenya

2.1 Introduction

The previous chapter established a striking relationship between household economic circumstances and parental beliefs about their children's academic proficiency in the context of India, with evidence that these beliefs decline in response to negative income shocks. This paper builds on that research by replicating the core cross-sectional analysis in a different context, Kenya, and extending the research in four ways.

First, I explore and refine measurement of parental beliefs through original data collection conducted as part of a broader data collection effort. Second, I examine the link between household economic circumstances and future-oriented beliefs in addition to current beliefs. Third, I explore the role of potential correlates of parental beliefs including psychological factors such as self-efficacy, aspirations, and depression. Finally, and perhaps most importantly, I leverage random variation in exposure to a well-known early-life health intervention shown to deliver a wide range of positive economic impacts in order to estimate the impact of this same intervention on parental beliefs.

The data for this analysis come from the Kenya Life Panel Survey (KLPS), an extensive and unique longitudinal dataset covering approximately 7,500 individuals over the course of over 20 years. This data setting again allows me to pair child test performance with stated parental beliefs about child academic proficiency. Questions related to parental beliefs were developed in partnership with the KLPS team and included in a survey targeted at the primary caregiver of children of KLPS participants, typically either the KLPS participant themselves or their spouse. In parallel, children completed a battery of tests designed to assess their math proficiency, reading proficiency, and executive function. These core performance and beliefs data can then be complemented with a wealth of household and parent characteristics collected and available as a result of the broader KLPS data collection effort.

I first briefly discuss key takeaways related to the exercise exploring and refining mea-

surement of parental beliefs. Stated beliefs appear very consistent regardless of whether parents are asked to make comparisons relative to one of several specific reference groups or whether no reference group is specified. Similarly, parental beliefs differ very little when asked about their child's proficiency overall, or in a specific domain (math or reading).

I also find that few household or parental characteristics predict those less common cases where parents do revise their stated beliefs as the reference group changes. These results are encouraging in terms of supporting the validity of beliefs elicited from questions that do not specify a reference group or domain, for example, as per the data analyzed in the previous chapter. Furthermore, these results suggest that the estimated correlation between parental beliefs and factors such as household economic circumstances, is unlikely to be simply an artifact of parents systematically interpreting questions in a different way and responding accordingly.

I then explore basic cross-sectional patterns, similar to the exercise described in the first chapter. While I find a somewhat weaker link between household economic circumstances and current beliefs in this setting, I find a much stronger link with future beliefs; parents in high earnings households expect their children will score higher on an upcoming high stakes exam and are more likely to report that their children will do much better on this exam relative to peers. I also demonstrate that beliefs correlate with investments. Here, time-based and spending-related investments are lower for those parents who believe their children are below average.

I next turn to potential correlates of current and future beliefs, in particular those related to psychological outcomes and mental health among parents. This focus is motivated by the hypothesis discussed in the first chapter that factors such as poverty-driven depression, hopelessness, or negative affect could explain the link between poverty and negatively biased parental beliefs. This analysis is only suggestive, but I find a strong relationship between self efficacy and aspirations with current beliefs, as well as a strong relationship between depression and future-oriented beliefs; these relationships persist even when accounting for household earnings. That these same factors also differ according to socioeconomic status (parents in high earnings households exhibit higher self efficacy and elevated aspirations, parents in low earning households exhibit more depressive symptoms) suggests that psychological mechanisms could potentially explain some of the observed link between socioeconomic status and beliefs.

Finally, I present results estimating the long-run impact of exposure to an early-life health intervention, school-based deworming, on parental beliefs. A wealth of rigorous research using the KLPS data shows that the deworming program had a range of positive impacts, including improved schooling and health-related outcomes in the short run (Miguel and Kremer, 2004) as well as higher educational attainment and improved labor market outcomes in the long run (Baird et al., 2016; Hamory et al., 2021b). Consistent with these findings, I find that those parents (or their spouses) who were assigned to the deworming treatment are marginally less likely to believe their children are below average, and significantly more likely to believe their child will perform above average and attain a higher score on a future high stakes exam.

This research relates to several strands within the literature. I again contribute to the literature discussed in the first chapter. This includes research that explores how various factors associated with poverty may negatively influence educational investments decisions (Attanasio et al., 2021), in particular that which explores the role and malleability of parental beliefs (Dizon-Ross, 2019; List et al., 2021; Kinsler and Pavan, 2021; Gan, 2021) or focuses on disparities in proficiency-related beliefs across socioeconomic lines (Mukherjee, 2017; Guyon and Huillery, 2021).

This paper also relates to the literature exploring how poverty can impose internal constraints over and above evident material constraints. While adverse early-life income shocks can negatively influence later life mental health outcomes (Adhvaryu et al., 2019), persistent poverty can contribute to lower aspirations (Appadurai, 2004; Genicot and Ray, 2020; Dalton et al., 2016; Ray, 2006; La Ferrara, 2019), lower self-efficacy (Wuepper and Lybbert, 2017), and higher rates of depression and hopelessness (De Quidt and Haushofer, 2016; Ridley et al., 2020; Lybbert and Wydick, 2018; Duflo, 2012).

Conversely, a wealth of evidence indicates that anti-poverty and cash transfer programs can lead to improvements in mental health and psychological outcomes along with improved economic outcomes, suggesting that programs designed to alleviate external constraints may also alleviate internal constraints (Banerjee et al., 2015; Baird et al., 2013; Bedoya et al., 2019; Haushofer et al., 2020; Haushofer and Shapiro, 2016). Indeed, some argue that positive impacts associated with certain programs such as international child sponsorship programs operate through psychological rather than purely material channels (Ross et al., 2021). Finally, related literature shows that interventions targeted at directly improving psychological outcomes, such as those that treat depression, can lead to more accurate self-beliefs (Bhat et al., 2022) and substantial improvements in human capital investments made by parents (Baranov et al., 2020; Angelucci and Bennett, 2021). I contribute to this literature by further exploring the linkages between household economic circumstances, psychological outcomes such as self efficacy and depression, and parental beliefs and investments.

2.2 Data

The data for this analysis come from original data collection conducted as part of the Kenya Life Panel Survey (KLPS). KLPS is a unique longitudinal dataset covering a sample of approximately 7,500 Kenyan individuals over four rounds of data collection spanning 1998 to 2021. Approximately 84% of original respondents were tracked in the fourth round of data collection, representing a remarkable data collection effort (Hamory et al., 2021b).

In addition to providing coverage of these individuals' lives over a long time horizon, the data collected are wide-ranging and extensive. Various modules capture household earnings and labor market outcomes (through the earnings plus module or "E-plus module"), as well as wide range of outcomes ranging from schooling, marriage, fertility, and migration histories, to time and risk preferences, social and political attitudes, and mental health and other psychological traits (through an integrated module or "I-module").

Motivated by the unique opportunity to explore persistence of outcomes across generations and to examine the intergenerational impacts of the deworming program, data collection extended even further during the fourth round of KLPS to measure outcomes among children of individuals covered in the sample. This included an extensive battery of assessments testing math proficiency, reading proficiency, and executive function among biological children of KLPS participants ("child assessments"). Information on educational investments, the home environment, and discipline strategies were collected via a survey administered with each child's primary caregiver (through the primary caregiver module or "PC module"). I refer to these primary caregivers as the parent of interest throughout the analysis and in the text, whether or not this parent was the KLPS participant.

The data used to capture parental beliefs come from a set of questions added to the primary caregiver module in collaboration with the KLPS team during the second of two waves of data collection. This second wave of data collection took place throughout 2021. These beliefs measures are then paired with scores from the child assessments, plus a wealth of information captured as part of the broader data collection effort to explore a wide range of determinants and correlates of parental beliefs. I discuss each of the key sources of data for this analysis below.

The sample

For each KLPS participant, up to two biological children between 3 to 8 years of age were selected to be assessed and to have their primary caregiver complete the primary caregiver module. The main sample used in this analysis includes children of those individuals assigned to wave two data collection for whom both test performance and parental beliefs are collected. This main sample includes 2,388 children across 1,887 KLPS participants/parents.

Many of the KLPS participants took part in a primary school deworming program (PSDP, or "deworming") that took place between 1998 and 2001 and led to long-lasting improvements in terms of health, education, and labor market outcomes (Miguel and Kremer, 2004; Hamory et al., 2021b). The portion of the analysis that estimates the impact of deworming on parental beliefs focuses on KLPS participants who took part in PSDP but did not take part in one of a number of other past interventions. These include a girl's scholarship program (GSP) which took place between 2000 and 2001, and vocational training and cash grants programs which took place between 2009 and 2014. While there is no overlap between the PSDP and GSP program participants, some PSDP participants did participate in the vocational training and cash grants programs. The sample for the deworming treatment analysis thus includes only PSDP participants who either did not take part in the vocational training and cash grants program, or who were assigned to the control group. Equivalently, the sample excludes GSP participants or those vocational training and cash grants program participants who were assigned to the treatment group.[1] Given these restrictions, the sample for the deworming

[1]These sample restrictions follow guidelines outlined in pre-analysis plans for estimating the long run (Baird et al., 2017) and intergenerational impacts (Fernald et al., 2021) of the primary school deworming program (PSDP).

treatment analysis comprises 1,777 children across 1,412 KLPS participants/parents.

Parental beliefs

The key measures for this analysis come from a series of questions that were included in the primary caregiver module and designed to elicit parental beliefs. These questions were developed in partnership with the KLPS team using input based on their extensive knowledge about the context. A listing of the exact questions used for this analysis are included in the Table B1. These questions fall into three categories.

The first category comprises a single question similar to that used in the India Human Development Survey (IHDS) as described in the first chapter. This question asks parents to indicate whether they consider their child to be an average, above average, or below average student. For children who are not yet of school-going age, parents are asked how their children compare in terms of their learning and development. This "no specified reference group" question is included for comparability with the results presented in the first chapter, and to test if and how responses vary when no reference group is specified versus when one is specified.

The second category includes several questions that seek to more carefully measure parental beliefs. This category includes several questions that capture beliefs about children's current academic proficiency relative to one of several reference groups and across domains. Parents were asked how their children compare (a) relative to all children of the same age in similar neighborhoods in their county, (b) relative to children of the same age within their same neighborhood, (c) relative to children of the same age in households with a similar financial situation in similar neighborhoods, and (d) relative to other children in their class. Further, parents were asked to report these beliefs with respect to math specifically, reading specifically, or overall. For each of these questions, parents could select one of five options ranging from "much worse"' to "much better."

These questions were designed to explore if and how stated beliefs shift depending on whether parents are asked how their children compare to a broad set of children ("similar neighborhoods"), children with a shared location or context ("own neighborhood"), children from a similar socioeconomic status ("similar financial situation"), or children who may be their child's closest peers ("same class"), and to see whether stated beliefs shift based on the domain in question (math, reading, overall).

While the second category seeks to refine measurement of current beliefs, the third category broadens the types of beliefs elicited by asking parents to predict their children's future proficiency. Specifically, parents are asked to estimate what score their children will earn on Kenya's high-stakes primary school leaving exam (the Kenya Certificate of Primary Education or KCPE exam) when the time comes, and to indicate how they think their child's performance will compare to other children of the same age. These future beliefs can be compared with current beliefs to infer whether parents think their child will fall back or progress relative to their peers over time (for example, if parents believe their children are "about the same" relative to their peers currently, but will perform "a little better" on the

KCPE exam). Note that these questions and the specific reference group questions described above were only asked of parents of school-going children.

Finally, a short series of questions capture parental confidence in terms of knowledge about their child's proficiency, how their child compares to other children, and whether their receive information about their child from teachers and other adults. Several additional questions also ask how parents perceive the influence of external factors and circumstances versus their own choices, actions, and effort or their child's ability and effort.

Educational investments

Several measures of educational-related investments were also collected in the primary caregiver module. Parents were asked to describe how much time their children spent on a number of activities in the past 24 hours, including on schooling, homework, structured activities, chores, working in the family business, playing sports, watching TV, etc. These disparate activities are grouped into (a) education, (b) unstructured activities, (c) productive activities and chores, and (d) other activities, in keeping with the groupings listed in the pre-analysis plan for the research exploring the intergenerational impacts of the deworming program (Fernald et al., 2021).

Child performance

Measures of child performance come from scores across a set of assessments designed to capture math proficiency, reading proficiency, and executive function. These assessments were adapted for the Kenyan context, then extensively tested and refined in an iterative pilot phase prior to the launch of the fourth round. Separate age-appropriate assessments were administered to younger children (ages 3 to 5) and older children (ages 6 to 8).

This analysis focuses on the math and reading assessments. Individual component tasks are normalized relative to children within the same age and gender. When one category (math, reading) is comprised of multiple components, these are added and then re-normalized in the same way. For the math category, younger children are assessed on a "mental transformation" task (UNICEF et al., 2017) and older children are assessed using the Early Grade Mathematics Assessment (EGMA) (Platas et al., 2014). For reading, all children are assessed using the Peabody Picture Vocabulary Test (PPVT) (Dunn and Dunn, 2007). Younger children are also assessed using the Malawi Developmental Assessment Tool (MDAT) (Gladstone et al., 2010) and older children also complete the Early Grade Reading Assessment in Swahili (EGRA-SWA) (Gove and Wetterberg, 2011; Dubeck and Gove, 2015).[2] More details on each of these measures and be found in the corresponding pre-analysis plan (Fernald et al., 2021).

[2]A subset of older children (aged 7-8) also complete the Early Grade Reading Assessment in English (EGRA-ENG), but these scores are not included.

Household and parental characteristics

As discussed above, the data includes information on KLPS participants across a wide range of outcomes. This analysis makes use of data capturing household economic circumstances and location, as well as data related to various parental mental health and psychological traits. For the former, I use the KLPS participant's highest years of education, total household earnings, per capita consumption, county of residence, and urban status, harmonizing these variables across several datasets. Per capita consumption and individual earnings are measured on an annual basis in 2017 US dollar terms, trimming the top 1% of the distribution (more details on the construction of these variables are available in Hamory et al. (2021b) and Baird et al. (2017)).

The data also include measures capturing self-efficacy, aspirations, perceived stress, fatalism, and depression. Depression is measured using the Center for Epidemiologic Studies Depression Short Form (CESD-10). This scale consists of ten questions scored on a scale ranging from 0 to 30, with scores above 10 considered as an indication of experiencing depression (Radloff, 1977; Andresen et al., 1994). Self-efficacy is captured using the ten item Generalized Self-Efficacy Scale (Schwarzer and Jerusalem, 1995) and perceived stress using the four item Perceived Stress Scale (Cohen et al., 1983; Warttig et al., 2013). Fatalism is measured using a question similar to that from the World Values Survey, which asks respondents to indicate on a scale ranging from 1 to 10 how closely they agree that "everything in life is determined by fate" versus "people shape their fate themselves" (Inglehart et al., 2014). Finally, subjective current socioeconomic status and aspired future status are measured using the MacArthur ladder, which asks respondents to indicate their current perceived relative socioeconomic status and which relative status they would like to achieve in their life on a scale ranging from 1 to 10 (Adler et al., 2000).

While the depression score was collected for all parents (whether they were KLPS participants or not), the remaining outcomes are only available for the subset of parents who are themselves the KLPS participant (instead of, for example, the spouse of the KLPS participant). For ease of interpretation, each of these outcomes are normalized within the sample so that these are measured in terms of standard deviation units. Raw means are presented in Table B4.

2.3 Results

This section presents the paper's key findings. I first briefly discuss measurement of parental beliefs. I then discuss how parental beliefs correlate with household economic circumstances and explore how beliefs correlate with various parental mental health and psychological traits. Finally, I present results estimating the effect of the early-life deworming treatment on later-life parental beliefs.

Measuring parental beliefs

This data setting allows me to address several of the measurement-related concerns raised in the first chapter, among them that beliefs elicited without a reference group or domain specified could be unreliable. Four main findings arise from the analysis that explores how to best measure parental beliefs. First, elicited beliefs are comparable when elicited with respect to no specific reference group or with respect to one of several specific reference groups. Secondly and closely related, beliefs tend to be stable even as the specified reference group moves from the general ("children in similar neighborhoods") to the specific ("children in the same class"). Third, neither household nor child characteristics appear to predict those less common cases where parents do provide different responses as the specified reference group changes. Finally, beliefs differ little across domains (math, reading, overall), and again, neither household nor child characteristics predict cases where beliefs differ across domains.

The first challenge associated with comparing responses from the no reference group question to any of the specific reference group questions is to calibrate these to the same scale; the former allows three possible responses (average, above average, below average) while the latter allows five (much worse, a little worse, about the same, a little better, and much better). One intuitive grouping would be to consider "about the same" as equivalent to "average," "much worse" and "a little worse" as equivalent to "below average," and "a little better" and "much better" equivalent to "above average." Panel A of Figure 2.3 makes clear that this makes for a poor alignment across the the no reference group question and the specific reference group questions (using "relative to children in the same neighborhood overall" to illustrate) such that it is difficult to compare the two. Instead, when "a little better" is considered equivalent to "average," the three-option and five-option scales look remarkably similarly distributed, as shown in Panel B of Figure 2.3. Going forward, this represents the preferred grouping for making comparisons across the three-option, no reference group question and each of the five-option, specific reference group questions.[3]

[3]Figure 2.4 presents this finding in a different way and with respect to each of the specific reference group questions. Each panel compares responses to the no reference group question relative to each of the specific reference group questions, where the numbers and shading in each cell represent the probability of each pair of responses across questions. The dark shading in the central square for each comparisons indicates a high degree of alignment when using the preferred grouping. Figure B2 shows weaker alignment when using what is perhaps a more intuitive grouping as described above, where "a little better" is classified as "above average" instead of "average."

The next step in the analysis explores potential correlates of those less common cases where parents do provide different responses when given no reference group versus when prompted to think about a specific reference group. Table 2.2 presents regressions where the "outcomes" of providing a different response between the no reference group and each of the specific reference group questions are regressed on a set of controls capturing household economic circumstances and child characteristics and performance.

The first observation is that parents are more likely to hold higher beliefs given no reference group relative to when a specific reference group is specified rather than the other way around: Parents report higher beliefs for the no reference group question 18-20% of the time, but only report higher beliefs for the specific reference group question 10-12% of the time (see table rows). More importantly, the estimates presented in Table 2.2 show no evidence that factors such as household earnings, child gender, or child performance predict changes in reported beliefs. Instead, the propensity to shift in one direction or another with the no reference group question relative to one of the specific reference group questions appears uncorrelated with any of these factors. While not conclusive, these results suggest that any patterns between these same characteristics and parental beliefs may not stem from systematic differences along these lines in terms of the reference group parents have in mind.

Closely related is the finding that beliefs shift very little across questions with different specified reference groups. Figure 2.5 makes this clear visually. This figure demonstrates alignment across questions for all pairs of possible combinations of specific reference groups. Darker shading and higher probabilities on the diagonal axis stretching from the bottom left to the top right indicate very few changes in how parents classify their children's academic proficiency as the reference group changes. Depending on the specific pairing, parents give the same response across two questions approximately 75% of the time.

Finally, parental beliefs differ little across domains (see Figure 2.6), and few parental or child characteristics predict those cases where parents do hold higher or lower beliefs in math relative to reading, or math relative to overall, or in reading relative to overall (see Table 2.3).

While this has been a detailed and perhaps tedious discussion, these findings help establish that belief responses appear very consistent across questions using a very broad and potentially ambiguous framing (no specific reference group, no specific domain) or when using questions with any number of clearly specified reference groups or domains, and that the 3-option and 5-option scales yield similar patterns when calibrated appropriately.[4] While it was worthwhile to explore whether measurement could be improved using questions that clearly specify a reference group, differentiate across domains, and allow for more granularity in responses, the bulk of the remaining analysis proceeds with the simple three-option question asking parents to assess whether they believe their child to be average, below average,

[4]Worth noting is that it could be the case that this alignment could arise if parents anchor around the response given to the first question (without a reference group) in their responses to the remaining questions. Patterns of responses could differ if asked in a different order, for example, or if parents are asked one of these questions in isolation. This could be something to explore in future research.

or above average. This choice also provides the additional advantage of direct comparability with the results presented in the first chapter.

Cross-sectional analysis

Current and future beliefs

The cross-sectional analysis discussed in this section follows closely the approach described in the previous chapter. However, while I again explore correlates of current beliefs, I also extend the analysis by also exploring correlates of future beliefs. As before, I estimate regressions of the form

$$Beliefs_{ihc} = \alpha + \beta_1 X1_h + \beta_2 X2_i + \delta_c + \varepsilon_{ihc} \tag{2.1}$$

where $Beliefs_{ihc}$ correspond to stated beliefs about child i in household h in county c. $X1_h$ includes a set of household-level characteristics including whether the household is a high earnings (above median) household, the highest level of education for the KLPS participant, whether the parent surveyed is the KLPS participant, and the number of children in the household. $X2_i$ includes child-level characteristics, including an indicator for whether the child is female, whether the child is a first child, age fixed effects, and composite scores. δ_c are county fixed effects, included to account for any time-invariant county-specific characteristics. In this context, county aligns closely with urban status, so the latter is not also included as a control. Standard errors are clustered by household.

Table 2.1 presents the main results. Similar analysis from the Indian context revealed a strong link between household economic circumstances and current beliefs. No similar pattern emerges here with respect to current beliefs, though we do see a strong correlation between household earnings and beliefs related to children's future proficiency. Parents in high earnings households expect their children will score 8 points higher on the KCPE exam (a relatively modest increase) and are 5 percentage points more likely to report that their child will do much better on the KCPE relative to her peers (a 11% increase relative to the mean for currently average children). Parents in high earnings households are 5 percentage points less likely to imply that their child will fall back in the distribution over time (a less common belief in any case), but no more likely to report that their child will advance in the distribution over time.

Figure 2.1 presents these results visually. Panel A shows local linear regressions of above-average current beliefs on log earnings separately for high-performing and low-performing children. The gap between the high-performance and low-performance lines indicates that parental beliefs do align with actual performance, while the upward slope suggests a positive (if relatively weak), relationship between earnings and current beliefs. Panel B shows a similar result with respect to believing children will perform above much better on a future KCPE exam. Figure 2.2 shows the distribution of expected KCPE scores separately for children in high and low earnings households among those parents who believe their children are currently average. The distribution of expected scores among children in high income

households is clearly shifted rightward relative those in low income households, with these two distributions being significantly different according to a Kolmogorov-Smirnov test for equality of distributions.

