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ABSTRACT

Reversal of Gender Gaps in Child Development: Evidence from Young Children in India

This paper provides unique evidence of a reversal of gender gaps in cognitive development in early childhood. We find steep caste and gender gradients and few substantive changes once children enter school. The gender gap, however, reverses its sign for the upper caste, with girls performing better than boys at age 5 but thereafter following the general pattern in India of boys performing better.

JEL Classification: I2, J1, J7

Keywords: cognitive skills, India, gender, caste inequality, children, Oaxaca

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I. Introduction

Early disparities in child development are a concern for at least two reasons. First, low levels of development at early ages make it difficult for children with early delays to accumulate skills later in life (Cunha & Heckman, 2007). As Cunha and Heckman argue, “capabilities beget capabilities.” Second, because children in poor households are more likely to exhibit delays early in life, inadequate levels of cognitive development are one way in which poverty is transmitted across generations. This transmission is of particular concern in societies in which inequality is high.

India has a long history of socioeconomic inequalities related to households belonging to a certain caste. Gang et al. (2008) found that differences in educational attainment explain about 25% of the poverty gap between the historically disadvantaged scheduled caste and scheduled tribe (the so-called lower caste [LC]) and non-scheduled Hindu households (upper caste [UC]). For this reason, the Indian government recently introduced policy interventions targeting the LC. Moreover, as the gender education gap in the majority of developing countries is falling, that gap is still rising in India (Ganguli et al., 2011).

This paper presents evidence on the age patterns of a measure of cognitive development for Indian children 5 to 12 years of age by caste and gender. Given the strong associations between child development and later outcomes, research describing the characteristics of children with deficits before they enter school and tracing the evolution of these children as they age is important.

To our knowledge, only a handful of earlier studies seek to measure socioeconomic differences in early childhood in developing countries using panel data. Longitudinal studies

from Ecuador and Peru show substantial differences in cognitive development between children of higher and lower socioeconomic status (Schady et al., 2014). Other studies use single cross sections of data from low-income countries (Fernald et al., 2011).

For India, recent research using nationally representative data documents the persistence of gender, caste, and religion gaps in school participation and attainment (Asadullah et al., 2013). Even the later years of liberalization have not been accompanied by a complete closure of social gaps in schooling (Desai and Kulkarni, 2008). However, most such research focuses on primary, secondary, and tertiary education. Self and Grabowski (2011) use a cross section of household survey data from Uttar Pradesh and Bihar in India and show no evidence of gender bias in participation in early childhood education programs. However, they do find evidence of consistent gender bias among poor households in the sample.

Our paper substantially extends earlier work on caste and gender gaps. We highlight three important contributions not addressed before due to the lack of appropriate data. First, we present results by both caste and gender. This approach allows us to better understand the dynamics of skill formation for different groups. The literature has so far focused only on either caste or gender. Second, we exploit the distinctive longitudinal structure of the data to analyze how deficits in receptive language ability observed at young ages evolve as children enter the early school years in a developing country. We also explore what part of the gap is due to discrimination and what part can be attributed to observable characteristics by means of a Oaxaca-Blinder decomposition. Our main finding of a reversal in the gender gap is possible because the nature of the data allows us to observe children's test scores at age 5, before they

enter formal school ¹. We also use another cohort of children to extrapolate our findings to children as they enter secondary school, which provides a picture of disparities by caste and gender over the first 12 years of life. Third, our research indicates that (unobserved) differential investments occur even before the enrollment decisions are made, while some of the existing literature has generally posited that gender bias in educational resource allocation manifests itself in Indian households via non-enrollment of girls (Kingdon, 2005). Our findings support early literature on the topic (Kishor, 1993).

II. Data and Methods

The data are from the longitudinal Indian survey of the Young Lives (YL) project². Beginning in 2002, YL surveyed approximately 3,000 children (in two cohorts, younger and older) from the Indian state of Andhra Pradesh. We first examine the younger cohort of children, who were 6 to 18 months of age at the initial survey (Round 1). The subsequent surveys were conducted when the children were age 5 (Round 2) and age 8 (Round 3)³. After stating our main findings, we extrapolate our findings by examining the older cohort of children, who were surveyed at age 12 and given the same cognitive test. The variable used is the Peabody Picture Vocabulary Test (PPVT), an internationally recognized test of vocabulary recognition widely used as a general measure of cognitive development (Dunn et al., 1986).

¹ Primary school in India starts with grade 1 at age 6.

² See <http://www.younglives.org.uk/>.

³ The 162 female UC children and 221 male UC children form a total of 383 UC children in the sample, while 266 female LC children and 304 males LC children constitute a total of 570 LC children in our sample. We follow these 953 children from age 5 to age 8.

We use seven-month moving averages of the internally standardized PPVT and split the sample into two groups of children: those in the UC and those in the LC. We further split the sample by gender.

III. Results

A. Main Findings from Younger Cohort

The upper panel of Figure 1 shows age patterns in the caste gradients in child development, while the middle and bottom panels show these patterns by gender (UC in the left panels and LC in the right panels). The top panel shows that, first, by age 5, the majority of differences between castes are already apparent. The z-scores of the UC children are 0.20 to 0.30 standard deviations (SDs) greater than those of LC children. Second, gradients apparent among 4- to 5-year-old children seem to widen as these children enter the first years of primary school in Round 3 (i.e., the difference between castes increases to 0.50 SD). UC children maintain and even improve their vocabulary throughout primary school, yet LC children's scores seem to be worsening over time.

The left figure in the middle panel of Figure 1 shows UC females have z-scores consistently higher than those of their male counterparts at age 5 years. Conversely, z-scores for 5-year-old LC females are consistently worse than those of LC males.

Finally, the bottom panel in Figure 1 plots the same relation for 8-year-old children. The reversal of the lines in the left figure shows that the UC trend among 5-year-olds, where females performed better than males, is overturned by age 8, and females perform considerably worse than their male counterparts. The z-scores for 90-month-old UC males is

around 0.70 SD larger than the z-scores for females of the same age. This substantial gender gap is consistent for all data points in Round 3. Unlike the gap for UC children, the gender gap for the LC 8-year-olds remains consistent with the one at age 5.

Clearly, the caste gap is greater than the gender gap by age 8, yet the gender gap within each socioeconomic class shows the performance of females is worse, with a smaller disparity in the LC than in the UC. However, the most noteworthy finding in Figure 1 is the changing performance of UC females, which is better than their male counterparts at age 5 but then falls considerably behind by age 8.

B. *Decomposing the Gender Gap*

We now make an attempt to deepen our understanding of the gender gradients by caste by carrying out some basic decompositions in the spirit of Oaxaca (1973) and Blinder (1973). For that, we decompose the boy-girl PPVT gap into explained (in terms of family background, region, schooling and child characteristics) and unexplained components. The Oaxaca decomposition estimates in Table 1 reveal that, for the UC, the PPVT gaps explained by observed characteristics included in our model decreased from a sizable 44.9% at age 5 to a mere 8.7% at age 8. Having said this, 55.1% and 91.3% of the UC PPVT gap at ages 5 and 8, respectively, remain unexplained by our covariates. The latter could be seemingly related to more gender discrimination occurring at age 8, which is consistent with our analysis of Figure 1 (i.e., the reversal of the lines).

Turning to consider the gap in the PPVT for the LC, our decomposition estimates (lower half of Table 1) indicate that the gender disadvantage is largely unexplained by background variables and is therefore suggestive of important within-household discrimination. Our

decomposition results therefore lead us to four conclusions: first, in all five estimations the proportion that is unexplained is larger for the LC than for the UC. Second, in the cross section estimates in columns (1) and (2) we see that the unexplained component is larger at age 8 for both castes, but remarkably so for the UC. Third, the pooled OLS and panel results in columns (3)-(5) show that, as the unexplained component increases, the *difference* between the UC's unexplained component and that of the LC's decreases substantially from the cross section, particularly from the age 5 benchmark (see last line of Table 1). And fourth, even if the magnitude of both effects is similar in the random effects (RE) panel and the pooled OLS estimation, in the fixed effects (FE) model, a higher fraction of the gap is now unexplained among UC children (from 97.9% in the pooled OLS to 103.1% in the FE), while the opposite happens for the LC children (from 139.6% in pooled OLS to 131.4% in FE), indicating that unobserved child fixed effects might explain a small fraction of the boy-girl gap among LC.

In brief, the fact that the unexplained component is larger for the LC indicates that gender discrimination could be an important issue for this caste from the onset in childhood, while for the UC this seems to start only after age 5. On the other hand, the fact that the unexplained component is larger at age 8 for both castes shows that our co-variables explain less of the gap as children age even though we include variables such as schooling access and height for age, indicating that more appropriate data needs to be collected for this age group. Lastly, and by means of the panel estimates, we do not find evidence of unobserved child fixed effects explaining the boy-girl gap in either caste.