Appendix Table B2 explores the robustness of these results. Whether using consumption in place of earnings (as per panel B), composite scores normalized relative to all same-age children in Kenya (panel C) or including an urban status control instead of county fixed effects (panel D), there does not seem to be a strong link between household economic circumstances and current beliefs, but we do observe a strong link between earnings and future beliefs.

Child gender

Turning back to Table 2.1, we can see that controlling for household income, performance, and other factors, parents are more likely to state their female children are currently above average, and less likely to state their female children are currently below average, though no analogous pattern emerges with respect to future beliefs. In fact, if anything, the weakly significant result in column 6 may suggest that parents expect their female children are less likely to advance relative to their peers over time, perhaps indicating that they instead expect male children to catch up.

While parents do perhaps hold more positive beliefs for their female children in general, there do not appear to be any domain-specific disparities in beliefs. Figure B1 compares domain-specific beliefs with domain-specific scores. While parents perhaps appear to report marginally higher beliefs for female children in math, reading, and overall, at no point in the distribution of scores are these disparities significantly different.

Beliefs and investments

Table B3 explores the link between beliefs and investments, regressing each of the time-related investments and schooling-related investments on current beliefs and the usual controls. While only suggestive, parents who believe their children are below average spend slightly less on their children's education, and their children spend less time on education-related activities each day. These patterns are perhaps weaker than those observed in India and discussed in the first chapter, but are nevertheless important to document to support that reported beliefs may matter in terms of shaping actual investments.

Exploring correlates

I next take advantage of the wealth of information collected through other components of the broader KLPS data collection effort to explore the correlation between current and future beliefs and each of several outcomes related to parental mental health and psychology. While this analysis is purely exploratory in nature, some of the patterns and correlations

observed could help inform future research looking at specific channels that might explain disparities in beliefs along socioeconomic lines.

Parental mental health and psychology

For each of self-efficacy, perceived relative socioeconomic status, aspired future socioeconomic status, depression, stress, and fatalism (mental health and psychological traits which for the purposes of this section I abbreviate as "traits"), I run two regressions of the form

$$Beliefs_{ip} = \alpha + \gamma_1 Trait_p + \theta_1 X2_i + \varepsilon_{ip} \tag{2.2}$$

$$Beliefs_{iphc} = \alpha + \gamma_2 Trait_p + \theta_2 X1_h + \theta_3 X2_i + \delta_c + \varepsilon_{iphc} \tag{2.3}$$

In the first set of regressions (represented by equation (2.2)), I regress beliefs corresponding to parent-child pair ip in household h and county c on the parental trait of interest ($Trait_p$) and the usual child-level controls ($X2_i$) without including household controls ($X1_h$) and location fixed effects (δ_c) that may themselves influence these parental traits. The second set of regressions (represented by equation (2.3)) does include these household controls and county fixed effects for the sake of comparison.

To ease of comparison across traits each measured on different scales, all measures are normalized to be mean zero with a standard deviation of one, so that these are each measured in standard deviation units. Depression is collected for all parents (whether the KLPS participant or their spouse), while the remaining outcomes are only available for the approximately 62% of parents who are also the KLPS participant.

Before delving into the primary analysis, I summarize each of these traits in raw terms (shown in Table B4) and discuss disparities across parents in high versus low earnings households. Several observations are worth noting. First, there are substantial disparities in terms of these outcomes along socioeconomic lines. Parents in high earnings households exhibit higher self efficacy and report a higher perceived current status and aspired future status. In contrast, parents in low earnings households are much more likely to be depressed, to exhibit symptoms of stress, and to express a fatalistic mindset.

Second, there is cause for both encouragement and concern. Parents exhibit relatively high rates of self-efficacy overall, scoring an average of 34 points on a 40 point scale. While on average parents report their current social status as equating to the fourth rung of a ten-rung social status ladder, they exhibit high hopes and aspirations for the future, indicating that they would like to achieve the ninth rung in their lifetime. On the other hand, parents in this sample exhibit high rates of depression. On average, 36% of parents score highly enough on the CESD-10 scale to be characterized as depressed in this context, a figure as high as 39% among parents in low earnings households.

Table 2.4 presents the results of the primary analysis, where each row represents a separate regression, with coefficient estimates corresponding to the trait of interest displayed (γ_1 in panel A, γ_2 in panel B) and no other coefficients displayed. Table B5 shows that the results discussed below are robust to using raw instead of normalized scores.

Focusing first on Panel A, several clear patterns emerge. For the most part, few parental traits correlate with current beliefs. Self-efficacy represents a notable exception, where parents with a one standard deviation higher self-efficacy score are nearly 3 percentage points more likely to believe their child is above average (column 1) and 2.6 percentage points less likely to believe their child is below average (column 2). Higher perceived socioeconomic status and higher aspirational socioeconomic status also correlate negatively with the likelihood of believing children are below average, though these relationships are only marginally significant.

In terms of future beliefs, these three factors (self-efficacy, perceived socioeconomic status, and aspired socioeconomic status) also show strongly positive correlations with respect to believing children will do much better on the KCPE exam than their peers. For these three traits, a standard deviation increase in score is associated with approximately 6 percentage point higher chance of believing children will perform much better on the KCPE exam (column 4). Bandura (1997) defines self efficacy as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments." Positive beliefs about one's children may simply be a natural consequence of holding positive beliefs about one's own capabilities. And to some extent, the link between perceived and aspired socioeconomic status may simply reflect the original finding that household earnings correlates with future beliefs.

Interestingly, while parental depression shows no strong link with current beliefs, it does correlate very strongly with future beliefs and expectations. For each standard deviation increase in depression score, parents are 3.5 percentage points less likely to anticipate their child will do much better on the KCPE exam (column 4) and nearly 3 percentage points less likely to anticipate their child will progress relative to their peers. Figure 2.7 depicts this visually, showing that the distribution of expected KCPE scores for children currently believed to be average is shifted leftward among depressed parents relative to non-depressed parents, with these two distributions being significantly different. Stress only correlates negatively with future expected KCPE performance, and fatalism correlates very little with either current or future beliefs.

The magnitude and significance of corresponding coefficients across the versions of regressions with and without household controls are very similar. Estimated coefficients decline only minimally with the inclusion of household controls in panel B, suggesting that these parental traits have similar explanatory power even once household economic circumstances are taken into consideration.

While this analysis remains purely exploratory, these findings are suggestive of potential channels through which beliefs may take on a negative or positive bias in general terms and potentially along socioeconomic lines. I find that self efficacy and perceived and aspired socioeconomic status are higher among parents in high earnings households, and that these same factors correlate positively with current and/or future beliefs. Conversely, symptoms of depression and stress are more common among parents in low earnings households, factors that also correlate negatively with future beliefs. Depression in particular may represent a potentially meaningful channel to consider, especially given the relatively high rates of

depression among parents in this sample and globally (Collins et al., 2011; WHO, 2017).

Parental confidence and information

Finally, Table 2.5 presents results from regressions of various survey-based measures of access to information, confidence, and agency. Years of education correlates positively with parents reporting that they receive information from school and other sources related to their child's academic proficiency (column 1), that they feel confident in their knowledge about their child's proficiency (column 2), and that they feel confident in their knowledge about how their child compares to others (column 3). Similarly, years of education correlates positively with parents reporting that they more strongly believe their own choices, actions, and effort as opposed to external factors will determine their child's success (column 4), though not with parents reporting that their child's ability and effort as opposed to external factors will determine their child's outcomes (column 5).

These magnitudes are each relatively small, particularly compared to the mean values reported in the table rows. Importantly, there do not seem to be disparities across high and low earnings households in terms of these self-reported measures, which might otherwise suggest that access to information or parental confidence could explain the earnings-based disparities observed in terms of future beliefs and expectations.

Deworming treatment effects

In this section, I estimate the long-term impacts of additional years of exposure to the original deworming (PDSP) treatment on parental beliefs. Though parental beliefs were not one of the pre-specified outcomes, I adopt pre-specified estimation strategies to estimate treatment effects for these outcomes. Results from this analysis support that parental beliefs do indeed respond positively in response to this early-life health intervention.

Intergenerational effects approach

I first follow the approach specified in the pre-analysis plan corresponding to the estimation of the intergenerational effects of the original deworming treatment (Fernald et al., 2021). The child assessments and much of the information collected in the primary caregiver module were intended for these purposes, so first I report estimates following these guidelines. These regressions are of the form

$$Beliefs_{ips} = \alpha + \lambda_1 T_{ps} + \lambda_2 C_{ps} + \pi_1 X_{ps}^{intergen} + \varepsilon_{ips} \tag{2.4}$$

$$Beliefs_{ips} = \alpha + \lambda_1 T_{ps} + \lambda_2 C_{ps} + \lambda_3 P_{ps} + \pi_1 X_{ps}^{intergen} + \varepsilon_{ips} \tag{2.5}$$

where $Beliefs_{ips}$ represent beliefs outcomes for child i corresponding to parent p who attended school s at the time of the deworming program.[5] T_{ps} indicates whether parent p in school s was assigned to one of the early deworming treatment recipient schools, and C_{ps} indicates whether parent p in school s was assigned to the cost-sharing treatment group; individuals in this group exhibited much lower take up of the deworming treatment, and so are distinct from individuals in non-cost-sharing schools who thus had a higher effective treatment rate. λ_1 represents the treatment effect of interest; all reported estimates correspond to this coefficient.

Regression specification (2.5) additionally includes P_{ps}, which represents the treatment saturation among schools within 6 kilometers of parent p's school, so that λ_3 captures the impact of local spillovers (Baird et al., 2016). Inclusion of treatment saturation is specified as a secondary approach in the intergenerational impacts pre-analysis plan, but is included in the primary specification associated with the long run effects research described in the next subsection; I include this specification for completeness.

$X_{ps}^{intergen}$ represents a vector of pre-specified controls, including gender of parent p, parent p's grade at the time of the deworming program, the total density of primary school children within 6 kilometers of parent p's school, indicator for the zone of parent p's school, population of parent p's school, average test scores at parent p's school, an indicator for being in the vocational education or cash grants program sample, gender of interviewer, and months since the start of the survey wave.[6]

Long run effects approach

The strategy specified in the pre-analysis plan corresponding to estimation of the long run effects of the deworming treatment follows a very similar approach (Baird et al., 2017). This includes regressions of the form

$$Beliefs_{ips} = \alpha + \lambda_1 T_{ps} + \lambda_2 C_{ps} + \pi_1 X_{ps}^{longrun} + \varepsilon_{ips} \tag{2.6}$$

$$Beliefs_{ips} = \alpha + \lambda_1 T_{ps} + \lambda_2 C_{ps} + \lambda_3 P_{ps} + \pi_1 X_{ps}^{longrun} + \varepsilon_{ips} \tag{2.7}$$

where all components are as before, only $X_{ps}^{longrun}$ includes indicators for month of survey but not gender of interviewer and months elapsed since the start of the survey wave. For this analysis, regression equation (2.7) including local treatment saturation represents the primary approach; again, I include estimates according to (2.6) for completeness.

I also estimate treatment effects separately for older and younger cohorts (differentiating between those who were older or younger than 12 at the time of the program's baseline), following Baird et al. (2016) and Hamory et al. (2021b). Stronger treatment effects among

[5]Note that beliefs are in some cases reported by the parent who actually participated in the deworming program themselves and in some cases reported by their spouse. For these purposes, spouses are assumed to share a treatment status.

[6]The specified list of controls also includes a survey wave indicator; this is not included here since all observations are from wave 2.

older cohorts were first detected when analyzing outcomes 10 years after the deworming program (Baird et al., 2016), and appear to have persisted until 20 years after the deworming program (Hamory et al., 2021b); the estimates presented below are consistent with this finding.

Finally, I estimate treatment effects within the subsample of parents who were themselves the deworming participant. While the primary approach essentially considers the whole family unit as treated (including surveyed parents who are not themselves the deworming program participant), this approach restricts attention to only those individuals who would have been directly treated.

Results

Overall, these results show that additional years of exposure to the original deworming treatment have a positive impact on both current and future beliefs. Consistent with the results presented throughout this paper, the strongest impacts are observed in terms of future beliefs, with somewhat weaker impacts on current beliefs.

Table 2.6 presents estimated treatment effects using each of the specifications, sets of controls, and subsamples specified above. The strongest impacts are observed with the inclusion of local treatment saturation as shown in even columns; recall that this specification is the primary specification used in a number of analyses of deworming treatment effects, among them the estimation of long run treatment effects as in Hamory et al. (2021b). Given this, I focus primarily on the specifications that include local treatment saturation.

Focusing on the estimates in panel B using the standard set of controls ($X_{ps}^{longrun}$), we can see that parents are 3.5 percentage points less likely to believe their children are below average (column 4), though this difference is only marginally significant. In terms of future beliefs, deworming treatment recipients expect their children to score 8 points higher on the KCPE exam (column 6), and are fully 10 percentage points more likely to report that their children will perform much better on the KCPE exam than their peers (column 8). Results are very similar, though perhaps slightly stronger when using the intergenerational analysis-specific controls ($X_{ps}^{intergen}$) as in panel A.

Comparing the cohort-specific estimates in panels C and D (again, using the standard set of controls, $X_{ps}^{longrun}$), we can see that the decline in below-average beliefs and the increase in expected KCPE scores appears concentrated among members of the older cohort (panel C). For the younger cohort, there are no detectable treatment effects on any of the beliefs-related outcomes (panel D). Note also that the positive effect on believing their children will do much better on the KCPE exam becomes insignificant for both cohorts, perhaps a consequence of further reducing the sample size (column 8). As discussed above, evidence of stronger treatment effects in this older cohort is remarkably consistent with that presented in Baird et al. (2016) and Hamory et al. (2021b) for various outcomes.

Finally, the main findings persist when we restrict attention to those parents who themselves participated in the deworming program (panel E). Within this subsample, parents are nearly 5 percentage points less likely to believe their children are below average (though this

result is only marginally significant), and expect their children will score nearly 13 points higher on the KCPE exam. Given that long-run gains associated with the deworming treatment extend beyond the proximate, individual health benefits to include those that might benefit the whole family unit (such as better labor market outcomes, higher earnings, greater likelihood of urban residence), it is perhaps not surprising that results are similar when estimating treatment effects over the full sample of PSDP participants and their spouses as in panels A to D or on deworming program participants alone as in panel E.

The significance of these results is twofold. First, these results add elevated parental beliefs to the collection of positive direct and spillover benefits observed as a result of the deworming treatment, among them improvements in schooling and health in the short run (Miguel and Kremer, 2004), increases in educational attainment and labor supply after 10 years (Baird et al., 2016), and increases in consumption, hourly earnings, non-agricultural employment, and urban residence after 20 years (Hamory et al., 2021b).

Secondly, these results suggest that parental beliefs do shift in response to the exogenous variation in household circumstances induced by the early life health intervention. Whether this stems from treatment-driven improvements related to earnings and employment, movement out of agriculture, migration to urban centers, or some combination of these factors remains unknown. Nevertheless, these results lend further support to the notion that household economic circumstances shape parental beliefs (and hence, downstream outcomes such as investments and effort) as explored in the first chapter.

2.4 Conclusion

This paper draws on original data collection as part of the Kenya Life Panel Survey (KLPS) to replicate, validate, and extend the closely-related research presented in the previous chapter. I find a weaker link between household socioeconomic status (as captured by household earnings) and current beliefs in the Kenyan context, but a strong link between socioeconomic status and future-oriented beliefs.

I also present suggestive evidence related to mental health and psychological channels that could potentially explain this link. Parents with higher self efficacy, perceived socioeconomic standing, and aspired future standing tend to hold elevated beliefs about their children's current proficiency and future potential. In contrast, parents who exhibit symptoms of depression or stress tend to hold diminished beliefs about their children's future potential. These same mental health and psychological traits differ substantially across socioeconomic lines: parents in high earnings household exhibit higher rates of self efficacy, perceived socioeconomic standing, and aspired future standing, while parents in low income households are much more likely to show symptoms of depression.

I do not find evidence that disparities in reported access to information or confidence in knowledge about child proficiency along socioeconomic lines play a primary role in driving the observed relationship between earnings and future beliefs. Parental attitudes about fatalism

correlate little with parental beliefs, and I find few disparities in measures of perceived parental and child agency along socioeconomic lines.

Finally, I estimate positive treatment effects on certain current and future beliefs outcomes resulting from exposure to a randomized early-life health intervention, a primary school-based deworming program. The deworming program has been shown to provide a range of positive economic benefits, among them increased labor supply, higher consumption and earnings, and greater participation in non-agricultural employment (Miguel and Kremer, 2004; Baird et al., 2016; Hamory et al., 2021b). Some combination of these economic improvements likely explains the observed positive treatment effects on parental beliefs.

Taken together, these estimated treatment effects lend compelling support to the idea that household economic circumstances may shape parental beliefs. In the first chapter we saw that beliefs responded negatively to negative income shocks driven by adverse rainfall; here we see evidence that beliefs respond positively to an early-life health intervention that (exogenously) improved household economic conditions. While the evidence linking parental mental health and psychological outcomes is only suggestive, exploring these and related potential channels could be a promising avenue for future research.

Tables

Table 2.1: Correlates of Parental Beliefs

	Raw beliefs		Raw future beliefs		Future beliefs relative to current	
	Believe above average	Believe below average	Expected KCPE score	Will do much better on KCPE	Will fall back relative to peers	Will advance relative to peers
	(1)	(2)	(3)	(4)	(5)	(6)
High earnings	-0.00127	0.0113	8.458**	0.0520*	-0.0460***	0.0344
	(0.024)	(0.016)	(3.319)	(0.029)	(0.015)	(0.029)
Years education	0.00639	-0.00989***	1.941***	0.00986*	-0.000332	-0.00717
	(0.004)	(0.003)	(0.562)	(0.005)	(0.003)	(0.005)
Child female	0.0424**	-0.0382***	-1.672	0.0246	-0.00158	-0.0470*
	(0.020)	(0.014)	(2.658)	(0.024)	(0.013)	(0.025)
Composite z-score	0.0557***	-0.0383***	11.21***	0.0780***	-0.00548	-0.00309
	(0.011)	(0.008)	(1.311)	(0.012)	(0.007)	(0.013)
Mean for Below Average Child	0.200	0.154	329.7	0.314	0.0925	0.486
Mean for Average Child	0.255	0.0869	342.4	0.457	0.0854	0.525
Mean for Above Average Child	0.362	0.0525	363.8	0.558	0.0728	0.463
Overall Mean	0.265	0.0904	344.2	0.456	0.0842	0.510
R-squared	0.0415	0.0560	0.141	0.0666	0.0261	0.0398
Observations	2388	2388	2272	2236	2136	2136

Controls include an indicator for high earnings (above median) household, highest level of education among adults in the household, number of children in the household, normalized composite z-score, indicators for age 4, 5, 6, 7, or 8, whether the child is female, whether the child is a first child, whether the parent surveyed is the KLPS respondent, indicators for missing earnings, education, number of children in the household, age, or first child status, and county fixed effects. Composite z-scores are normalized relative to all children of the same age within the same county. Includes appropriate weights to ensure representativeness of the original population. Standard errors clustered by parent.

Table 2.2: Parental Beliefs across Different Reference Groups

	(A) No reference group specified versus specified reference group of:							
	(B) Children in similar neighborhoods		(B) Children in this neighborhood		(B) Children in similar income households		(B) Children in same class	
	Higher beliefs with no ref group (A)	Higher beliefs with ref group (B)	Higher beliefs with no ref group (A)	Higher beliefs with ref group (B)	Higher beliefs with no ref group (A)	Higher beliefs with ref group (B)	Higher beliefs with no ref group (A)	Higher beliefs with ref group (B)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
High earnings	-0.00209	0.00858	-0.0169	0.0289	-0.0123	0.0237	-0.00235	0.0222
	(0.022)	(0.018)	(0.022)	(0.020)	(0.022)	(0.019)	(0.023)	(0.020)
Child female	0.0219	-0.0117	0.0207	-0.0160	0.0156	-0.0308*	0.00973	-0.0182
	(0.019)	(0.016)	(0.019)	(0.017)	(0.019)	(0.016)	(0.019)	(0.017)
Composite z-score	0.00623	-0.0115	-0.00213	-0.00679	0.0144	-0.0107	-0.000344	-0.00454
	(0.011)	(0.009)	(0.010)	(0.010)	(0.011)	(0.009)	(0.011)	(0.010)
Higher no ref group (A)	0.188		0.186		0.196		0.183	
No change (A=B)	0.705		0.690		0.686		0.694	
Higher with ref group (B)	0.106		0.123		0.118		0.123	
R-squared	0.0262	0.0187	0.0235	0.0200	0.0294	0.0161	0.0314	0.0151
Observations	2146	2146	2147	2147	2149	2149	2052	2052

Controls include an indicator for high earnings (above median) household, highest level of education among adults in the household, number of children in the household, normalized composite z-score, indicators for age 4, 5, 6, 7, or 8, whether the child is female, whether the child is a first child, whether the parent surveyed is the KLPS respondent, indicators for missing earnings, education, number of children in the household, age, or first child status, and county fixed effects. Composite z-scores are normalized relative to all children of the same age within the same county. Includes appropriate weights to ensure representativeness of the original population. Standard errors clustered by parent.

Table 2.3: Parental Beliefs Across Different Domains

	Higher beliefs			Lower beliefs		
	Math vs reading	Math vs overall	Reading vs overall	Math vs reading	Math vs overall	Reading vs overall
	(1)	(2)	(3)	(4)	(5)	(6)
High earnings	0.00764	0.0148	-0.0155	0.00764	0.0148	-0.0155
	(0.026)	(0.023)	(0.017)	(0.026)	(0.023)	(0.017)
Child female	0.0169	0.0127	0.00445	0.0169	0.0127	0.00445
	(0.021)	(0.019)	(0.015)	(0.021)	(0.019)	(0.015)
Math z-score	0.0116	0.00783	0.00665	0.0116	0.00783	0.00665
	(0.013)	(0.011)	(0.009)	(0.013)	(0.011)	(0.009)
Reading z-score	-0.0365***	-0.0138	-0.00146	-0.0365***	-0.0138	-0.00146
	(0.014)	(0.012)	(0.009)	(0.014)	(0.012)	(0.009)
Mean	0.215	0.160	0.103	0.215	0.160	0.103
R-squared	0.0198	0.0139	0.0198	0.0198	0.0139	0.0198
Observations	2044	2045	2065	2044	2045	2065

Controls include an indicator for high earnings (above median) household, highest level of education among adults in the household, number of children in the household, normalized composite z-score in each of math and reading, indicators for age 4, 5, 6, 7, or 8, whether the child is female, whether the child is a first child, whether the parent surveyed is the KLPS respondent, indicators for missing earnings, education, number of children in the household, age, or first child status, and county fixed effects. Composite z-scores are normalized relative to all children of the same age within the same county. Includes appropriate weights to ensure representativeness of the original population. Standard errors clustered by parent.

Table 2.4: Correlates of Parental Beliefs: Parental Mental Health and Psychology

	Raw current beliefs		Raw future beliefs		Future beliefs relative to current	
	Believe above average	Believe below average	Expected KCPE score	Will do much better on KCPE	Will fall back relative to peers	Will advance relative to peers
Panel A: Child Controls	(1)	(2)	(3)	(4)	(5)	(6)
Self-efficacy	0.0286**	-0.0262**	3.678*	0.0627***	-0.0144	0.0201
	(0.012)	(0.010)	(1.960)	(0.015)	(0.009)	(0.016)
Perceived relative status	0.0148	-0.0156*	1.459	0.0599***	0.00674	0.0109
	(0.012)	(0.009)	(1.842)	(0.015)	(0.010)	(0.015)
Aspired future status	0.0134	-0.0194*	2.357	0.0595***	-0.0122	0.0112
	(0.015)	(0.011)	(2.183)	(0.016)	(0.010)	(0.017)
Depression	0.0112	0.0102	-5.316***	-0.0348***	0.0177**	-0.0276**
	(0.011)	(0.007)	(1.474)	(0.012)	(0.007)	(0.013)
Stress	0.000341	0.0106	-0.736	-0.0465***	0.0125	-0.0151
	(0.013)	(0.009)	(1.858)	(0.015)	(0.009)	(0.016)
Fatalism	0.0134	0.0106	-3.995**	-0.0178	0.0104	0.0144
	(0.013)	(0.009)	(1.862)	(0.016)	(0.010)	(0.016)
Panel B: Full Controls	(1)	(2)	(3)	(4)	(5)	(6)
Self-efficacy	0.0252**	-0.0238**	2.361	0.0563***	-0.0136	0.0229
	(0.012)	(0.010)	(1.890)	(0.015)	(0.009)	(0.016)
Perceived relative status	0.0133	-0.0141	1.104	0.0574***	0.00706	0.0174
	(0.013)	(0.009)	(1.866)	(0.015)	(0.010)	(0.015)
Aspired future status	0.0130	-0.0181*	0.00283	0.0529***	-0.00675	0.0140
	(0.015)	(0.011)	(2.125)	(0.016)	(0.010)	(0.017)
Depression	0.0123	0.00279	-1.805	-0.0297**	0.0146**	-0.0329**
	(0.011)	(0.007)	(1.442)	(0.013)	(0.007)	(0.013)
Stress	0.00201	0.00776	-0.501	-0.0383**	0.0120	-0.0143
	(0.013)	(0.009)	(1.816)	(0.015)	(0.010)	(0.016)
Fatalism	0.0161	0.00514	-3.102*	-0.0123	0.00929	0.0100
	(0.013)	(0.009)	(1.795)	(0.017)	(0.010)	(0.016)
Mean for Average Child	0.255	0.0869	342.4	0.457	0.0854	0.525
Observations (Depression)	2388	2388	2272	2236	2136	2136
Observations (Others)	1461	1461	1389	1371	1306	1306

Each row represents a separate regression of the dependent variable on the parent characteristic listed in the row (with the corresponding coefficient displayed) plus all controls (coefficients not displayed). All parent characteristics are normalized to be mean zero with standard deviation of one. Controls in panel A include normalized composite z-score and indicators for age 4, 5, 6, 7, or 8, whether the child is female, and whether the child is a first child. Controls in panel B include the usual controls described in Table 1. Includes appropriate weights to ensure representativeness of the original population. Standard errors clustered by parent.

Table 2.5: Parental Information and Confidence

	Receives information about child	Confidence: Knowledge of child ability	Confidence: Knowledge how child compares	Parent agency: Role of own choices, actions, effort	Parent agency: Role of child ability, effort
	(1)	(2)	(3)	(4)	(5)
High earnings	0.0308	0.00614	0.0312	0.00586	0.0208
	(0.026)	(0.025)	(0.027)	(0.022)	(0.023)
Years education	0.0133***	0.0123***	0.00845*	0.00707**	-0.00493
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Caregiver female	-0.0358	-0.0376	-0.0715**	-0.0376	0.0619**
	(0.028)	(0.028)	(0.028)	(0.023)	(0.027)
Mean	0.709	0.757	0.716	0.829	0.783
R-squared	0.0303	0.0329	0.0221	0.0266	0.0267
Observations	2388	2388	2388	2388	2388

Controls include an indicator for high earnings (above median) household, highest level of education among adults in the household, whether the parent surveyed is female, whether the parent surveyed is the KLPS respondent, and county fixed effects. Includes appropriate weights to ensure representativeness of the original population. Standard errors clustered by parent.

Table 2.6: Deworming Treatment Effects

	Raw current beliefs				Raw future beliefs			
	Believe above average		Believe below average		Expected KCPE score		Will do much better on KCPE	
Panel A: Intergen effects controls	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Deworming treatment	0.0513	0.0622*	-0.0211	-0.0380**	3.904	8.582**	0.109***	0.114***
	(0.036)	(0.037)	(0.019)	(0.019)	(3.587)	(3.588)	(0.034)	(0.037)
Includes Treatment Saturation	No	Yes	No	Yes	No	Yes	No	Yes
Observations	1777	1777	1777	1777	1692	1692	1664	1664
Panel B: Long term effects controls	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Deworming treatment	0.0475	0.0550	-0.0201	-0.0347*	3.358	8.124**	0.0983***	0.102***
	(0.038)	(0.038)	(0.020)	(0.019)	(3.386)	(3.368)	(0.033)	(0.036)
Saturation Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	1777	1777	1777	1777	1692	1692	1664	1664
Panel C: Older sample	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Deworming treatment	0.0507	0.0489	-0.0433	-0.0686**	3.070	10.59*	0.0852	0.0961
	(0.044)	(0.042)	(0.030)	(0.029)	(5.174)	(5.639)	(0.052)	(0.059)
Saturation Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	879	879	879	879	829	829	831	831
Panel D: Younger sample	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Deworming treatment	0.0526	0.0827	-0.0103	-0.0190	1.092	2.840	0.0584	0.0532
	(0.050)	(0.053)	(0.027)	(0.029)	(4.607)	(4.582)	(0.049)	(0.050)
Saturation Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	890	890	890	890	855	855	825	825
Panel E: Deworming participants	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Deworming treatment	0.0141	0.0210	-0.0308	-0.0459*	7.195*	12.71***	0.0485	0.0748
	(0.037)	(0.038)	(0.025)	(0.025)	(4.274)	(4.201)	(0.049)	(0.047)
Saturation Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	1050	1050	1050	1050	998	998	983	983

Odd columns include an indicator for deworming treatment status and cost sharing status. Even columns additionally include treatment saturation among schools within 6 kilometers. Controls in panel A include those described in the pre-analysis plan corresponding to the research exploring the intergenerational impacts of the deworming treatment. These include: gender of interviewer, months since the start of the survey wave, wave 2 indicator (not included here, as all observations are from the second wave), total density of primary school children within 6 kilometers of the PSDP participant's school (PSDP parent), an indicator for being in the vocational education or cash grants program sample, PSDP parent gender, PSDP parent grade at the time of the deworming program, zone indicator for PSDP parent school, population of KLPS parent school, and average test scores at PSDP parent's school. Controls in panels B, C, and D include those described in the pre-analysis plan corresponding to the research exploring the long term impacts of the deworming treatment. The set of controls is very similar, aside from including indicators for month of survey instead of gender of interviewer and months elapsed since the start of the survey wave. Panel C restricts to parents in the older cohort (12 years or older at baseline) and panel D restricts to parents in the younger cohort (less than 12 years old at baseline). Panel E restricts to those surveyed parents who were themselves the PSDP partipant. Includes appropriate weights to ensure representativeness of the original population, taking into consideration the exclusion of the GSP, vocational education, and cash grants programs. Standard errors clustered by PSDP school.

Figures

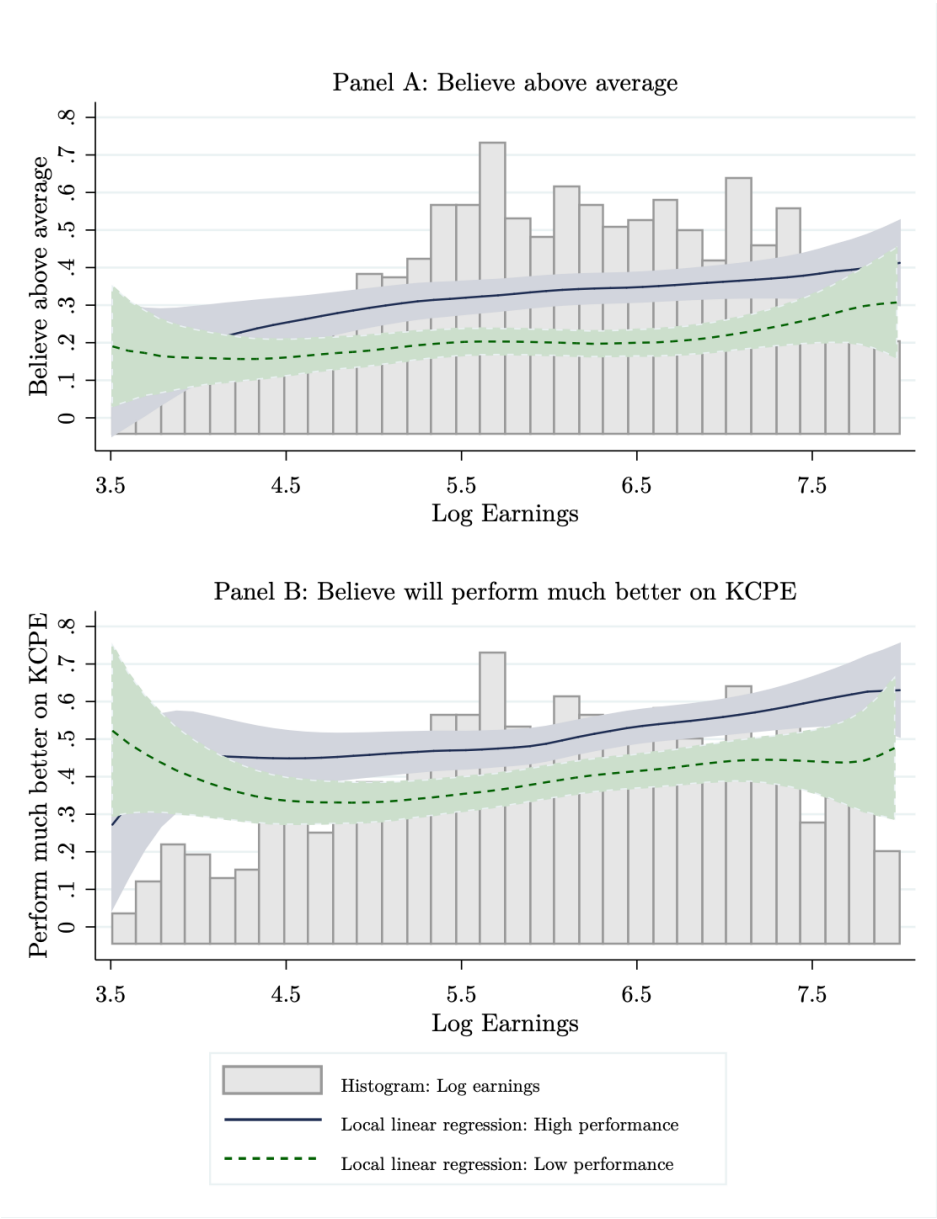

Figure 2.1: Current and future beliefs over earnings

Note: This figure shows local linear regressions of parental beliefs on household earnings, separately for children with high performance (composite score greater than zero) or low performance (composite score lower than zero). The lightly shaded areas represent 95% confidence intervals. Data are from the Kenya Life Panel Survey (KLPS).

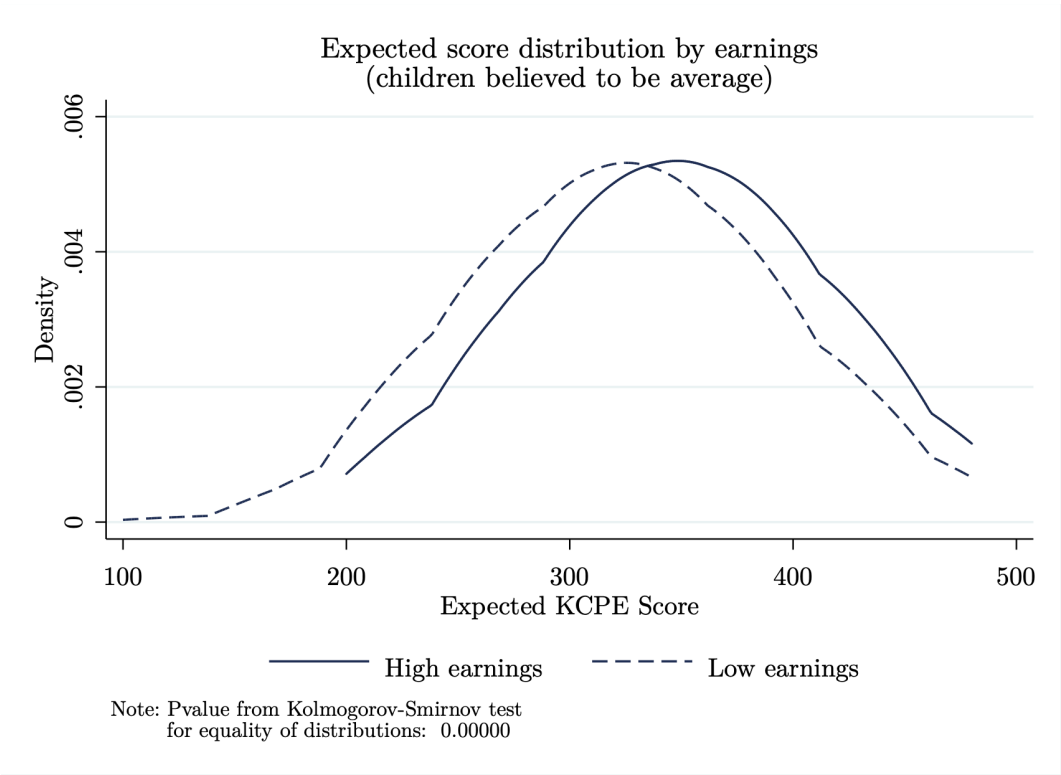

Figure 2.2: Density of expected KCPE scores by earnings

Note: This figure plots kernel densities of expected future KCPE scores for children whose parents classify them as (currently) average students, separately for high and low earnings households). Data are from the Kenya Life Panel Survey (KLPS).

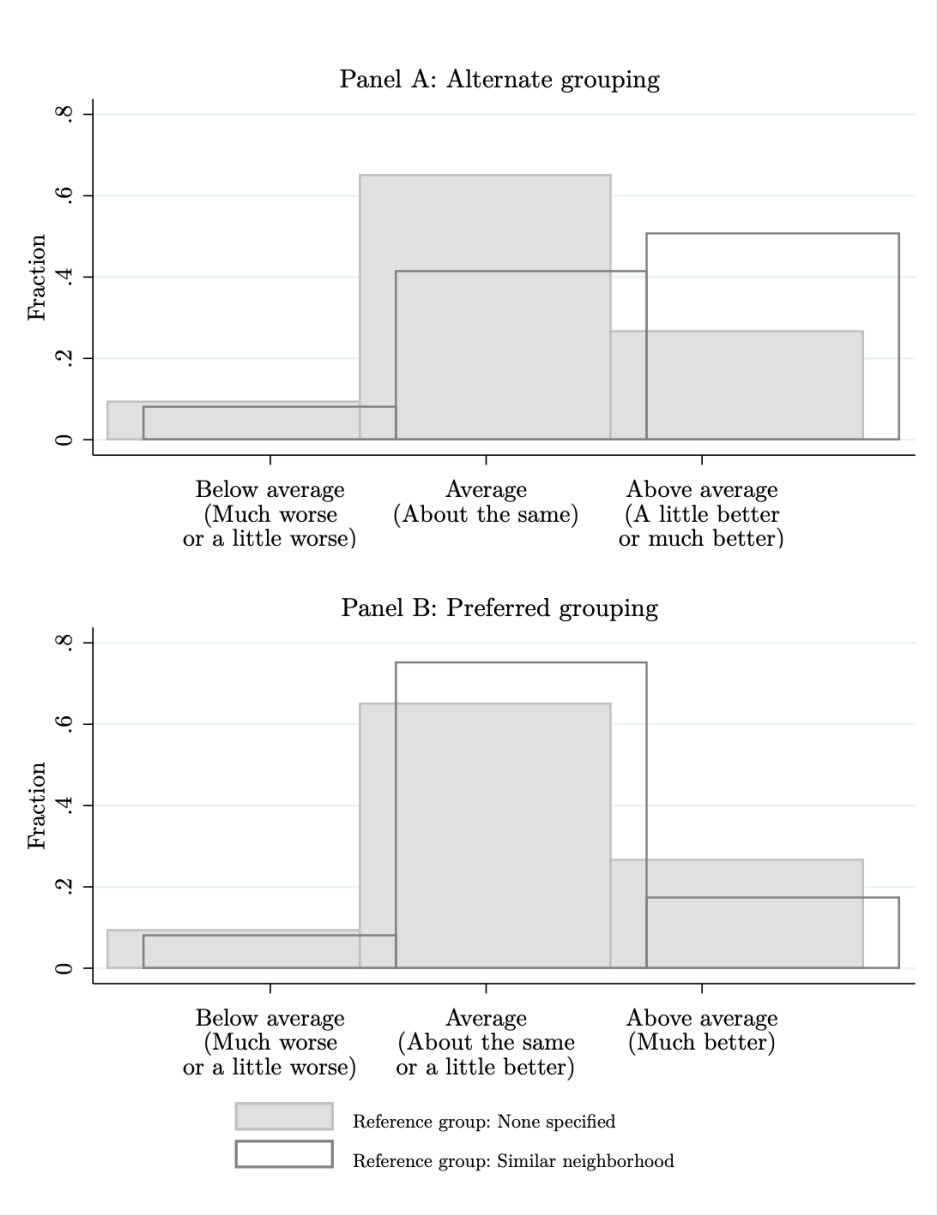

Figure 2.3: Response comparison across questions

Note: This figure compares the distribution of responses across the no reference group question ("is your child an average student, better than average, or below average") and one of the specific reference group questions ("how does your child's overall ability compare to other children of the same age in similar neighborhoods in your county?"). In panel A, responding "much worse" and "a little worse" to the second question is classified as equivalent to "below average" on the first, responding "about the same" as equivalent to "average", and responding "a little better" or "much better" as equivalent to "above average." In panel B, all classifications are the same, except "a little better" is grouped with "about the same" in the "average" category. Data are from the Kenya Life Panel Survey (KLPS).

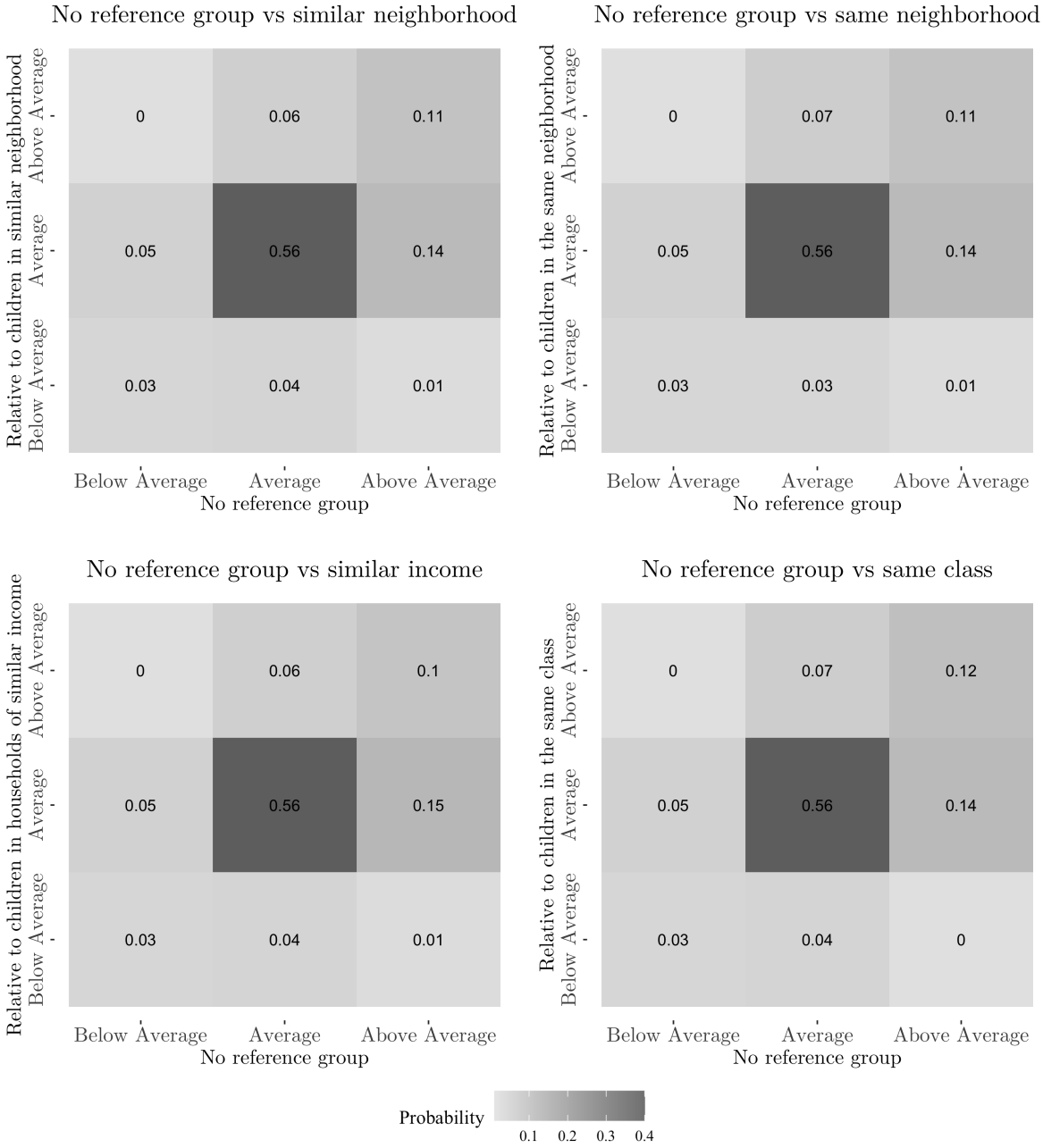

Figure 2.4: Beliefs responses across no reference group specified vs specified reference group

Note: This figure compares responses across the no reference group question ("is your child an average student, better than average, or below average") and each of the specific reference group questions ("how does your child's overall ability compare to other children of the same age in ... ?") using the preferred response grouping. Responses to the latter are recoded according to the preferred grouping, where responding "much worse" and "a little worse" are classified as equivalent to "below average" on the first no reference group question, responding "about the same" or "a little better" are classified as equivalent to "average", and responding "much better" is classified as equivalent to "above average." Numbers and shading represent the probability of responding in the equivalent categories across the two questions. Data are from the Kenya Life Panel Survey (KLPS).