In the next subsection, we extrapolate our findings with the older cohort data. In the last subsection we explore two hypotheses that arise as the most powerful ones underlying these trends.

C. Main Findings from the Older Cohort

Figure 2 plots the PPVT z-scores for the older cohort at age 12 by caste (top panel) and gender (middle and bottom panels). The disparity between socioeconomic classes is also apparent among older children. The PPVT z-scores of UC children range from 0.30 to 0.50 SDs higher than those of their LC counterparts.

The middle panel of Figure 2 shows that the z-scores of UC males are considerably higher than those of the females. The bottom panel shows that there appears to be less disparity by gender among LC children than among UC children. Overall, using the same outcome measure, the pro-male gender gap is still present at age 12 for both castes.

Our results are consistent with findings from Kingdon (2005) and Zimmerman (2012), who find that discrimination against girls increases with age. However, our findings are not in line with those of Self and Grabowski (2011), as we also find a gender bias among the UC (richer than the LC).

D. Possible Hypotheses

One hypothesis to explain the reversal of UC trends in Figure 1 is a cohort effect, but the older-cohort findings do not support this. Still, the main hypothesis underlying that reversal is consistent with the findings of recent papers on differential treatment of Indian girls and boys. Barcellos et al. (2012), for example, demonstrate differences in the allocation of mothers' time in Indian households with and without sons. Jayachandran and Kuziemko (2012) identify gender

differences in the duration of breastfeeding of young children. However, our findings suggest a new slant to this literature. First, the differential treatment, at least in terms of cognitive development inputs, starts only *after* age 5 in UC families. Second, even if the Oaxaca decomposition shows that discrimination seems present in both castes, it might have increased more intensely between Rounds 2 and 3 for UC families as 45% of the gap in the PPVT was explained by observable characteristic at age 5, but that figure decreased by around 36 points by age 8. This is a new finding and, as far as we know, there is no evidence on this topic for India.

IV. Concluding Remarks

The Indian government recently introduced policy interventions targeting social groups such as the LC. Some evidence indicates these interventions have been successful. However, no current policy intervention in India is directed at preventing UC girls from continuing to fall behind. Given the results in this paper, policymakers in India should consider this seemingly acute gender bias among upper castes in the design of future social and educational policies, particularly before children enter school. Our Oaxaca decompositions show that most of the gap cannot be explained by observable characteristics and is therefore most likely due to discrimination. Therefore, future research should carefully consider which variables could be good proxies for parental investments. Rich data on caste-specific parental inputs such as time use and allocation of expenditures between boys and girls as they age still needs to be collected.

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Tables

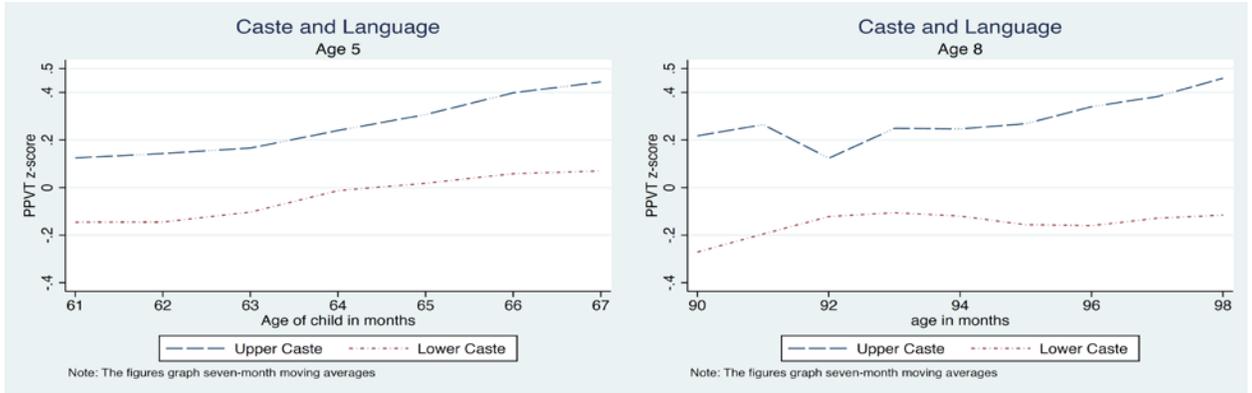
Table 1. DECOMPOSITION OF GENDER PPVT GAPS

	(1)	(2)	(3)	(4)	(5)
	Age 5 OLS	Age 8 OLS	Pooled OLS	Panel FE	Panel RE
Upper caste					
Mean prediction Boy	0.276	0.445	0.362	0.362	0.357
Mean prediction Girl	0.312	0.141	0.213	0.213	0.212
Raw differential Boy-girl	-0.036	0.304	0.149	0.149	0.144
Total unexplained (U)	-0.02	0.278	0.146	0.154	0.141
(% unexplained)	55.1	91.3	97.9	103.1	97.7
Total explained (E)	-0.016	0.026	0.003	-0.005	0.003
(% explained)	44.9	8.7	2.1	-3.1	2.3
Lower caste					
Mean prediction Boy	0.055	-0.083	-0.015	-0.015	-0.015
Mean prediction Girl	-0.12	-0.211	-0.166	-0.167	-0.167
Raw differential Boy-girl	0.175	0.127	0.151	0.151	0.151
Total unexplained (U)	0.243	0.202	0.211	0.199	0.212
(% unexplained)	139.4	158.6	139.6	131.4	139.9
Total explained (E)	-0.069	-0.075	-0.06	-0.048	-0.06
(% explained)	-39.4	-58.6	-39.6	-31.4	-39.9
Diff in U (LC-UC)	84.3	67.3	41.7	28.3	42.2

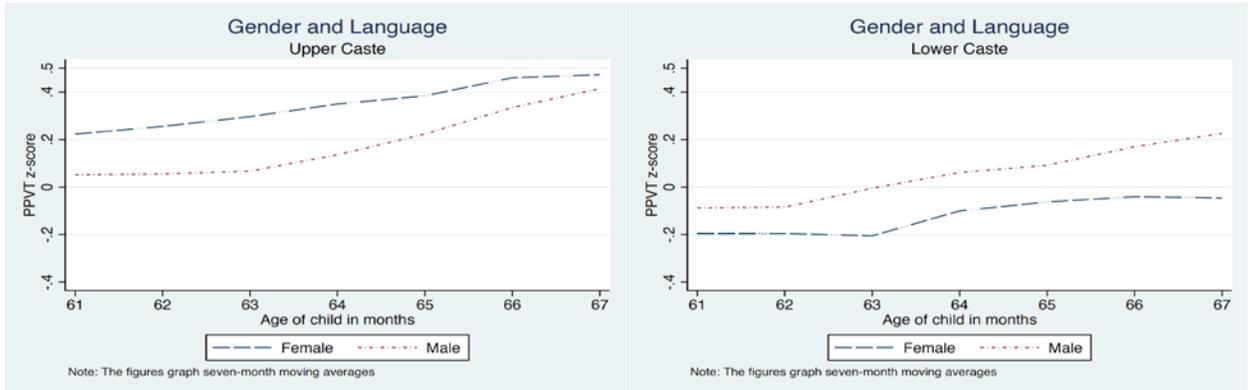
Note: Regression specifications control for region dummies, child characteristics (child's age, birth order, preschool at age 5 and school at age 8, and height for age) and household characteristics (mother and father education, urban-rural status, household size and wealth). PPVT gap estimates are based on ordinary least squares (OLS) for the cross-section estimations at ages 5, 8 and the pooled one (first to third columns); and on a fixed-effects (FE) and random-effects (RE) panel data model for the fourth and fifth column.

Figures

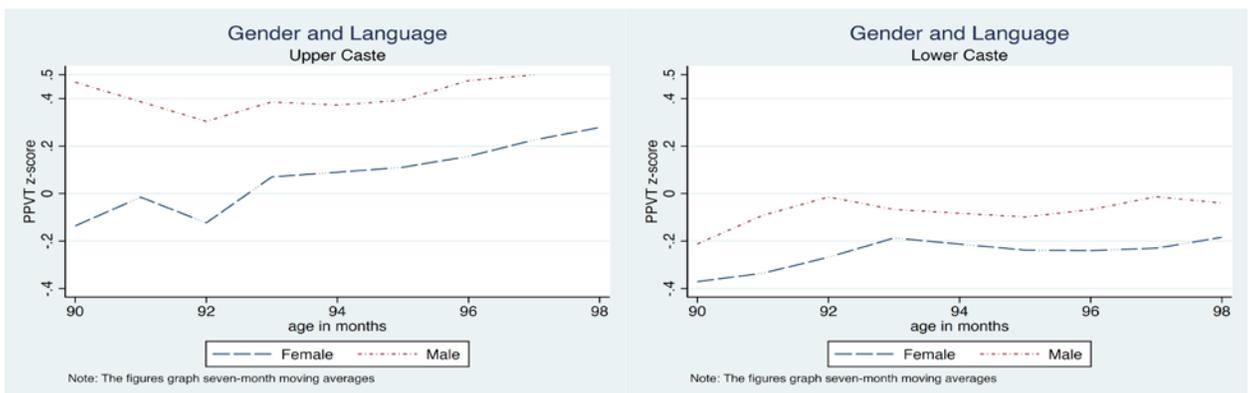
FIGURE 1—PANEL DATA ANALYSIS OF PPVT AGE PATTERNS: AGES 5 AND 8 (YOUNGER COHORT)