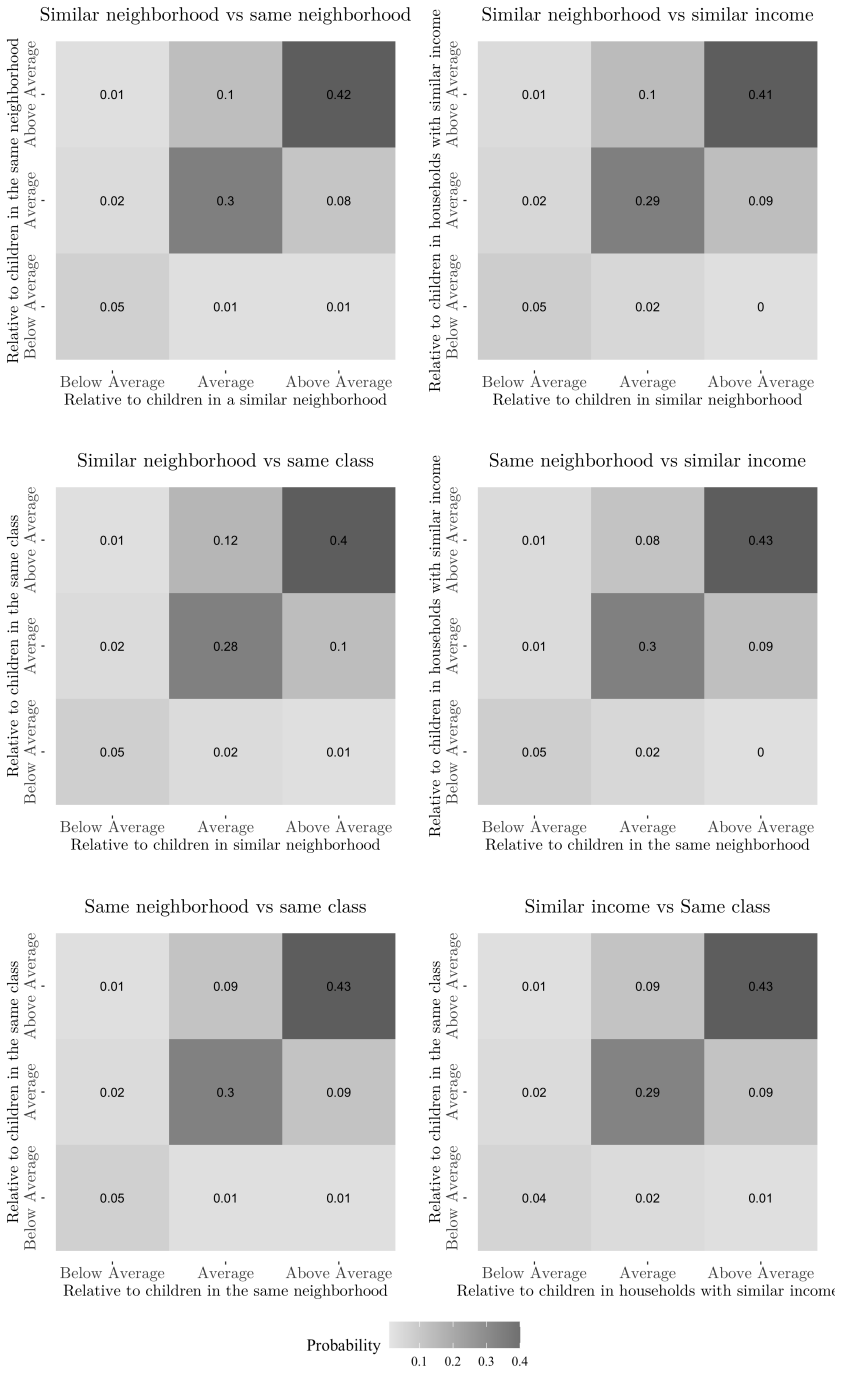

Figure 2.5: Beliefs responses across different specified reference groups

Note: This figure compares responses across each of the different reference group questions ("how does your child's overall ability compare to other children of the same age in ... ?") using the preferred grouping described in the text and in Figure 2.3 and Figure B2 Numbers and shading represent the probability of responding in the equivalent categories across the two questions. Data are from the Kenya Life Panel Survey (KLPS).

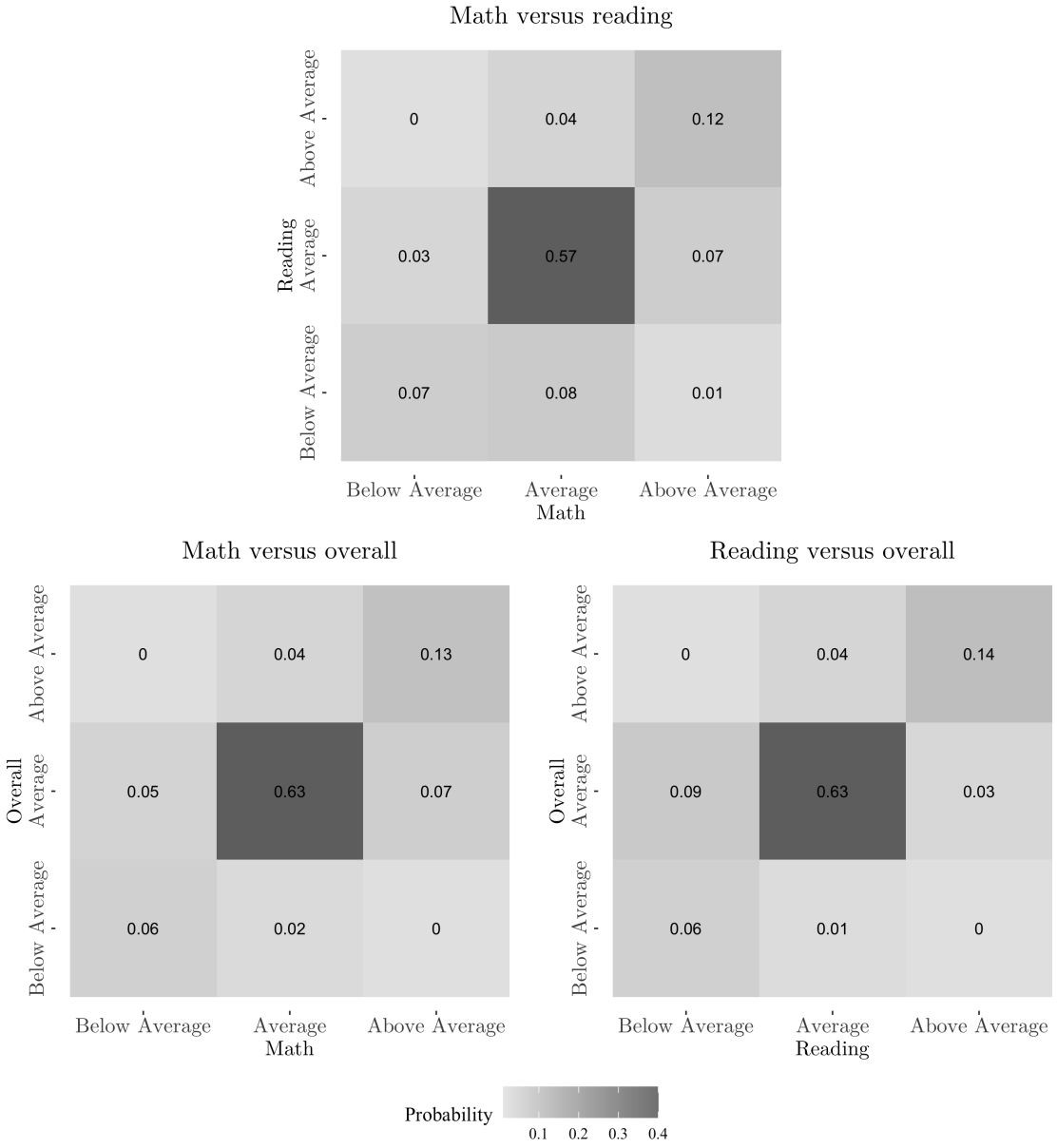

Figure 2.6: Beliefs responses across domains

Note: This figure compares responses across domains to the question "how does your child's overall ability compare to other children of the same age in similar neighborhoods?" using the preferred grouping described in the text and in Figure 2.3 and Figure B2 Numbers and shading represent the probability of responding in the equivalent categories across the two domains. Data are from the Kenya Life Panel Survey (KLPS).

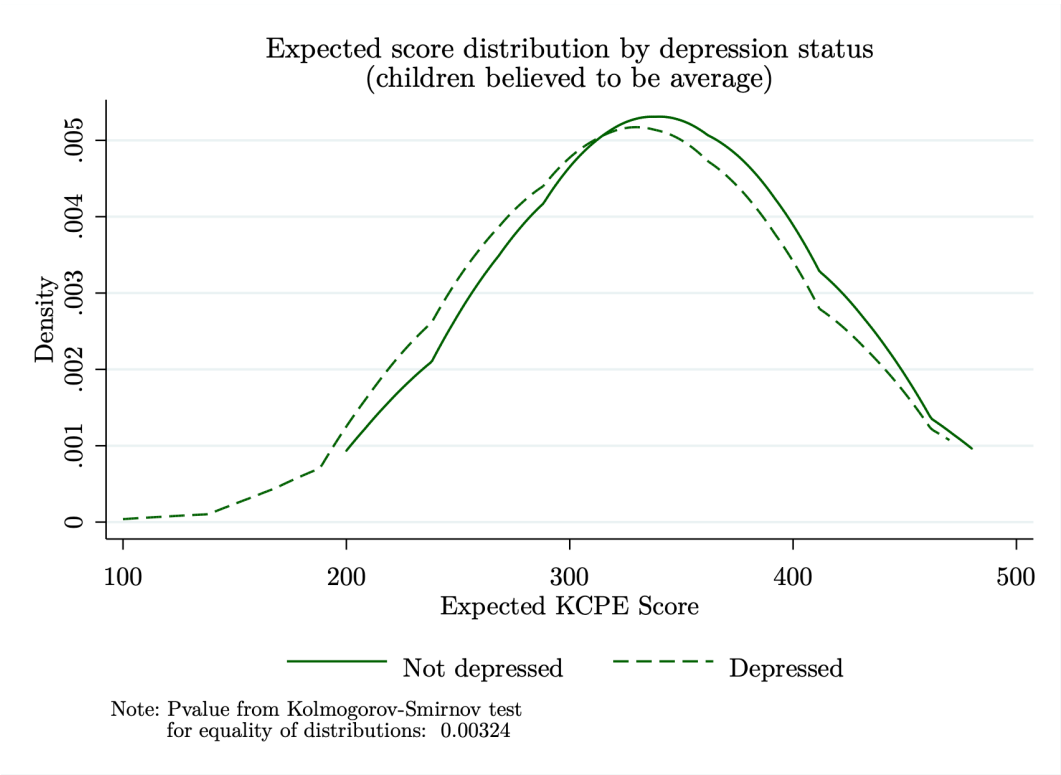

Figure 2.7: Density of expected KCPE scores by depression

Note: This figure plots kernel densities of expected future KCPE scores for children whose parents classify them as (currently) average students, separately for depressed and non-depressed parents. Data are from the Kenya Life Panel Survey (KLPS).

Chapter 3

Gender and Parental Beliefs: Evidence from the USA

3.1 Introduction

The previous two chapters documented a robust link between socioeconomic status and parental beliefs about children's academic proficiency in India and Kenya. In both contexts, I found evidence to support that parental beliefs not only correlate positively with household economic circumstances, but that economic circumstances may themselves directly shape parental beliefs. In India, I found that beliefs respond negatively to exogenous negative income shocks, while in Kenya, I found evidence of elevated beliefs among recipients of an early-life health intervention that led to later-life improvements in labor market outcomes and earnings.

In this chapter I explore correlates of parental beliefs in the context of the United States, with a particular focus on how these beliefs differ for male and female children across math and reading. I leverage panel data from the Early Childhood Longitudinal Studies Program: Kindergarten Class of 1998-1999 Study (ECLS-K), a dataset tracking over 21,000 children from kindergarten through eighth grade which contains information on children's academic performance in math and reading along with parental beliefs about children's academic proficiency in math, reading, and overall.

I first document a link between parental beliefs and socioeconomic status in terms of household income and parental education. I then show that beliefs are sensitive to children's performance relative to peers within the same school, and that the link between relative performance and above-average beliefs is even stronger among parents in high income households. These findings are remarkably consistent with the patterns documented in each of India and Kenya.

In the US context, a different picture emerges with respect to domain-specific parental beliefs. Parents are substantially more likely to believe male children are above average in math, and substantially more likely to believe female children are above average in reading,

even after accounting for actual performance in each of these domains. These findings are consistent with the idea that in the absence of perfect information, parents may rely on gender-based stereotypes or norms to fill in the gaps in their knowledge, in this case, relying on the stereotype that males tend to be better at math and related domains, while females tend to be better at reading and related domains. In Kenya, I found no evidence of disparities across domains for male and female children; in India, parental beliefs were collected for overall academic proficiency only, precluding domain-specific analyses.

Furthermore, the relationship between domain-specific relative performance and domain-specific beliefs differs for male and female children: as relative math performance increases, parents are more likely to believe their children are above average in math, even more so for male than for female children. Similarly, as relative reading performance increases, parents are more likely to believe their children are above average in reading, though now this relationship is stronger for female than for male children.

Motivated by these gender-based disparities, I next explore how family structure may influence parental beliefs across domains and genders. I examine the influence of opposite-sex siblings relative to same-sex siblings for males and females separately, finding that a mixed-sex sibling composition correlates positively with above-average overall beliefs for females. Specifically, parents are more likely to hold above-average overall beliefs for female children with at least one brother relative to those with only sisters.

On the other hand, I also find evidence that beliefs among parents in mixed-sex households perhaps align more closely with gender-based biases across domains. Parents of male children with at least one sister (compared to those with only brothers) are more likely to believe that male child is above average in math, while parents of female children with at least one brother (compared to those with only sisters) are more likely to believe that female child is above average in reading. In both cases, these relationships are primarily driven by the presence of older opposite-sex siblings, with virtually no such patterns based on the presence of younger opposite-sex siblings.

Finally, I document a link between parental beliefs and children's own self-reported interest and perceived competency overall and across domains. Overall parental beliefs correlate positively with children's interest and perceived competency both overall and within specific domains. More nuanced relationships emerge with respect to interest and perceived competency within specific domains. Math-specific parental beliefs correlate positively with math-specific interest and competency, but not at all with reading-specific interest and competency. The opposite is true for reading: self-reported interest and competency in reading correlate positively with above-average parental beliefs in reading, but not at all with above-average parental beliefs in math.

Taken together, these results suggest that in the US, traditional gender-based biases could influence parental beliefs about their male and female children's proficiency across domains. To the extent that such beliefs influence the nature of educational investments, how parents engage with their children, and the expectations parents set for their children from an early age, these biased beliefs could play some role in contributing to gender-based gaps in the pursuit of math-related coursework and participation in Science, Technology, Engineering,

and Mathematics-related (STEM) fields.

This research relates to the literature documenting and exploring gender-based participation and performance gaps across domains. Kahn and Ginther (2017) document disparities across males and females in terms of participation and performance in STEM-related fields from childhood through to adulthood, pointing to preferences, perceptions, and other psychological explanations as key drivers of these disparities. Similarly, Bharadwaj et al. (2016) document gaps in math performance among Chilean males and females, finding that few household or contextual factors can account for these disparities, but instead suggesting that parenting practices and perceptions could play some role. Consistent with my results, Bharadwaj et al. (2016) also find that female students tend to be much less confident in their math abilities compared to equally-performing male peers. Other research supports that domain-specific gender norms (Friedman-Sokuler and Justman, 2016), including culturally-determined gender norms (Friedman-Sokuler and Senik, 2020), may contribute to disparities in participation across males and females in STEM-related fields.

This research also links to a related strand of the literature that explores the role of opposite-sex classmates or opposite-sex siblings on educational and occupational choices. Evidence from this literature suggests that a mixed-sex school environment leads women to make educational choices more in line with traditional gender-based stereotypes (Favara, 2012), that females growing up with male siblings are less likely to choose a STEM-related major or field (Brenøe, 2017; Oguzoglu and Ozbeklik, 2016; Anelli and Peri, 2015), and that females with male siblings earn less in the labor market (Cools and Patacchini, 2017). These patterns are interpreted as perhaps reflecting that a mixed-sex environment may reinforce traditional gender-based identities, or that parents of mixed-sex families may alter their parenting practices to align with prevailing gender-based biases and norms. I build on each of these literatures by suggesting that gender-based disparities in parental beliefs could be another avenue contributing to disparities in STEM participation across males and females. Social norms may influence parental beliefs along gendered lines, and such beliefs may alter the way parents invest in or engage with their children, and perhaps even the way children perceive their own domain-specific capabilities.

3.2 Data

The data used for this analysis come from the Early Childhood Longitudinal Studies Program: Kindergarten Class of 1998-1999 Study (ECLS-K). This longitudinal dataset includes a wealth of information for a nationally representative sample of children who started kindergarten in 1998. A sample of over 21,000 children across over 1,200 schools were first surveyed in fall or spring of their kindergarten year, then in each of fall of first grade, spring of first grade, spring of third grade, spring of fifth grade, and spring of eighth grade.

This analysis focuses on data collected through parent questionnaires, child assessments, and a child self-description questionnaire collected in fall of kindergarten, spring of first grade,

and/or spring of third grade. I first describe the data available, the discuss the sample(s) used for the analysis.

Household and child characteristics

Household characteristics come from a detailed parent interview conducted with one of the child's parents (typically the child's mother) over the phone. In this interview, parents provided key demographic information such as household income, each parent's level of education, whether either parent was born outside the US, the child's sociodemographic group, as well as a detailed listing of all resident children, including their age, gender, and relationship to the child in the sample.

Parents indicated their household income by selecting from one of thirteen categories instead of providing an exact figure. I assign to each household the midpoint of the indicated range, using the lower-bound for the top-most income bracket; as such, household income is essentially top-coded at $200,000. Parental education is measured in years, and averaged across both parents.

The listing of all resident children allows me to construct a detailed sibling roster, and to identify whether the child has older or younger siblings of the same or opposite sex.

Parental beliefs

The parent interview also provides key inputs to the analysis of parental beliefs. In the fall of kindergarten, spring of first grade, and spring of third grade, parents were asked whether they think their child can "learn, think, and solve problems" "as well as other children," "slightly less well than other children," or "much less well than other children." I consider this to represent a measure of "overall" proficiency, and classify the responses as indicating whether parents believe their child is average, below average, or above average.

In spring of first grade and spring of third grade, parents were asked "compared to other children in your child's class, how well do you think he/she is doing in school this spring in math?" and similarly "in reading/language arts?" Parents could choose from "much worse," "a little worse," "about the same," "a little better," and "much better" to respond to each of these questions. I consider these responses as measures of "domain-specific" proficiency. Similar to the approach used in the previous chapter, I classify "much worse" and "a little worse" as below average, " about the same" or "a little better" as average, and "much better" as above average.

Child performance

Measures of child performance come from Item Response Theory (IRT) scores in each of math and reading. These tests were adaptive, so that early questions routed children to later questions of the appropriate difficulty. IRT scores provide a measure of student performance on the full set of questions included in the test by taking into consideration performance

on the set of questions they did complete, and inferring expected performance on the set of questions they did not complete.[1] These math and reading IRT scores are normalized relative to other children within the same grade. Composite scores are constructed by summing across the math and reading scores (using just one or the other if both are not available) and renormalizing.

In much of the analysis to follow, I control for composite scores when looking at overall beliefs as the outcome, math scores when looking at math-specific beliefs, and reading scores when looking at reading-specific beliefs.

Child self-beliefs

Finally, in third grade, children completed a self-description questionnaire. As part of this questionnaire, children responded to 22 questions designed to capture their perceived interest and competence in each of math, reading, and overall (8 questions for each of math and reading, 6 questions for overall). These questions encouraged children to indicate how closely a series of statements described themselves on a scale from "very true" to "not at all true." Examples include statements such as "I like reading long chapter books" (for the reading category), "work in math is easy for me" (for math), and "I am good at all school subjects" (for overall).

The table below summarizes the availability of each of the components discussed above in each of the relevant rounds of data collection:

	K Fall	1st Spring	3rd Spring
Child assessment data	✓	✓	✓
Overall parental beliefs	✓	✓	✓
Domain-specific parental beliefs		✓	✓
Child self-description questionnaire			✓

The sample

The primary sample used for this analysis includes children with the relevant test scores and parental beliefs available during any of rounds required for the corresponding analysis. Analysis of overall beliefs uses data pooled across kindergarten, first grade, and third grade, and includes children with composite scores and overall parental beliefs available. Analysis of domain-specific beliefs uses data from the first and third grades, and includes children who have math scores, reading scores, and domain-specific parental beliefs available. Finally, analysis involving child self-beliefs uses all children observed in third grade. I refer to this primary sample as the "full sample."

[1] More details about these measures are available in the extensive accompanying documentation (Tourangeau et al., 2009).

Two points are worth highlighting. First, there was considerable attrition across rounds, with over 4,400 children observed in kindergarten leaving the sample by spring of first grade and over 3,400 additional children leaving the sample by spring of third grade.[2] The primary results are robust to excluding those children who attrit over time (and so restricting to only those children observed in all of the relevant rounds). I refer to this alternate sample as the "panel sample."

Second, over 2,000 children enter the sample in spring of first grade or spring of third grade, in one of three ways. First, many non-respondents during the fall of kindergarten were converted to respondents by the spring of kindergarten. Second, a small number children (among them, those who were not enrolled for kindergarten in the previous year and so were not present in the kindergarten sample) were deliberately added to the sample in time for first grade using a "freshening procedure." Finally, a small number of children not observed in the spring of first grade were again observed in spring of third grade. The primary results are robust to excluding children added to the sample over time and instead focusing on children present in at least kindergarten (for the analysis involving kindergarten, first grade, and third grade) or at least first grade (for the analysis involving first grade and third grade).[3] I refer to this alternate sample as the "base year sample."

As discussed above, the primary results are robust to using the full sample, non-attrition sample, or the panel sample. I consider the full sample as the primary sample for the analysis, and discuss in the results section the few cases where results do vary across samples. Information on the number of children observed with corresponding test scores and parental beliefs available in each round are presented in the following table.

Sample	Description	K Fall	1st Spring	3rd Spring
Full sample	Observed in any of K, 1, 3	17,131	14,767	12,300
Base year sample	Observed in at least K	17,131	12,698	10,521
	Observed in at least 1		14,444	11,081
Panel sample	Observed in all of K, 1, 3	9,854	9,854	9,854
	Observed in both of 1, 3		11,081	11,081
Other	Attrited this round		4,433	3,425
	Entered this round		2,069	291
	Returned this round			667

[2]Attrition picks up after third grade and so fifth grade and eighth grade are not included in the sample, even though test scores and overall parental beliefs are collected in those grades. Close to 7,000 of the children observed in the fall of kindergarten are not observed in fifth grade, and over 8,000 of the children observed in the fall of kindergarten are not observed in eighth grade.

[3]This sample selection is similar to other research using this dataset, for example Kinsler and Pavan (2021).

3.3 Results

In this section I discuss the key results of this analysis. I first present basic correlates of overall beliefs, finding that household income correlates strongly with parental beliefs in this context. I then discuss gender-based disparities in beliefs across math and reading, and explore how beliefs respond to the presence of same and opposite gender siblings within the household. Finally, I present evidence linking parental beliefs to children's own self-perceiving interest and competency overall and across domains.

Correlates of parental beliefs

Table 3.1 presents coefficient estimates corresponding to the following regression

$$Beliefs_{igs} = \alpha + \beta X_i + \theta_g + \delta_s + \varepsilon_{igs} \tag{3.1}$$

where $Beliefs_{igs}$ refer to overall parental beliefs corresponding to child i in grade g and school s. X_i represents a set of household and child characteristics including log household income, parental years of education, normalized composite score, indicators for whether the child is female, the first born, and for the child's sociodemographic group (race, whether either parent was born in a different country). and θ_g and δ_s are school and grade fixed effects.[4] Standard errors are clustered by child.

Table 3.1 includes results for the full sample (which serves as the primary sample for the remaining analysis) in columns 1 and 2, the alternate base year sample in columns 3 and 4, and the more restricted panel sample in columns 5 and 6. With a few exceptions, results are robust across these three samples.

Parental beliefs correlate strongly with child performance. In this context, one third of all parents believe their child is above average, which nearly doubles for children with above average test performance (see means in table rows). Focusing on the primary/full sample, the estimated coefficients indicate that each standard deviation increase in a child's test score is associated with a 17 percentage point increase in the likelihood parents believe their child is above average (column 1).

As was observed in each of India and Kenya, measures of socioeconomic status such as household income and parental education also correlate strongly with parental beliefs. Each 50% increase in income is associated with a 0.4 to 0.5 percentage point increase in the likelihood of believing children are above average (columns 1, 3, and 5), and a somewhat weaker decline in the likelihood of believing children are below average (columns 2; with the estimate for the latter is small and insignificant in the base year sample in column 4 and significant at 10% for the panel sample in column 6). Finally, each additional year of education is associated with a 1 percentage point increase in the likelihood parents believe their children are above average.

[4]Results are robust to instead using school by grade fixed effects.

These results also reveal a striking link between child gender and parental beliefs, a relationship that was either not present or substantially weaker in the Indian and Kenyan contexts. In this context, parents are 2.7 percentage points more likely to believe their female children are above average, and 3 percentage points less likely to believe their female children are below average, even accounting for the household environment and child test performance. To put these figures into perspective, a 2.7 percentage point increase (associated with female children) equates to about a sixth of a standard deviation higher test performance in terms of predicting above-average beliefs.

Finally, across all samples, above-average beliefs tend to be more common and below-average beliefs less common for first born children. These patterns hint towards potential differences in the nature of parental beliefs across male and female children and according to household composition, something I explore in the following analysis.

Relative performance and income

Before turning to potential gender disparities, I first explore how parental beliefs relate to child performance relative to peers within the same school. This exercise is similar to that in the first chapter. Given that the target number of children sampled per school was 24 (Tourangeau et al., 2009), a greater proportion of children in the sample can be linked to peers within the same school than was possible in the Indian context (close to 94%). As before, I compute school by grade average composite scores, excluding each child's own score and restricting to schools where children have at least two peers in the same school and grade. For this analysis, regressions are of the form:

$$Beliefs_{ig} = \alpha + \gamma_1 Avg_i + \beta X_i + \theta_g + \varepsilon_{ig} \tag{3.2}$$

$$Beliefs_{ig} = \alpha + \gamma_2 Avg_i + \gamma_3 Gap_i + \beta \widetilde{X}_i + \theta_g + \varepsilon_{ig} \tag{3.3}$$

$$Beliefs_{ig} = \alpha + \gamma_4 Avg_i + \gamma_5 Gap_i + \gamma_6 Gap \times HighInc_i + \beta \widetilde{X}_i + \theta_g + \varepsilon_{ig} \tag{3.4}$$

where $Beliefs_{ig}$ is as before, and X_i includes the usual set of controls in regression (3.2), with a modified version $\widetilde{X}_i$ in regressions (3.3) and (3.4) that excludes children's own composite scores. School fixed effects are omitted from this analysis. Avg_i represents school average scores (excluding the child's own score, and so child-specific and indexed by child), and Gap_i represents the gap between the students own score and the school mean. For regressions of above-average beliefs, these performance gaps are constructed as the child's score minus the mean; for regressions with below-average beliefs, gaps are constructed as the mean minus the child's score, so that they can be interpreted as measuring how far below the mean a child scores.

Table 3.2 presents the main results. I include regression (3.2) for comparability with some of the analysis in Kinsler and Pavan (2021) which uses this same dataset. Their analysis finds an inverse relationship between school average performance and own-child beliefs (focusing on math performance and overall beliefs), which replicates here (columns 1 and 4).

The remaining results reinforce that beliefs align strongly with performance relative to peers, with an even stronger relationship among parents in high income households. Each standard deviation increase in a child's score relative to the school mean is associated with a 17 percentage point higher likelihood of believing children are above average (column 2). In column 3, we can see that this effect is even stronger among higher income households; as shown by the positive coefficient estimate for γ_6. Turning to below-average beliefs, we see a similar pattern. Parents are 7 percentage points more likely to believe children are below average for each one standard deviation below the school mean a child scores (column 5), with no evident differences across high and low income households (column 6).

Figure 3.1 presents this relationship visually. Splitting the sample into high (above median) and low (below median) income households, the results in panel A show that for nearly all levels of relative performance (score gaps), parents in high income households are more likely to believe their children are above average.

Though not the focus of the current research, I do find disparities across sociodemographic categories, as shown in panel B of Figure 3.1. For nearly the full distribution of relative performance, non-immigrant white parents are more likely to believe their children are above average than non-immigrant Black parents or parents belonging to one of the other sociodemographic groups (Hispanic, Native American, born outside the US, etc.). These patterns are perhaps similar to those detected in the Indian context with respect to disparities across more privileged and more disadvantaged caste groups; here the minority groups represented by non-immigrant Black parents, or those belonging to one of the other demographic groups are also less likely to believe their children are above average compared to the majority group of non-immigrant white parents. Though only suggestive, these findings raise the possibility that some element of disadvantage could exert a negative influence on beliefs about proficiency, whether as a result of a history of oppression, an experience of discrimination, being underserved by the education system, or any other related factors.

Disparities across domains for male and female children

In this section, I present evidence of substantial disparities in parental beliefs across domains for male and female children. Specifically, parents are less likely to believe female children are above average in math compared to male children, and are more likely to believe female children are above average with respect to reading. For this analysis, I use regressions similar to those from the previous subsection, now interacting performance gaps with female status instead of income, and considering beliefs, school averages, and performance gaps across three domains: overall, math, and reading. These regressions are of the form:

$$Beliefs_{ig}^{j} = \alpha + \gamma_4 Avg_i^j + \lambda_1 Gap_i^j + \lambda_2 Gap^j \times Female_i + \beta \widetilde{X}_i + \theta_g + \varepsilon_{ig} \tag{3.5}$$

where most elements are as before, though now beliefs ($Beliefs_{ig}^{j}$) school average scores ($Avg_i{}^j$), and relative performance (score gaps, $Gap_i{}^j$) are with respect to domain j (overall, math, reading) specifically. $\beta \widetilde{X}_i^j$ excludes the female indicator and composite scores, and school fixed effects are excluded.

Table 3.3 presents the results of this analysis. Similar to the results presented in Table 3.1, above-average beliefs are more common and below-average beliefs are less common in the overall domain for female children (columns 1 and 2). Again, relative performance correlates strongly with the likelihood of holding above-average or below-average beliefs. For above-average beliefs, there are no detectable differences in the strength of this relationship across males and females (column 1), while for below-average beliefs, the relationship with (negative) relative performance weakens for parents of females ($\lambda_2 < 0$ in column 2).

Moving from overall beliefs to specific domains, a different picture emerges. Parents are less likely to believe their female children are above average in math (column 3) and instead, are more likely to believe their female children are above average in reading (column 5), even accounting for their actual relative performance in each of these domains. These patterns closely follow extensively-documented domain-based norms, where males are perceived to be more competent in math and related domains, and females in reading and related domains.

Furthermore, the strength of the relationship between relative performance and above-average and below-average beliefs differs for male and female children. The likelihood of above-average beliefs in math increases as relative math performance increases ($\lambda_1 > 0$ in column 3), but less so for female children ($\lambda_2 < 0$ in column 3). Similarly, the likelihood of below-average beliefs increases as relative math performance worsens ($\lambda_1 > 0$ in column 4), even more so for female children ($\lambda_2 > 0$ in column 4.) In other words, parents appear less sensitive to gains and more sensitive to declines in relative math performance for female children.

The reading domain shows the opposite picture. The link between performance gaps and above-average beliefs in reading is stronger for female children than for male children ($\lambda_2 > 0$ in column 5), while the link between performance gaps and below-average beliefs is weaker for female than for male children ($\lambda_2 < 0$ in column 6). In the reading domain, parents appear more sensitive to gains and less sensitive to declines in relative reading performance for female children.

Figure 3.2 depicts these patterns clearly. Panel A shows that the slope of the relationship between relative performance and above-average beliefs in the math domain steepen for male children relative to female children. In panel B, this pattern reverses for above-average beliefs in reading.

Taken together, these results suggest the intriguing possibility that prevailing gender biases could influence parental beliefs. The first set of results showed that parents tend to exhibit a positive bias towards female children in terms of overall beliefs. Analysis in this section reveals that this overall bias masks domain-specific biases, where parents are more likely to believe male children are above average in math, more likely to believe female children are above average in reading, and the relationship between relative performance and beliefs differs across domains and across male and female children.

These patterns are perhaps precisely what we might expect to see if parents rely on heuristics – among them the belief that males tend to be more proficient in math and related disciplines, while females tend to be more proficient in reading and related disciplines – in the formation of beliefs about their children's domain-specific proficiency. The biases could

have consequences in terms of how parents choose to invest in their male and female children, or which courses of study they encourage their male and female children to pursue. Viewed in this way, these early-life domain-based belief disparities could potentially contribute to later-life disparities across males and females in terms of participation in math-heavy courses of study and STEM-related fields.

Disparities within the household

This section explores the relationship between sibling sex composition and parental beliefs across domains. I first explore how the presence of any siblings, older siblings, or younger siblings of the opposite sex versus those of the same sex relates to parental beliefs, separately for male and female children. I then leverage an approach common in the literature to identify the causal impact of second born siblings of the opposite sex (relative to siblings of the same sex) on parental beliefs corresponding to first born children.

These analyses estimate the following regression, separately for males and females and for different samples following the four approaches described below:

$$Beliefs^{j}_{igs} = \alpha + \pi OppositeSexSibling_i + \beta \widetilde{X}^{j}_{i} + \theta_g + \delta_s + \varepsilon_{igs} \tag{3.6}$$

All components are as before, only now $OppositeSexSibling_i$ indicates the presence of a male sibling for female children or the presence of a female sibling for male children. $\widetilde{X}^{j}_{i}$ excludes the female and first born indicators and includes domain-specific normalized scores.

In the first approach, I restrict the sample to children with siblings of any kind, older or younger, following one of several strategies used in Oguzoglu and Ozbeklik (2016), Cools and Patacchini (2017) and Anelli and Peri (2015). The female-only regressions essentially compare beliefs across females with only sisters to females with at least one brother. Similarly, the male-only regressions compare beliefs across males with only brothers to those with at least one sister.

In the second approach, I restrict to younger children and explore how parental beliefs differ in the presence of opposite-sex older siblings, similar to another approach adopted in Anelli and Peri (2015). In the third approach, I do the reverse, restricting to older children and examining how beliefs differ in the presence of opposite-sex younger siblings.

I then leverage an approach common in the literature to explore how the presence of an opposite-sex sibling impacts parental beliefs, following Brenøe (2017), Peter et al. (2018), and Cools and Patacchini (2017). The first three approaches described above do not reflect the causal effect of opposite-sex siblings on parental beliefs, since fertility decisions may be influenced by the sex of existing siblings, leading to endogeneity in the sex composition of siblings. However, conditional on the decision to have (at least) a second child, the gender of that second child could be considered exogenous. This fourth approach thus focuses on first-born children and compares those with second-born siblings of the opposite sex to those with second-born siblings of the same sex.

The results from this analysis are presented in Table 3.4, where the two rows within each panel present estimates of π for separate regressions with believe above average (top row) or

believe below average (bottom row) as the dependent variable. Panel A shows that above-average overall beliefs are 2 percentage points higher for females with any brothers compared to females with only sisters (column 1), with no such differences for males (columns 2).

Turning to specific domains, we can see that math-specific beliefs are 2 percentage points higher for male children with a sister compared to male children with only brothers (column 4), and reading-specific beliefs are 2 percentage points higher for female children with a brother compared to those with only sisters (column 5). One interpretation of these findings is that the presence of an opposite-sex sibling reinforces traditional gender-based norms: when male children have a sister, those male children are seen as more proficient in math, and when female children have a brother, those female children are seen as more proficient in reading. These findings could also reflect that families who make fertility decisions aiming for mix of sexes are more likely to hold these traditional domain-based beliefs. These relationships are tentative, however (only significant at the 10% level), and no apparent differences emerge with respect to below-average beliefs.

Comparing the results in panels B and C, these disparities appear strongest for younger siblings based on the sex composition of older siblings (that is, comparing those with older siblings of the opposite sex to those with older siblings of the same sex) and virtually disappear for older siblings based on the sex composition of younger siblings (comparing those with younger siblings of the opposite sex to those with only same-sex younger siblings).[5] This perhaps makes sense, if the presence of older siblings tends to be more influential for shaping parental beliefs, or if some of the younger siblings are too young for any domain-specific gender-based biases to necessarily be relevant.[6]

Estimates in panel D of Table 3.4 show only weak evidence for differences in parental beliefs corresponding to first borns with an opposite-sex next born sibling compared to those with a same-sex next born sibling. Parents of first born females with a second born brother are almost 2 percentage points less likely to believe that their first born female is below average overall compared to those with a second born sister, though this difference is only marginally significant. No clear differences emerge with respect to domain-specific beliefs.[7]

Several notes of caution are worth keeping in mind when interpreting the results from this final approach. First, these estimates only speak to the specific experience of being a first born child. As we saw in Table 3.1, being the oldest child correlates strongly with both overall and domain-specific beliefs. Perhaps for oldest children, that first child status

[5]For these analysis, patterns are largely similar within the base year sample (shown in Table C1), but show some differences within the panel sample (shown in Table C2). In the panel sample, the gap in above-average overall beliefs for females with any brothers compared to those with only sisters shrinks and becomes insignificant (panels A and B, column 1); in this sample, the domain-based patterns persist and if anything become more pronounced (panels A and B, columns 4 and 5). Though certain estimates shift slightly across samples, taken together these estimates are largely consistent with the core findings described above.

[6]For example, approximately half of younger siblings are four years of age or younger.

[7]I do find marginally positive effects for oldest females with a second born brother in both above-average overall beliefs and above-average math-specific beliefs in a robustness check excluding weights in the analysis, as shown in Table C3.

dominates what would be a more marginal impact of any domain-specific biases. In that case, a more appropriate analysis may be to explore the impact of opposite-sex third born children on second born children. Second, this empirical approach may be more well-suited to exploring later life outcomes, such as occupational choice or later life earnings as is common in this literature, as opposed to these more early life outcomes, particularly given that many of the younger siblings considered are quite young, perhaps having not even started their education.

Taken together, these results provide suggestive evidence for meaningful interactions between family structure and parental beliefs, particularly for female children and for beliefs across domains. The first set of results shows that above-average overall beliefs are more common among parents of females in the presence of an opposite-sex sibling. However, these results also hint that a mixed-sex sibling composition may foster more pronounced domain-based gender biases; above-average math beliefs are higher for males in mixed-sex families, while above-average reading beliefs are higher for females in mixed-sex families. Finally results from the more rigorous fourth approach indicate that the presence of a second born brother (as opposed to a second born sister) leads to a reduction in below-average overall beliefs among first born females, though these estimates are only marginally significant and should be interpreted with caution.

Perceived interest and competency among children

As discussed briefly above, these gender-based belief disparities could matter to the extent these such disparities influence domain-specific educational choices for male and female children. Indeed, a strand of the literature documents that parents and teachers tend to hold gender-biased beliefs about children's math ability, which influence parenting practices and the expectations parents set for their children (Copur-Gencturk et al., 2020). These biases can shape children's interest in math, self-perceived math ability, and eventual math performance (Jacobs et al., 2005; Gunderson et al., 2012). Other evidence supports that disparities in later-life participation in STEM-related fields may originate not from differences in math ability across males in females, but in part due to the influence of gender-based social norms (Friedman-Sokuler and Justman, 2016) or self-perceived ability (Bharadwaj et al., 2016).

In this section I briefly document the correlation between parental beliefs and children's self-reported interest and competency across domains. Self-reported interest and competency overall, in math, and in reading derive from the self-description questionnaire children completed in third grade; scores range from 1 to 4, with 4 indicating higher levels of interest and perceived competency. Here, regressions are of the form

$$InterestCompetency^{j}_{isg} = \alpha + \tau_j BelieveAbove^{j}_{i} + \beta \widetilde{X}^{j}_{i} + \delta_s + \theta_g + \delta_s + \varepsilon_{igs} \tag{3.7}$$

$$InterestCompetency^{j}_{isg} = \alpha + \tau_{j'} BelieveAbove^{j' \neq j}_{i} + \beta \widetilde{X}^{j}_{i} + \delta_s + \theta_g + \delta_s + \varepsilon_{igs} \tag{3.8}$$

where all elements are as before, though I include a control for parental beliefs in the same domain (equation (3.7)) or those corresponding to another domain (equation (3.8)). As

before, $\widetilde{X}_i^j$ includes same-domain composite scores.

Results are presented in Table 3.5. Consistent with the parental beliefs results presented earlier, female children are more likely to indicate higher perceived interest and competency overall and in reading, but less likely to indicate the same in math. These patterns arise even when controlling for overall, math-specific, or reading-specific performance.

Unsurprisingly, interest and perceived competency in all domains correlates positively with overall parental beliefs: children with parents who believe they are above average overall report higher interest and perceived competency overall (column 1), in math (column 2) and in reading (column 5), with magnitudes ranging from 0.06 to 0.15 on the 4 point scale.

Turning to domain-specific interest and perceived competency, we can see that the relationship between child interest and competency and same-domain parental beliefs is even stronger than with overall parental beliefs. Children whose parents believe they are above average in math score over a quarter of a point higher in terms of interest and competency in math (column 3), while children whose parents believe they are above average in reading score nearly 0.2 points higher on the reading-related interest and competency scale (column 6).

The final result corresponding to regression (3.8) is perhaps the most insightful. I find no correlation between above-average beliefs in the opposite domain on domain-specific beliefs. In other words, children whose parents believe they are above average in reading score no higher on the interest and perceived competency in math scale, and vice versa. In unreported regressions, I find no significant coefficient estimates for the interaction between parental beliefs and an indicator for female status, suggesting that these patterns are similar for male and female children.

While not conclusive and purely correlational, these results suggest that domain-specific parental beliefs may truly matter in terms of shaping children's own interest and perceived ability across domains. To the extent that children pick up on their parent's domain-specific beliefs and expectations, such beliefs and expectations could play into children's decision to pursue STEM-related fields where those skills are more or less rewarded.

3.4 Conclusion

This paper has presented patterns related to beliefs about academic proficiency among parents in the US. Similar to the findings from India and Kenya presented in previous chapters, I find that parental beliefs correlate strongly with socioeconomic status, where high income parents and those with additional years of education are more likely to believe their children are above average, and less likely to believe their children are below average.

I also find that parental beliefs differ substantially for male and female children across math and reading domains. Parents are more likely to believe their female children are above average overall and in reading specifically, and more likely to believe their male children are above average in math specifically.