Age 5

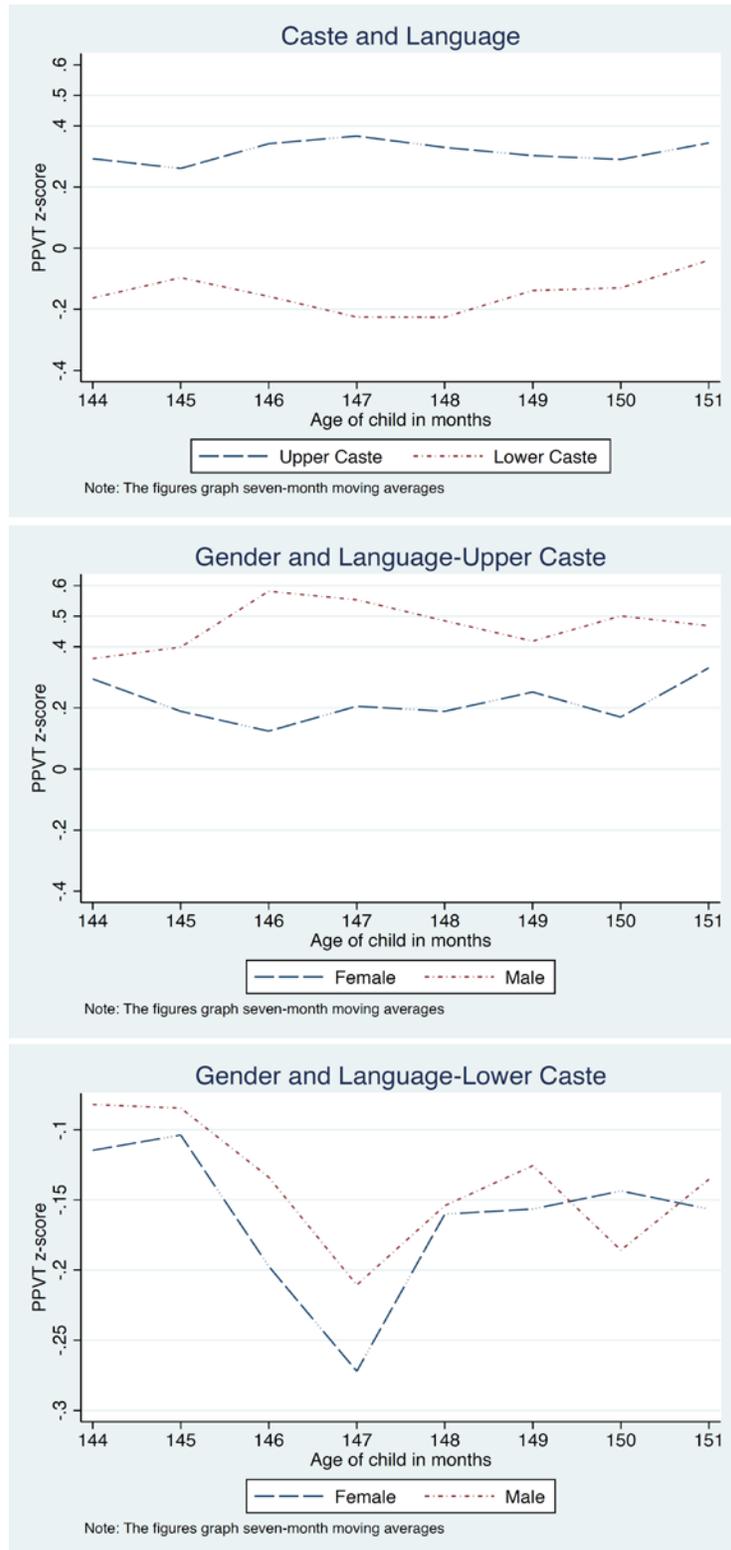


Age 8



Source: Authors' calculations based on YL data

FIGURE 2. ANALYSIS OF PPVT AGE PATTERNS: AGE 12 (OLDER COHORT)



Source: Authors' calculations based on YL data