Further, I find evidence suggesting that parental beliefs may be more closely aligned with traditional gender-based norms in households with mixed-sex sibling compositions than those with same-sex siblings only. In mixed-sex households compared to those with only male or only female children, parents are even more likely to believe their male children are above average in math, and more likely to believe their female children are above average in reading.

Taken together, these findings suggest that gender-biased parental beliefs could play some role in shaping male-female disparities in participation in STEM-related fields. To the extent that gender-biased parental beliefs influence the nature of educational investments parents make, the expectations parents set for their children, and even children's own self-perceived domain-specific abilities, the impact of these biases could take root early on in life and contribute to gender-based gaps that only grow as children progress from childhood into adulthood. These results thus point towards parents as an important component to consider in policies designed to encourage female participation in STEM and related fields.

Tables

Table 3.1: Correlates of Parental Beliefs

	Full Sample		Base Year Sample		Panel Sample	
	Believe Above Overall	Believe Below Overall	Believe Above Overall	Believe Below Overall	Believe Above Overall	Believe Below Overall
	(1)	(2)	(3)	(4)	(5)	(6)
Log income	0.00797*	-0.00774**	0.00988**	-0.00419	0.0108**	-0.00668*
	(0.004)	(0.003)	(0.004)	(0.003)	(0.005)	(0.003)
Parental years education	0.0107***	-0.00504***	0.0106***	-0.00515***	0.0106***	-0.00365***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
Female	0.0266***	-0.0302***	0.0261***	-0.0271***	0.0198***	-0.0227***
	(0.005)	(0.004)	(0.006)	(0.004)	(0.007)	(0.004)
First born	0.0222***	-0.0103***	0.0209***	-0.0101***	0.0159**	-0.00771*
	(0.005)	(0.004)	(0.006)	(0.004)	(0.007)	(0.004)
Composite score	0.173***	-0.0736***	0.178***	-0.0705***	0.182***	-0.0665***
	(0.003)	(0.002)	(0.003)	(0.002)	(0.004)	(0.003)
Sample	Grades K, 1, 3	Grades K, 1, 3	Grades K, 1, 3	Grades K, 1, 3	Grades K, 1, 3	Grades K, 1, 3
Fixed Effects	School	School	School	School	School	School
Mean for Below Average	0.125	0.255	0.124	0.251	0.124	0.244
Mean for Average	0.301	0.0690	0.298	0.0709	0.301	0.0663
Mean for Above Average	0.635	0.0115	0.637	0.0113	0.641	0.0111
Overall Mean	0.332	0.0837	0.327	0.0855	0.339	0.0779
R-squared	0.249	0.231	0.208	0.158	0.231	0.180
Observations	44198	44198	40350	40350	29562	29562

Controls include log household income, parental years of education, an indicator for whether the child is female, an indicator for first born status, normalized composite scores, an indicator for child sociodemographic group, an indicator for grade, and school fixed effects (some coefficients not displayed). Also includes indicators for missing income, parental education, or sociodemographic group. Columns (1) and (2) include children with test scores and parental beliefs available in kindergarten, first grade, or third grade. Columns (3) and (4) include children with test scores and parental beliefs available in kindergarten, first grade, or third grade, among those observed at least in kindergarten. Columns (5) and (6) restrict to children with test scores and parental beliefs available in all grades: kindergarten, first grade, and third grade. Standard errors clustered by child. Includes appropriate weights.

Table 3.2: Parental Beliefs Relative to Peer Performance

	Believe above average			Believe below average		
	(1)	(2)	(3)	(4)	(5)	(6)
School mean score	-0.0631***	0.0822***	0.0826***	0.0295***	-0.0348***	-0.0348***
	(0.006)	(0.006)	(0.006)	(0.004)	(0.004)	(0.004)
Gap with school mean		0.170***	0.157***		0.0730***	0.0724***
		(0.003)	(0.003)		(0.002)	(0.003)
Gap × High income			0.0484***			0.00205
			(0.006)			(0.004)
Sample	Grades K, 1, 3	Grades K, 1, 3	Grades K, 1, 3	Grades K, 1, 3	Grades K, 1, 3	Grades K, 1, 3
Mean	0.320	0.320	0.320	0.0929	0.0929	0.0929
R-squared	0.139	0.120	0.122	0.0763	0.0625	0.0626
Observations	44198	44198	44198	44198	44198	44198

Controls include parental years of education, an indicator for whether the child is female, an indicator for first born status, an indicator for child sociodemographic group, and an indicator for grade (some coefficients not displayed). Also includes indicators for missing income, parental education, or sociodemographic group. Includes a control for school mean test scores (excluding that of the child). Gaps in columns (1) to (3) capture how high above the school mean the child scores. Gaps in columns (4) to (6) are negative gaps for ease of interpretation (and so capture distance below the school mean). All scores and gaps are in terms of normalized composite scores. Includes indicators for missing school mean or gap. Sample includes children with test scores and parental beliefs available in kindergarten, first grade, or third grade. Standard errors clustered by child. Includes appropriate weights.

Table 3.3: Parental Beliefs Relative to Peer Performance by Domain and Gender

	Overall		Math		Reading	
	Believe Above	Believe Below	Believe Above	Believe Below	Believe Above	Believe Below
	(1)	(2)	(3)	(4)	(5)	(6)
Female	0.0229***	-0.0333***	-0.0273***	0.00383	0.0485***	-0.0179***
	(0.006)	(0.004)	(0.008)	(0.004)	(0.008)	(0.005)
Gap with school mean	0.166***	0.0784***	0.148***	0.0566***	0.173***	0.100***
	(0.004)	(0.003)	(0.005)	(0.003)	(0.005)	(0.004)
Gap × Female	0.00828	-0.0128***	-0.0175**	0.0151***	0.0140*	-0.0123**
	(0.006)	(0.005)	(0.008)	(0.005)	(0.008)	(0.006)
Sample	Grades K, 1, 3	Grades K, 1, 3	Grades 1, 3	Grades 1, 3	Grades 1, 3	Grades 1, 3
Mean	0.320	0.0929	0.354	0.0758	0.386	0.109
R-squared	0.121	0.0634	0.0663	0.0480	0.102	0.0676
Observations	44198	44198	26846	26846	26870	26870

Controls include log household income, parental years of education, an indicator for whether the child is female, an indicator for first born status, an indicator for child sociodemographic group, and an indicator for grade (some coefficients not displayed). Also includes indicators for missing income, parental education, or sociodemographic group. Includes a control for school mean test scores (excluding that of the child). Columns (1) and (2) use normalized composite scores and gaps, columns (3) and (4) use normalized math scores and gaps, and column (5) and (6) use normalized reading scores and gaps. Gaps in columns (1), (3), and (5) capture how high above the school mean the child scores. Gaps in columns (2), (4), and (6) are negative gaps for ease of interpretation (and so capture distance below the school mean). Includes indicators for missing school mean or gap. Columns (1) and (2) include children with test scores and parental beliefs available in kindergarten, first grade, or third grade. Columns (3) to (6) includes children with test scores and parental beliefs available in first grade or third grade. Standard errors clustered by child. Includes appropriate weights.

Table 3.4: Parental Beliefs by Domain, Gender, and Family Structure

	Overall		Math		Reading	
	Females	Males	Females	Males	Females	Males
Panel A: All Siblings	(1)	(2)	(3)	(4)	(5)	(6)
Any opposite sex sibling: Above	0.0201**	0.00376	0.0119	0.0216*	0.0231*	0.00551
	(0.009)	(0.009)	(0.013)	(0.013)	(0.013)	(0.013)
Any opposite sex sibling: Below	0.00249	0.00390	0.000134	-0.00655	0.00372	-0.00428
	(0.005)	(0.006)	(0.008)	(0.007)	(0.008)	(0.010)
Observations	17991	18723	11003	11543	10893	11400
Panel B: Younger Siblings Only	(1)	(2)	(3)	(4)	(5)	(6)
Opposite sex older sibling: Above	0.0281**	0.0103	0.00416	0.0306*	0.0237	0.0262
	(0.011)	(0.010)	(0.016)	(0.017)	(0.015)	(0.017)
Opposite sex older sibling: Below	-0.00192	-0.00107	0.0108	-0.0220**	-0.000238	-0.0149
	(0.007)	(0.008)	(0.010)	(0.009)	(0.010)	(0.013)
Observations	11898	12449	7053	7441	6989	7344
Panel C: Older Siblings Only	(1)	(2)	(3)	(4)	(5)	(6)
Opposite sex younger sibling: Above	0.00938	0.00898	0.0219	0.0190	0.0215	-0.00147
	(0.012)	(0.012)	(0.017)	(0.017)	(0.017)	(0.018)
Opposite sex younger sibling: Below	-0.0141*	0.00592	-0.00461	0.0135	0.00469	0.00982
	(0.008)	(0.008)	(0.010)	(0.009)	(0.011)	(0.012)
Observations	9980	10326	6382	6650	6308	6561
Panel D: Oldest Siblings Only	(1)	(2)	(3)	(4)	(5)	(6)
Opposite sex next born: Above	0.0267	-0.00564	0.0307	0.0130	0.00621	-0.0144
	(0.017)	(0.017)	(0.023)	(0.023)	(0.023)	(0.024)
Opposite sex next born: Below	-0.0177*	-0.00876	0.00442	-0.00587	0.00216	-0.0114
	(0.010)	(0.010)	(0.013)	(0.011)	(0.013)	(0.016)
Sample	Grades K, 1, 3	Grades K, 1, 3	Grades 1, 3	Grades 1, 3	Grades 1, 3	Grades 1, 3
Fixed Effects	School	School	School	School	School	School
Observations	6093	6274	3950	4102	3904	4056

The first row in each panel displays coefficients on the independent variable indicated (type of opposite sex sibling) for regressions where the dependent variable is believe above average. The second row in each panel displays coefficients on the independent variable indicated (type of opposite sex sibling) for regressions where the dependent variable is believe below average. Panel A includes children with at least one sibling of any kind (older or younger). Panel B restricts to children with at least one older sibling. Panel C restricts to children with at least one younger sibling. Panel D restricts to oldest children with at least one younger sibling. All regressions include children with test scores and parental beliefs available in first grade and/or third grade. Includes the usual controls described in Table 1, aside from first born status and female. Standard errors clustered by child. Includes appropriate weights.

Table 3.5: Child Self Beliefs by Domain

	Interest and Perceived Competency						
	Overall	Math			Reading		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Believe above average overall	0.149***	0.0562**			0.0927***		
	(0.021)	(0.024)			(0.020)		
Believe above in same domain			0.262***			0.167***	
			(0.021)			(0.019)	
Believe above in other domain				0.00485			0.000115
				(0.021)			(0.019)
Female	0.0495***	-0.185***	-0.167***	-0.182***	0.129***	0.127***	0.128***
	(0.017)	(0.018)	(0.018)	(0.019)	(0.017)	(0.017)	(0.017)
Sample	Grade 3	Grade 3	Grade 3	Grade 3	Grade 3	Grade 3	Grade 3
Fixed Effects	School	School	School	School	School	School	School
Mean	2.930	3.133	3.133	3.133	3.271	3.270	3.270
R-squared	0.382	0.404	0.421	0.403	0.420	0.427	0.419
Observations	12287	12275	12189	12182	12200	12107	12113

Controls include log household income, parental years of education, an indicator for whether the child is female, an indicator for first born status, normalized domain-specific scores, an indicator for child sociodemographic group, an indicator for grade, and school fixed effects (some coefficients not displayed). Also includes indicators for missing income, parental education, or sociodemographic group. For interest and perceived competency in math, believe above average in same domain refers to parental beliefs in math, while other domain refers to parental beliefs in reading. Similarly, for interest and perceived competency in reading, believe above average in same domain refers to parental beliefs in reading, while other domain refers to parental beliefs in math. Sample includes children in third grade. Standard errors clustered by school. Includes appropriate weights.

Figures

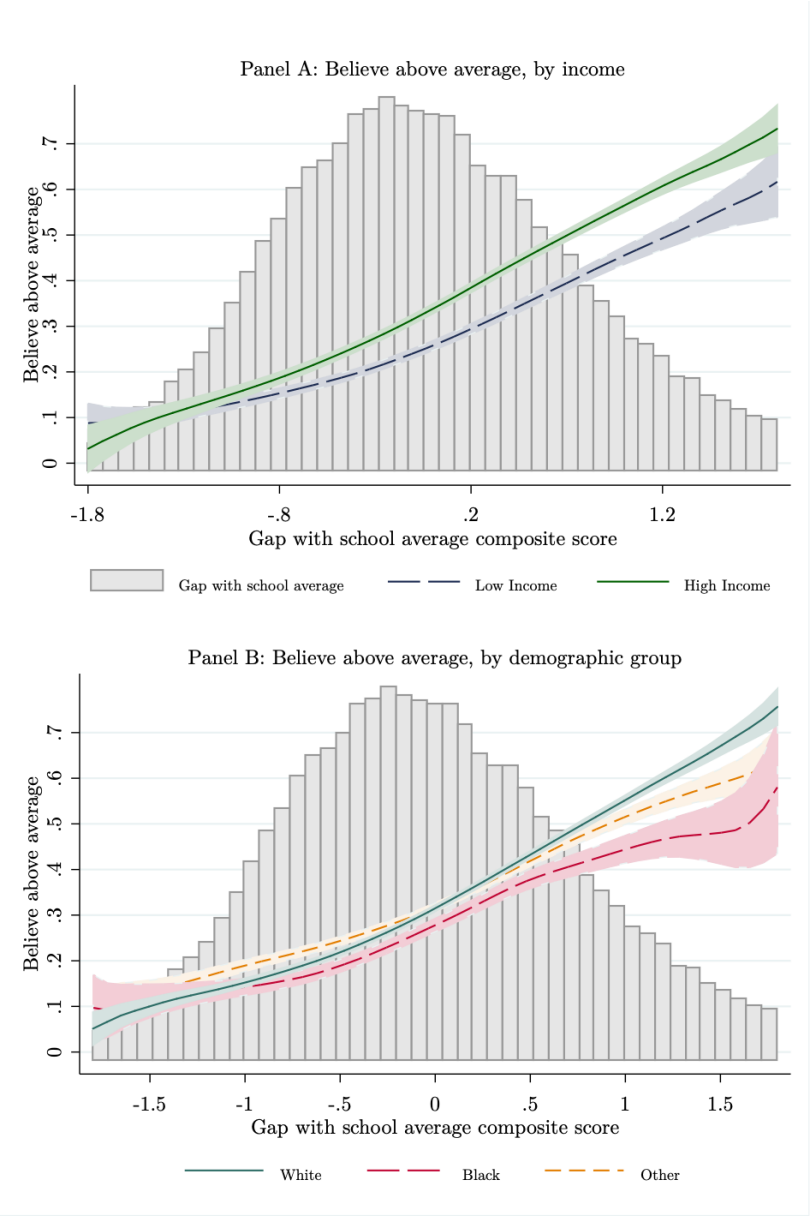

Figure 3.1: Performance and beliefs by income and demographic group

Note: This figure shows local linear regressions of parental beliefs (believe above average) on children's gap with school average performance, separately for high and low income households (top panel) and across different demographic groups (panel A). Lightly shaded areas represent 95% (panel B) and 90% confidence intervals. Data are from the Early Childhood Longitudinal Study, Kindergarten (ECLS-K).

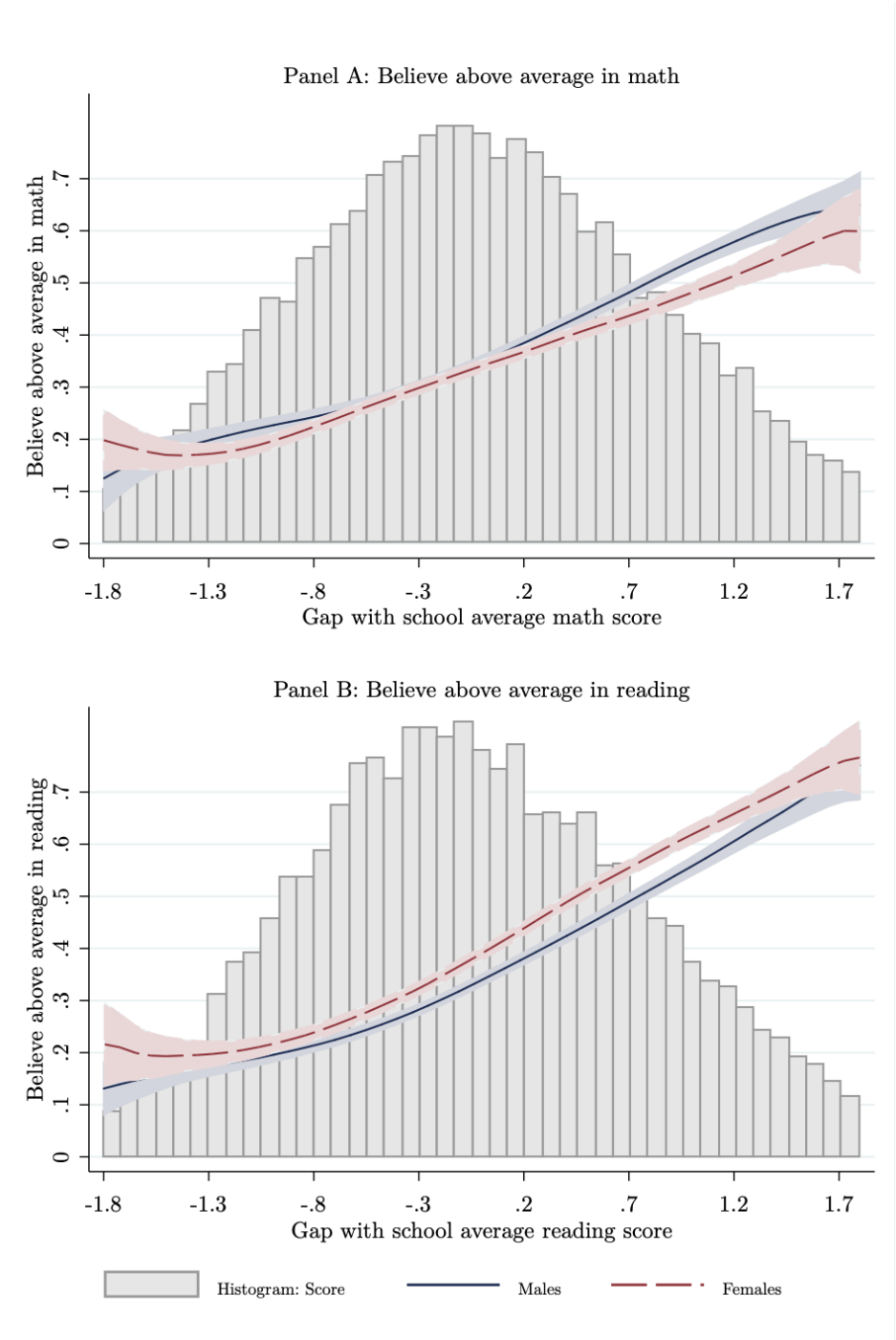

Figure 3.2: Domain specific beliefs by gender

Note: This figure shows local linear regressions of whether parents believe their children are above average in math on relative math performance (panel A) and above average in reading on relative reading performance (panel B), separately for male and female children. Lightly shaded areas represent 95% confidence intervals. Data are from the Early Childhood Longitudinal Study, Kindergarten (ECLS-K).

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Appendix A

Chapter 1 Appendix Tables and Figures

Table A1: Summary of Child and Household Characteristics

	Mean	SD	N
Panel A Child Performance &			
Math Beginner	0.158	0.365	22726
Math Double digit numbers	0.339	0.473	22726
Math Subtraction	0.290	0.454	22726
Math Division	0.213	0.409	22726
Reading Beginner	0.0954	0.294	22726
Reading Can recognize letters	0.135	0.342	22726
Reading Can recognize words	0.202	0.401	22726
Reading Can read paragraph	0.207	0.405	22726
Reading Can read story	0.361	0.480	22726
Reading Composite Level (0 to 1)	0.585	0.305	22726
Panel B Child Characteristics &			
Age 8	0.244	0.430	22726
Age 9	0.229	0.420	22726
Age 10	0.320	0.467	22726
Age 11	0.207	0.405	22726
Female	0.475	0.499	22726
Panel C Parental Beliefs&			
Believe above average	0.128	0.334	22726
Believe average	0.727	0.446	22726
Believe below average	0.145	0.352	22726
Panel D Investments&			
Educational spending (Rs)	2938.9	4941.5	22381
Educational spending (%)	14.76	21.30	22372
Educational time (hours)	41.66	11.56	20967
Panel E Household Characteristics &			
Consumption per capita (Rs)	9895.0	8025.8	19322
Below poverty line	0.260	0.439	19320
Urban	0.315	0.465	19322
Parental education (years)	5.730	4.599	19322
SCST	0.305	0.460	19322
Household size	6.387	2.636	19322
Children in sample	1.176	0.382	19322

This table presents sample characteristics. Note that the final panel with household characteristics includes at most one observation per household per wave.

Table A2: Correlates of Parental Beliefs: Robustness

	Panel A: Dependent Variable: Believe Above Average							
	Main specification (1)	Below poverty line (2)	Raw composite score (3)	School fixed effects (4)	Urban sample (5)	Rural sample (6)	Wave one sample (7)	Wave two sample (8)
Log consumption	.0438***		.0410***	.0259***	.0760***	.0278***	.0467***	.0420***
	(.007)		(.007)	(.009)	(.012)	(.009)	(.009)	(.010)
Below poverty line		-.0191***						
		(.007)						
SCST	-.0204***	-.0257***	-.0184***	-.0205*	-.0337***	-.0161**	-.0316***	-.00453
	(.006)	(.006)	(.006)	(.011)	(.012)	(.007)	(.008)	(.009)
Normalized (raw) score	.0301***	.0322***	.118***	.0345***	.0316***	.0308***	.0440***	.0159***
	(.003)	(.003)	(.011)	(.004)	(.006)	(.004)	(.004)	(.005)
Mean for Average Child	.120	.120	.121	.111	.175	.0994	.122	.117
	Panel B: Dependent Variable: Believe Below Average							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log consumption	-.0428***		-.0360***	-.0322**	-.0268***	-.0497***	-.0407***	-.0335***
	(.008)		(.008)	(.015)	(.008)	(.011)	(.011)	(.012)
Below poverty line		.0573***						
		(.010)						
SCST	.0181**	.0185**	.0132	.0258*	.0250**	.0145	.00899	.0310***
	(.009)	(.008)	(.009)	(.015)	(.011)	(.010)	(.011)	(.012)
Normalized (raw) score	-.0770***	-.0772***	-.295***	-.0748***	-.0527***	-.0839***	-.0863***	-.0685***
	(.004)	(.004)	(.016)	(.007)	(.005)	(.005)	(.006)	(.006)
Sample	Full	Full	Full	Full	Urban	Rural	Wave 1	Wave 2
Fixed Effects	District	District	District	School	District	District	District	District
Mean for Average Child	.150	.150	.163	.145	.0800	.175	.123	.177
Observations	22726	22722	22726	16094	7099	15627	11639	11087

Each column represents a different robustness check as described in the column labels. Column (1) replicates the main specification. Column (2) controls for below poverty line status instead of log household consumption. Column (3) controls for raw scores instead of normalized scores. Column (4) includes school fixed effects and restricts to the sample of children who can me matched to a school present in the schools data. Columns (5) and (6) restrict to urban and rural only, and columns (7) and (8) to wave 1 and wave 2 only. Additional controls (with coefficients not displayed) include parental education, an indicator for whether ther child is female, indicators for age 9, 10, or 11 years of age, whether the child is a first child, household size, and indicators for missing consumption, parental education, or first child status. Includes district and wave fixed effects. Includes appropriate sampling weights. Standard errors clustered by village/neighborhood.

Table A3: Correlates of Parental Beliefs: Gender and Birth Order

	Believe above average		Believe below average	
	(1)	(2)	(3)	(4)
Log consumption	0.0407***	0.0345***	-0.0393***	-0.0480***
	(0.008)	(0.009)	(0.010)	(0.010)
Log consumption × Child female	0.00759		-0.00753	
	(0.011)		(0.012)	
Log consumption × First child		0.0238**		0.0138
		(0.011)		(0.012)
Sample	Full	Full	Full	Full
Fixed Effects	District	District	District	District
Mean for Average Child	0.120	0.120	0.150	0.150
R-squared	0.110	0.109	0.165	0.165
Observations	22726	22726	22726	22726

All controls fully interacted with either gender group (in columns (1) and (3)) or first child status (in columns (2) and (4)). Additional controls (with coefficients not displayed) include indicators for age 9, 10, or 11 years of age, whether the child is a first child, household size, and indicators for missing consumption, parental education, or first child status. Includes district and wave fixed effects. Includes appropriate sampling weights. Standard errors clustered by village/neighborhood.

Table A4: Beliefs and District Mobility and Poverty: Gender Interactions

	Believe above average		Believe below average	
	District char: High mobility	District char: Low poverty	District char: Low mobility	District char: High poverty
	(1)	(2)	(3)	(4)
Child female	.00454	-.00313	.000657	-.00418
	(.009)	(.007)	(.008)	(.009)
District characteristic	.00305	-.0145	.0385***	.0525***
	(.012)	(.010)	(.014)	(.012)
Child female × District characteristic	.0144	.0380***	.0257	.0336**
	(.014)	(.012)	(.016)	(.014)
Fixed Effects	State	State	State	State
Pvalue Female + Dist Char * Female = 0	.0642	.000971	.0615	.00819
Observations	22726	22726	22726	22726

Additional controls (with coefficients not displayed) include indicators for age 9, 10, or 11 years of age, whether the child is a first child, household size, and indicators for missing consumption, parental education, or first child status. Includes district and wave fixed effects. Includes appropriate sampling weights. Standard errors clustered by village/neighborhood.

Table A5: Robustness to Inclusion of Investment Controls

	Believe above average		Believe below average	
	(1)	(2)	(3)	(4)
Log household consumption	0.0438***	0.0255***	-0.0428***	-0.0206**
	(0.007)	(0.007)	(0.008)	(0.008)
SCST	-0.0204***	-0.0156**	0.0181**	0.0121
	(0.006)	(0.006)	(0.009)	(0.008)
Annual log educational spending		0.0176***		-0.0302***
		(0.004)		(0.005)
Weekly hours educational time		0.000367		-0.000771**
		(0.000)		(0.000)
Any tutoring		0.0279**		0.0212*
		(0.011)		(0.011)
Attends private school		0.0259***		-0.00912
		(0.009)		(0.010)
Days absent last 30 days		0.000151		0.00389***
		(0.001)		(0.001)
Sample	Full	Full	Full	Full
Fixed Effects	District	District	District	District
Includes Investment Controls	No	Yes	No	Yes
Mean for Average Child	0.120	0.120	0.150	0.150
R-squared	0.109	0.117	0.164	0.179
Observations	22726	22726	22726	22726

Columns (2) and (4) include current educational investment controls as displayed (including annual educational spending, hours educational activities each week, whether the child receives any tutoring, whether the child attends private school, and the number of days absent over the past 30 days.) All regressions additionally include indicators for age 9, 10, or 11 years of age, whether the child is a first child, household size, and indicators for missing consumption, parental education, or first child status (coefficients not displayed). Includes district and wave fixed effects. Includes appropriate sampling weights. Standard errors clustered by village/neighborhood.

Table A6: Rainfall and Investments

	Annual spending (%) (1)	Weekly minutes educational activities (2)	Any tutoring (3)	Attends private school (4)	Absence last 30 days (5)
Positive rainshock	0.771	217.6**	-0.0206	0.00419	0.488
	(1.434)	(87.622)	(0.038)	(0.036)	(0.890)
Negative rainshock	-0.198	-66.32	0.0171	0.00590	-0.399
	(1.369)	(91.517)	(0.038)	(0.041)	(1.095)
Sample					
Fixed Effects	HH	HH	HH	HH	HH
Mean for Average Child	10.69	2378.7	0.148	0.291	4.604
R-squared	0.602	0.622	0.681	0.713	0.537
Observations	3221	2987	3026	3236	3181

Includes the same set of controls as per the main specification. These include log household consumption, urban status, caste, parental education, an indicator for whether the child is female, indicators for age 9, 10, or 11 years of age, whether the child is a first child, household size, and indicators for missing consumption, parental education, or first child status. Includes district and rainfall year fixed effects. Includes appropriate sampling weights. Standard errors clustered by village/neighborhood.

Table A7: Urban Mover Sample Balance

	(1) Moved urban: Full sample	(2) Moved urban 0-3 years ago	(3) Moved urban 0-5 years ago	(4) Moved urban 0-10 years ago	(5) Pvalue difference 0-3 to 3+	(6) Pvalue difference 0-5 to 5+	(7) Pvalue difference 0-10 to 10+
Composite level	0.681	0.689	0.686	0.694	0.716	0.733	0.176
	(0.278)	(0.286)	(0.287)	(0.279)			
Female	0.477	0.506	0.488	0.491	0.436	0.696	0.432
	(0.500)	(0.501)	(0.501)	(0.500)			
Consumption	13108.2	13397.3	12745.8	13038.0	0.694	0.502	0.837
	(9871.9)	(8253.7)	(8134.4)	(9077.0)			
Parental education	7.229	8.298	7.683	7.417	0.002	0.070	0.236
	(4.591)	(4.376)	(4.636)	(4.651)			
SCST	0.230	0.127	0.188	0.200	0.001	0.067	0.035
	(0.421)	(0.333)	(0.392)	(0.400)			
Wave 2	0.415	0.0723	0.122	0.227	0.000	0.000	0.000
	(0.493)	(0.260)	(0.328)	(0.419)			
N	2010	166	287	591			

Sample restricted to urban movers (households who reported originating in a rural location and currently reside in an urban location), for moves within the last 50 years.

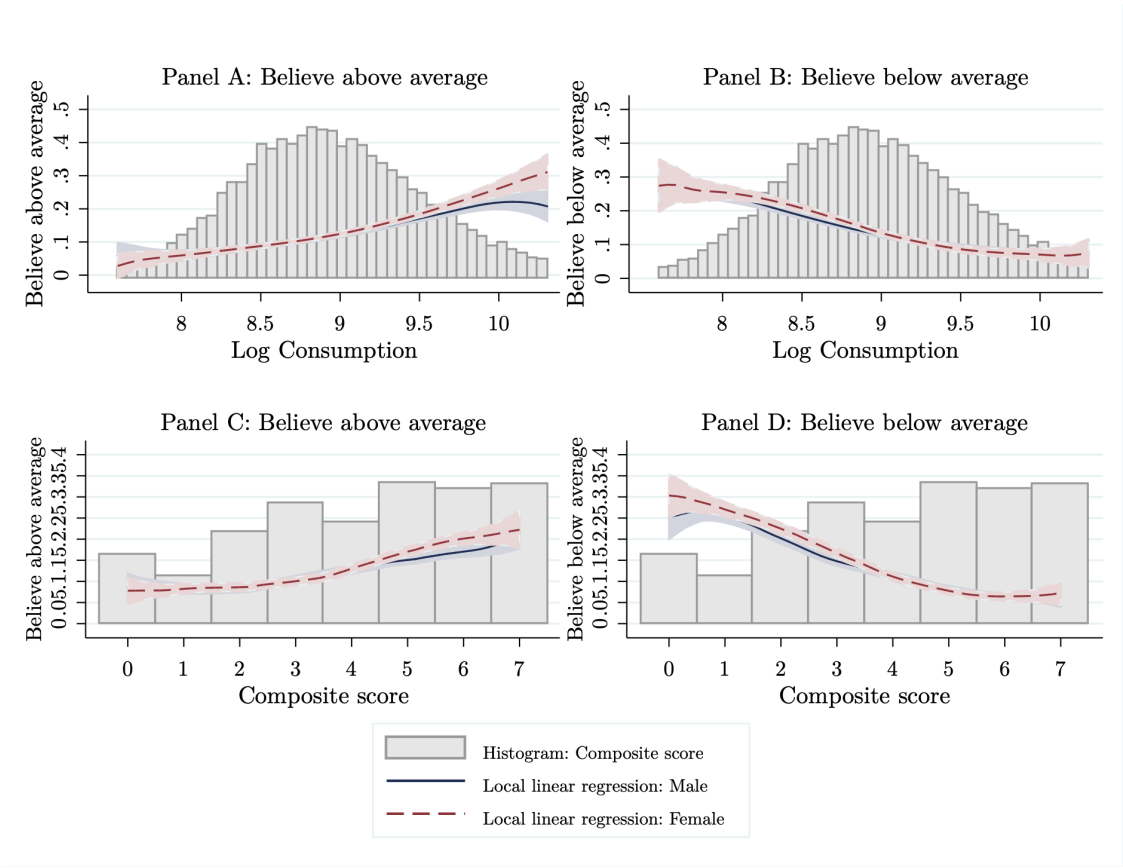

Figure A1: Parental Beliefs over Consumption and Performance by Gender

Note: This figure shows local linear regressions of parental beliefs on household consumption, separately for male and female children in panels A and B (defining high consumption households as those with above median household consumption) of parental beliefs on performance, separately for male and female children in panels C and D. The lightly shaded areas represent 95% confidence intervals. Local linear regressions in panels C and D use scores normalized while respect to children of the same age in the same district and sector, while the histogram depicts the distribution of raw composite scores. Data are from the Indian Human Development Survey (IHDS).

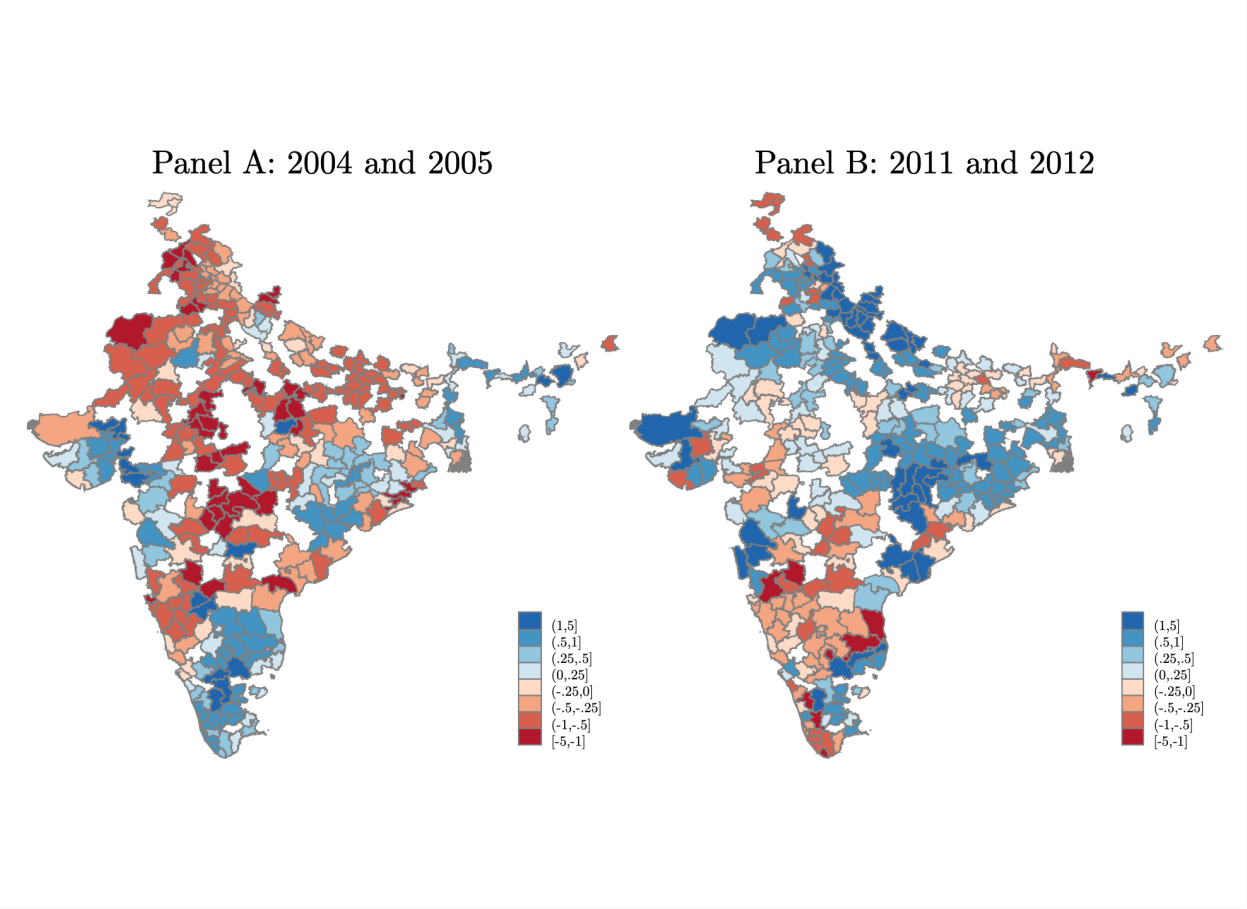

Figure A2: Distribution of Normalized Rainfall Deviations

Note: This figure shows how rainfall deviations in rainfall years corresponding to 2004-2005 and 2011-2012 varies across districts observed in the IHDS data. Normalized deviations are measured as deviations of recent rainfall from historical averages divided by the standard deviation of historical rainfall. Data are from the Center for Climatic Research at the University of Delaware.

Appendix B

Chapter 2 Appendix Tables and Figures

Table B1: Parental Beliefs Questions (Primary Caregiver Module)

1	Is/was ... an average student, better than average, or below average? (If child has never been enrolled in school: Is ... average, better than average, or below average in terms of their learning and development?) Options: Below average, average, above average
2a	Now please think about other children of the same age in neighborhoods similar to your neighborhood in all of your county. How does your child's ability in math/reading/overall compare to other children of the same age in similar neighborhoods in your county?
2b	Now think about other children of the same age in all of your neighborhood. How does your child's academic ability in math/reading/overall compare to other children of the same age in your neighborhood?
2c	Please think about other children of the same age in neighborhoods similar to your neighborhood in all of your county in households with a similar financial situation as your household. How does your child's ability in math/reading/overall compare to other children of the same age in households with a similar financial situation in similar neighborhoods in your county?
2d	Compared to other children in your child's class, how well do you think your child is doing in school in math, reading, and overall? Do you think he/she is doing: Options: Much worse, a little worse, about the same, a little better, much better
3	When it comes time for your child to take the KCPE/PLE, he/she will receive a total score across all subjects. Please take a moment to think about how your child will perform when he/she takes the exam in the future based on what you know about his/her ability. Now think about how other children of the same age in neighborhoods similar to your neighborhood in all of your county will perform. How do you think your child will score compared to other children of the same age in similar neighborhoods in your county? Options: Much worse, a little worse, about the same, a little better, much better
4	Out of a minimum of 0 and a maximum of 500, what score do you think your child will most likely earn based on his/her ability? (For respondents in Uganda, out of a minimum of 0 and a maximum of 34 points, what score do you think your child will most likely earn in the PLE based on his/her ability?) Please make your best guess.
	Please indicate your level of agreement with the following:
5a	I feel confident that I understand my child's ability.
5b	I feel confident that I know how my child's ability compares to other children of the same age in my county.
5c	I receive information about my child's general abilities or how my child does in school from teachers, school representatives, or other adults in my community.
5d	My choices, actions, and effort as a parent/caregiver will determine how my child will do in school and in life. Options: Agree very strongly with A, agree with A, agree with B, agree very strongly with B, agree with neither
6	Please tell me which statement is closest to your view. Please choose Statement A or B. A. My child's ability and effort will determine how well he/she will do in school and life. B. External factors such as the quality of my child's school will determine how well he/she will do in school and in life.

Table B2: Robustness

	Raw beliefs		Raw future beliefs		Future beliefs relative to current	
	Believe above average	Believe below average	Expected KCPE score	Will do much better on KCPE	Will fall back relative to peers	Will advance relative to peers
Panel A: Main Specification	(1)	(2)	(3)	(4)	(5)	(6)
High earnings	-0.00127	0.0113	8.458**	0.0520*	-0.0460***	0.0344
	(0.024)	(0.016)	(3.319)	(0.029)	(0.015)	(0.029)
Composite z-score	0.0557***	-0.0383***	11.21***	0.0780***	-0.00548	-0.00309
	(0.011)	(0.008)	(1.311)	(0.012)	(0.007)	(0.013)
Panel B: Consumption	(1)	(2)	(3)	(4)	(5)	(6)
High consumption	-0.0361	0.0189	0.743	0.0307	-0.0465***	0.0779***
	(0.025)	(0.016)	(3.363)	(0.031)	(0.017)	(0.030)
Composite z-score	0.0567***	-0.0386***	11.44***	0.0787***	-0.00527	-0.00502
	(0.011)	(0.008)	(1.315)	(0.012)	(0.007)	(0.013)
Panel C: Alternate composite scores	(1)	(2)	(3)	(4)	(5)	(6)
High earnings	-0.00150	0.0111	8.505**	0.0519*	-0.0462***	0.0343
	(0.024)	(0.016)	(3.331)	(0.029)	(0.015)	(0.029)
Alternate composite z-score	0.0592***	-0.0384***	11.37***	0.0806***	-0.00441	-0.00268
	(0.012)	(0.008)	(1.378)	(0.013)	(0.007)	(0.014)
Panel D: Urban status control	(1)	(2)	(3)	(4)	(5)	(6)
High earnings	-0.0159	0.0437*	3.484	0.0528	-0.0689***	0.0150
	(0.034)	(0.024)	(4.577)	(0.042)	(0.026)	(0.040)
Composite z-score	0.0482***	-0.0321***	11.80***	0.0749***	0.00245	0.00930
	(0.016)	(0.011)	(1.744)	(0.018)	(0.009)	(0.017)
Observations	2388	2388	2272	2236	2136	2136

Controls in panel A includes the usual set of controls described in Table 1. Controls in panel B include log consumption instead of log earnings. Controls in panel C include composite z-scores normalized relative to all children of the same age in all of Kenya. Panel D includes an urban status indicator instead of county fixed effects. Includes appropriate weights to ensure representativeness of the original population. Standard errors clustered by parent.

Table B3: Parental Beliefs and Investments

	Time-related investments (hours spent in last 24 hours)				Schooling-related investments (for children of school-going age)		
	Education	Unstructured activities	Productive activities & chores	Other activities	Currently enrolled	Attended last week	Schooling cost last month
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Believe above average	-0.163	0.0946	-0.0206	0.0576	-0.0164	-0.000707	140.2
	(0.153)	(0.150)	(0.052)	(0.185)	(0.010)	(0.014)	(139.494)
Believe below average	-0.806***	0.380	-0.108	-0.470**	-0.0476*	-0.0309	-124.9*
	(0.225)	(0.233)	(0.097)	(0.228)	(0.025)	(0.029)	(66.130)
Composite z-score	0.512***	0.122*	0.0469**	0.0462	0.0273***	0.0310***	179.2***
	(0.070)	(0.070)	(0.023)	(0.064)	(0.006)	(0.008)	(44.369)
Mean for Below Avg	5.662	5.096	0.691	1.514	0.877	0.841	405.9
Mean for Average	6.449	5.452	0.810	1.843	0.982	0.948	767.1
Mean for Above Avg	7.464	5.594	0.935	1.851	0.995	0.965	1300.4
Overall Mean	6.504	5.428	0.814	1.802	0.971	0.937	803.6
R-squared	0.364	0.0835	0.163	0.0419	0.0725	0.0621	0.140
Observations	2388	2388	2388	2388	1706	1706	1706

Controls include an indicator for high earnings (above median) household, highest level of education among adults in the household, number of children in the household, normalized composite z-score, indicators for age 4, 5, 6, 7, or 8, whether the child is female, whether the child is a first child, whether the parent surveyed is the KLPS respondent, indicators for missing earnings, education, number of children in the household, age, or first child status, and county fixed effects. Composite z-scores are normalized relative to all children of the same age within the same county. Includes appropriate weights to ensure representativeness of the original population. Standard errors clustered by parent.

Table B4: Summary of Parental Mental Health and Psychology

	Overall mean (1)	High earnings mean (2)	Low earnings mean (3)	P-value difference (4)
Self efficacy (10 to 40)	33.78	34.56	33.20	0.000
	[5.117]	[4.427]	[5.451]	
	1136	451	569	
Perceived status (1 to 10)	4.485	4.672	4.398	0.060
	[2.290]	[2.001]	[2.537]	
	1140	454	571	
Aspired future status (1 to 10)	9.109	9.302	8.939	0.000
	[1.413]	[1.164]	[1.543]	
	1140	454	571	
Depression (0 to 30)	7.919	7.234	8.456	0.000
	[5.559]	[5.379]	[5.539]	
	1843	753	872	
Depressed (10+)	0.358	0.324	0.392	0.004
	[0.479]	[0.468]	[0.489]	
	1843	753	872	
Stress (0 to 16)	7.172	6.738	7.438	0.000
	[3.182]	[3.104]	[3.212]	
	1150	455	575	
Fatalism (1 to 10)	4.416	4.099	4.611	0.030
	[3.764]	[3.643]	[3.836]	
	1141	454	571	

This table presents means for each of the parental traits of interest for the full sample (in column 1), among high earnings households (in column 2), and among low earnings households (in column 3). Standard deviations are reported in brackets with observation counts below. P-values from a simple test of equality of means are in columns 4.

Table B5: Correlates of Parental Beliefs: Parental Mental Health and Psychology

	Raw current beliefs		Raw future beliefs		Future beliefs relative to current	
	Believe above average	Believe below average	Expected KCPE score	Will do much better on KCPE	Will fall back relative to peers	Will advance relative to peers
Panel A: Child Controls	(1)	(2)	(3)	(4)	(5)	(6)
Self-efficacy (10 to 40)	0.00576**	-0.00527**	0.740*	0.0126***	-0.00290	0.00405
	(0.002)	(0.002)	(0.394)	(0.003)	(0.002)	(0.003)
Perceived relative status (1 to 10)	0.00679	-0.00715*	0.671	0.0275***	0.00310	0.00501
	(0.006)	(0.004)	(0.847)	(0.007)	(0.005)	(0.007)
Aspired future status (1 to 10)	0.00926	-0.0134*	1.628	0.0411***	-0.00846	0.00775
	(0.010)	(0.007)	(1.508)	(0.011)	(0.007)	(0.012)
Depression (0 to 30)	0.00202	0.00184	-0.958***	-0.00627***	0.00319**	-0.00497**
	(0.002)	(0.001)	(0.266)	(0.002)	(0.001)	(0.002)
Stress (0 to 16)	0.000109	0.00340	-0.236	-0.0149***	0.00402	-0.00486
	(0.004)	(0.003)	(0.596)	(0.005)	(0.003)	(0.005)
Fatalism (1 to 10)	0.00363	0.00288	-1.079**	-0.00480	0.00281	0.00388
	(0.004)	(0.002)	(0.503)	(0.004)	(0.003)	(0.004)
Panel B: Full Controls	(1)	(2)	(3)	(4)	(5)	(6)
Self-efficacy (10 to 40)	0.00506**	-0.00478**	0.475	0.0113***	-0.00275	0.00461
	(0.002)	(0.002)	(0.380)	(0.003)	(0.002)	(0.003)
Perceived relative status (1 to 10)	0.00612	-0.00650	0.507	0.0264***	0.00325	0.00800
	(0.006)	(0.004)	(0.858)	(0.007)	(0.005)	(0.007)
Aspired future status (1 to 10)	0.00898	-0.0125*	0.00195	0.0365***	-0.00466	0.00969
	(0.010)	(0.007)	(1.468)	(0.011)	(0.007)	(0.012)
Depression (0 to 30)	0.00221	0.000502	-0.325	-0.00536**	0.00262**	-0.00592**
	(0.002)	(0.001)	(0.260)	(0.002)	(0.001)	(0.002)
Stress (0 to 16)	0.000646	0.00249	-0.161	-0.0123**	0.00386	-0.00458
	(0.004)	(0.003)	(0.583)	(0.005)	(0.003)	(0.005)
Fatalism (1 to 10)	0.00436	0.00139	-0.838*	-0.00333	0.00251	0.00270
	(0.004)	(0.002)	(0.485)	(0.005)	(0.003)	(0.004)
Mean for Average Child	0.255	0.0869	342.4	0.457	0.0854	0.525
Observations (Depression)	2388	2388	2272	2236	2136	2136
Observations (Others)	1461	1461	1389	1371	1306	1306

Each row represents a separate regression of the dependent variable on the parent characteristic listed in the row (with the corresponding coefficient displayed) plus all controls (coefficients not displayed). All parent characteristics are in raw terms, with appropriate scale ranges as indicated. Controls in panel A include normalized composite z-score and indicators for age 4, 5, 6, 7, or 8, whether the child is female, and whether the child is a first child. Controls in panel B include the usual controls described in Table 1. Includes appropriate weights to ensure representativeness of the original population. Standard errors clustered by parent.

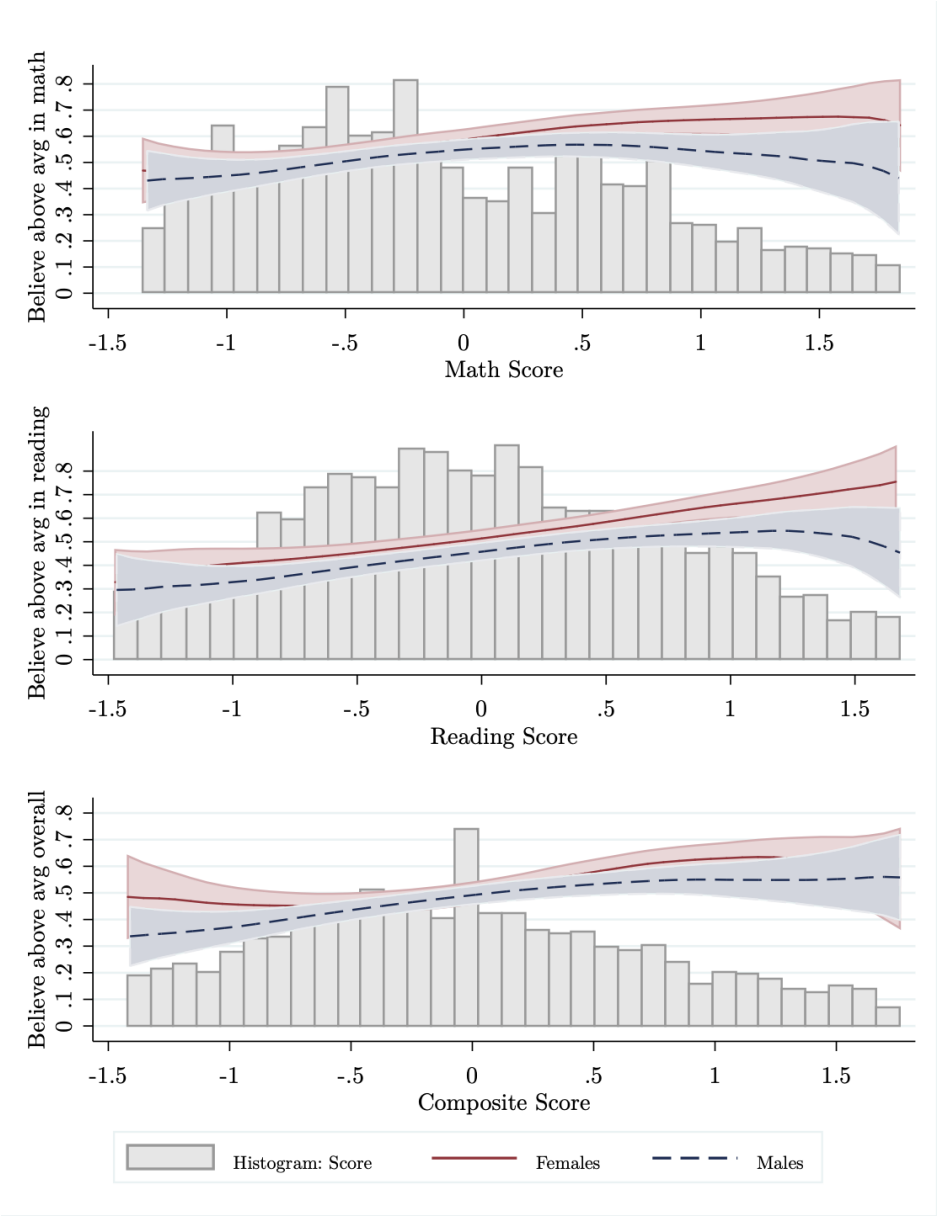

Figure B1: Domain-specific beliefs and gender

Note: This figure shows local linear regressions of domain-specific parental beliefs (using the version of the question where parents are asked to compare their child to children in similar neighborhoods in each of math, reading and overall) on math, reading, and composite scores, separately for male and female children. The lightly shaded areas represent 95% confidence intervals. Data are from the Kenya Life Panel Survey (KLPS).

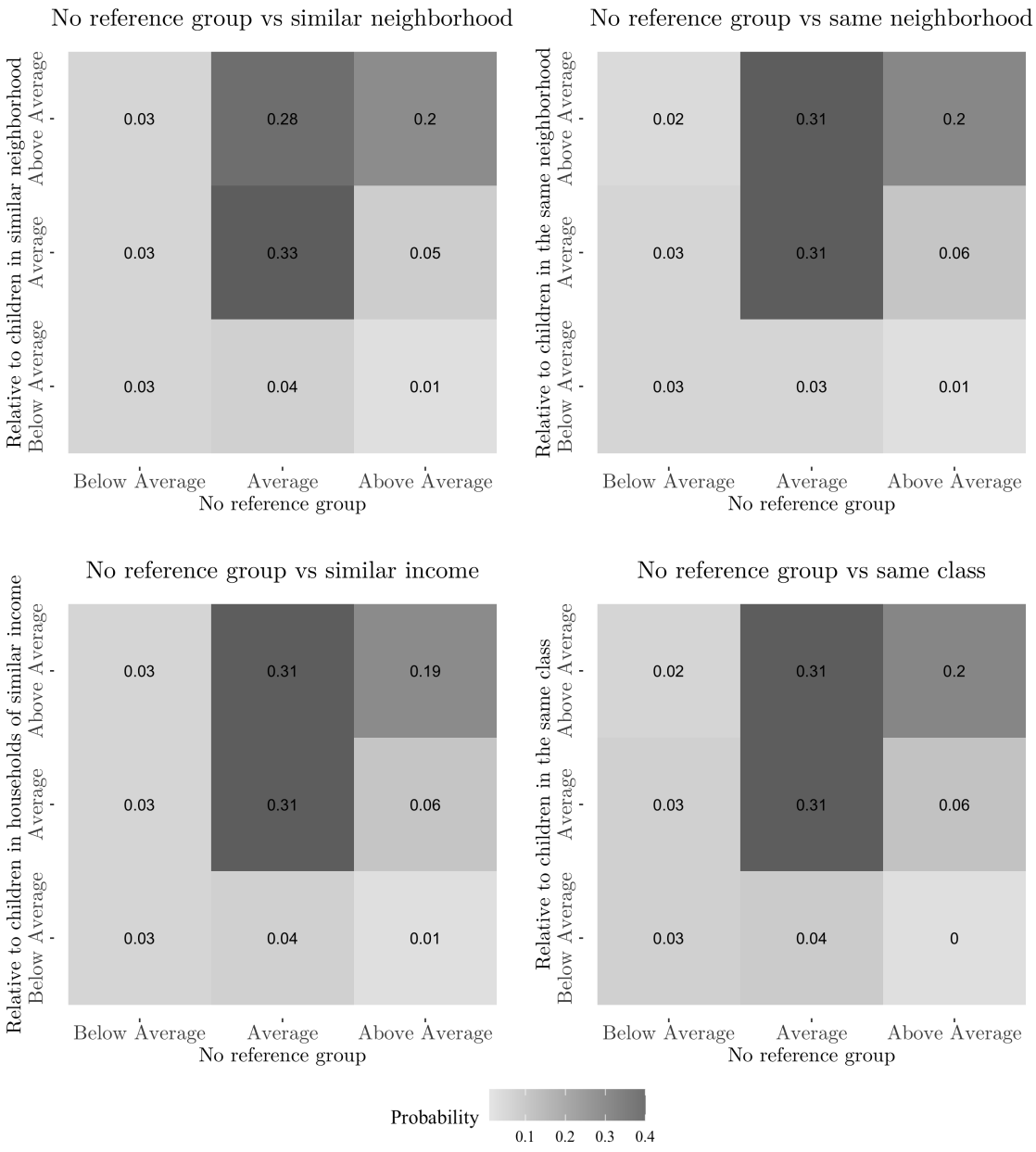

Figure B2: Beliefs responses across no reference group specified vs specified reference group (alternate grouping)

Note: This figure compares responses across the no reference group question ("is your child an average student, better than average, or below average") and each of the specific reference group questions ("how does your child's overall ability compare to other children of the same age in ... ?") using the alternate response grouping. Responses to the latter are recoded according to the preferred grouping, where responding "much worse" and "a little worse" are classified as equivalent to "below average" on the first no reference group question, responding "about the same" is classified as equivalent to "average", and responding "a little better" or "much better" is classified as equivalent to "above average." Numbers and shading represent the probability of responding in the equivalent categories across the two questions. Data are from the Kenya Life Panel Survey (KLPS).

Appendix C

Chapter 3 Appendix Tables and Figures

Table C1: Parental Beliefs by Domain, Gender, and Family Structure: Base Year Sample

	Overall		Math		Reading	
	Females	Males	Females	Males	Females	Males
Panel A: All Siblings	(1)	(2)	(3)	(4)	(5)	(6)
Any opposite sex sibling: Above	0.0186**	0.00492	0.0162	0.0209	0.0243*	0.00568
	(0.009)	(0.009)	(0.013)	(0.013)	(0.012)	(0.013)
Any opposite sex sibling: Below	0.000649	0.00651	0.00253	-0.00490	0.00224	-0.00514
	(0.005)	(0.006)	(0.008)	(0.007)	(0.008)	(0.010)
Observations	16523	17017	10510	10932	10510	10932
Panel B: Younger Siblings Only	(1)	(2)	(3)	(4)	(5)	(6)
Opposite sex older sibling: Above	0.0290**	0.0153	0.00469	0.0286*	0.0214	0.0232
	(0.012)	(0.011)	(0.016)	(0.017)	(0.015)	(0.017)
Opposite sex older sibling: Below	-0.00405	0.00188	0.00798	-0.0196**	-0.0000846	-0.0112
	(0.007)	(0.008)	(0.010)	(0.009)	(0.010)	(0.013)
Observations	10922	11301	6740	7035	6740	7035
Panel C: Older Siblings Only	(1)	(2)	(3)	(4)	(5)	(6)
Opposite sex younger sibling: Above	0.00977	0.00840	0.0276	0.0226	0.0228	-0.00686
	(0.013)	(0.013)	(0.017)	(0.017)	(0.017)	(0.018)
Opposite sex younger sibling: Below	-0.0158*	0.00530	-0.00207	0.0117	0.000310	0.00735
	(0.008)	(0.009)	(0.010)	(0.009)	(0.011)	(0.012)
Observations	9123	9373	6065	6285	6065	6285
Panel D: Oldest Siblings Only	(1)	(2)	(3)	(4)	(5)	(6)
Opposite sex next born: Above	0.0166	-0.0158	0.0271	0.0130	0.0105	-0.0138
	(0.018)	(0.018)	(0.024)	(0.023)	(0.024)	(0.025)
Opposite sex next born: Below	-0.0132	-0.000415	0.00968	-0.00408	0.00420	-0.0130
	(0.010)	(0.010)	(0.014)	(0.011)	(0.013)	(0.016)
Sample	Grades K, 1, 3	Grades K, 1, 3	Grades 1, 3	Grades 1, 3	Grades 1, 3	Grades 1, 3
Fixed Effects	School	School	School	School	School	School
Observations	5601	5716	3770	3897	3770	3897

The first row in each panel displays coefficients on the independent variable indicated (type of opposite sex sibling) for regressions where the dependent variable is believe above average. The second row in each panel displays coefficients on the independent variable indicated (type of opposite sex sibling) for regressions where the dependent variable is believe below average. Panel A includes children with at least one sibling of any kind (older or younger). Panel B restricts to children with at least one older sibling. Panel C restricts to children with at least one younger sibling. Panel D restricts to oldest children with at least one younger sibling. All regressions include children with test scores and parental beliefs available in at least first grade. Includes the usual controls described in Table 1, aside from first born status and female. Standard errors clustered by child. Includes appropriate weights.

Table C2: Parental Beliefs by Domain, Gender, and Family Structure: Panel Sample

	Overall		Math		Reading	
	Females	Males	Females	Males	Females	Males
Panel A: All Siblings	(1)	(2)	(3)	(4)	(5)	(6)
Any opposite sex sibling: Above	0.00469	0.0146	0.0194	0.0263*	0.0285**	-0.00257
	(0.012)	(0.011)	(0.015)	(0.014)	(0.013)	(0.014)
Any opposite sex sibling: Below	0.0000575	0.00798	-0.00777	0.00105	0.00205	-0.00175
	(0.006)	(0.007)	(0.008)	(0.008)	(0.009)	(0.010)
Observations	12299	12606	9208	9518	9208	9518
Panel B: Younger Siblings Only	(1)	(2)	(3)	(4)	(5)	(6)
Opposite sex older sibling: Above	0.0144	0.0191	0.00565	0.0366*	0.0133	0.0179
	(0.014)	(0.014)	(0.018)	(0.019)	(0.017)	(0.018)
Opposite sex older sibling: Below	0.000488	0.00430	-0.00110	-0.0161	-0.00136	-0.0100
	(0.008)	(0.010)	(0.010)	(0.010)	(0.012)	(0.014)
Observations	8163	8328	5971	6154	5971	6154
Panel C: Older Siblings Only	(1)	(2)	(3)	(4)	(5)	(6)
Opposite sex younger sibling: Above	0.00384	0.00749	0.0255	0.0172	0.0257	-0.0228
	(0.016)	(0.016)	(0.019)	(0.019)	(0.019)	(0.020)
Opposite sex younger sibling: Below	-0.0131	0.00675	-0.0117	0.0166*	-0.0103	0.00642
	(0.010)	(0.010)	(0.011)	(0.010)	(0.012)	(0.012)
Observations	6742	6944	5230	5436	5230	5436
Panel D: Oldest Siblings Only	(1)	(2)	(3)	(4)	(5)	(6)
Opposite sex next born: Above	0.0219	-0.0163	0.0289	0.00555	0.0387	-0.0347
	(0.021)	(0.023)	(0.028)	(0.026)	(0.027)	(0.028)
Opposite sex next born: Below	-0.0180	-0.000791	-0.0162	0.00490	0.00449	-0.0156
	(0.011)	(0.012)	(0.015)	(0.012)	(0.016)	(0.018)
Sample	Grades K, 1, 3	Grades K, 1, 3	Grades 1, 3	Grades 1, 3	Grades 1, 3	Grades 1, 3
Fixed Effects	School	School	School	School	School	School
Observations	4133	4278	3235	3364	3235	3364

The first row in each panel displays coefficients on the independent variable indicated (type of opposite sex sibling) for regressions where the dependent variable is believe above average. The second row in each panel displays coefficients on the independent variable indicated (type of opposite sex sibling) for regressions where the dependent variable is believe below average. Panel A includes children with at least one sibling of any kind (older or younger). Panel B restricts to children with at least one older sibling. Panel C restricts to children with at least one younger sibling. Panel D restricts to oldest children with at least one younger sibling. All regressions include children with test scores and parental beliefs available in both first grade and third grade. Includes the usual controls described in Table 1, aside from first born status and female. Standard errors clustered by child. Includes appropriate weights.

Table C3: Parental Beliefs by Domain, Gender, and Family Structure: Unweighted

	Overall		Math		Reading	
	Females	Males	Females	Males	Females	Males
Panel A: All Siblings	(1)	(2)	(3)	(4)	(5)	(6)
Any opposite sex sibling: Above	0.0227***	0.0120	0.0125	0.0120	0.0204*	0.00400
	(0.009)	(0.008)	(0.011)	(0.011)	(0.011)	(0.011)
Any opposite sex sibling: Below	0.0000339	0.00604	-0.00346	-0.00341	0.00281	-0.00383
	(0.005)	(0.005)	(0.006)	(0.005)	(0.007)	(0.007)
Observations	17991	18723	11003	11543	10893	11400
Panel B: Younger Siblings Only	(1)	(2)	(3)	(4)	(5)	(6)
Opposite sex older sibling: Above	0.0297***	0.0127	0.000371	0.0188	0.0111	0.00942
	(0.010)	(0.010)	(0.014)	(0.014)	(0.014)	(0.013)
Opposite sex older sibling: Below	-0.00634	0.00157	0.00759	-0.0169**	0.000713	-0.00611
	(0.006)	(0.007)	(0.008)	(0.007)	(0.009)	(0.010)
Observations	11898	12449	7053	7441	6989	7344
Panel C: Older Siblings Only	(1)	(2)	(3)	(4)	(5)	(6)
Opposite sex younger sibling: Above	0.0170	0.0176	0.0246*	0.0135	0.0244	0.00862
	(0.011)	(0.011)	(0.015)	(0.015)	(0.016)	(0.015)
Opposite sex younger sibling: Below	-0.0103	0.00344	-0.00854	0.0122	0.00158	0.00115
	(0.007)	(0.007)	(0.008)	(0.008)	(0.009)	(0.010)
Observations	9980	10326	6382	6650	6308	6561
Panel D: Oldest Siblings Only	(1)	(2)	(3)	(4)	(5)	(6)
Opposite sex next born: Above	0.0291*	0.00687	0.0377*	0.00248	0.0182	-0.0110
	(0.016)	(0.015)	(0.020)	(0.021)	(0.021)	(0.021)
Opposite sex next born: Below	-0.0127	0.00309	-0.00863	-0.00464	-0.000262	-0.00334
	(0.008)	(0.009)	(0.011)	(0.009)	(0.012)	(0.013)
Sample	Grades K, 1, 3	Grades K, 1, 3	Grades 1, 3	Grades 1, 3	Grades 1, 3	Grades 1, 3
Fixed Effects	School	School	School	School	School	School
Observations	6093	6274	3950	4102	3904	4056

The first row in each panel displays coefficients on the independent variable indicated (type of opposite sex sibling) for regressions where the dependent variable is believe above average. The second row in each panel displays coefficients on the independent variable indicated (type of opposite sex sibling) for regressions where the dependent variable is believe below average. Panel A includes children with at least one sibling of any kind (older or younger). Panel B restricts to children with at least one older sibling. Panel C restricts to children with at least one younger sibling. Panel D restricts to oldest children with at least one younger sibling. All regressions include children with test scores and parental beliefs available in first grade and/or third grade. Includes the usual controls described in Table 1, aside from first born status and female. Standard errors clustered by child.