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Explaining Cross-State Disparities in Child Nutrition in Rural India

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Summary. — What drives the large disparities in height-for-age distributions among Indian states - variation in observed nutrition-related endowments, such as wealth or maternal education, or differential strengths of relationships across states between endowments and height-for-age? We explore this question by comparing a set of states with poor nutrition outcomes with the benchmark of Tamil Nadu, a good performer. Applying counterfactual decomposition methods to National Family Health Survey data, we find that surprisingly modest proportions of HAZ differences are attributable to endowment differences. We discuss our results in light of the superior track record of food and nutrition policies in Tamil Nadu.

Key words — nutrition, India, height-for-age, food policy, nutrition policy

1. INTRODUCTION

Understanding the reasons for persistently poor child nutrition, particularly height for age (HAZ), outcomes in India in the face of relatively strong economic performance has emerged as an important research area in recent years. India has the largest number of stunted children in the world, with a child stunting prevalence that is worse than Sub-Saharan Africa's, despite India's economic advantages (Spears, 2013). Evidence is accumulating that there could be severe lifelong economic, health, and cognitive repercussions arising from these early childhood height deficits (Spears, 2012).

A marked feature of child nutrition outcomes in India and their evolution is their substantial heterogeneity across states. The National Family Health Survey 2005 data (NFHS-3) show that stunting prevalence among under-fives ranges from 24% in Kerala to 57% in Uttar Pradesh. Also, the evolution of stunting prevalence over time and its associations with aspects such as economic growth and agricultural growth is characterized by significant heterogeneity across states. Headey, Chiu, and Kadiyala (2012) present data over 1992–2005 to show that economic progress, including agricultural growth, is strongly correlated with nutritional outcomes in some states but very weakly in others. Menon, Deolalikar, and Bhaskar (2008) compute an Indian State Hunger Index (comprising calorie inadequacy, child underweight and child mortality) using the same methodology as the Global Hunger Index and find that there is substantial variability among states and that much of this variability is contributed by the anthropometry component of the index. Moreover, they find the association between values of the index and state per-capita income and economic growth to be weak.

What explains the observed heterogeneity in nutrition outcomes across states in India? Some of it will be due to differential endowments across states of the variables commonly used in explaining nutrition outcomes using individual and household-level data - household income, assets, education, sanitation, etc. This is, for example, reflected in the correspondence between state Human Development Index values (covering indices of income, life-expectancy and education) and child nutrition outcomes - some of the best performers are the same across these dimensions (e.g., Tamil Nadu, Kerala, Goa), and so are some of the worst performers (e.g., Bihar, Madhya Pradesh). However, the findings of Headey et al. and Menon et al. (2008) noted above suggest that the *strengths of relationships* between observed determinants and nutrition outcomes might also be different across states.

Although other unobservable factors could also be reflected in the strength of relationship between a typical observed covariate such as household income or maternal education and a child nutrition outcome, variations in nutrition-related policies, programs and institutions across states could be important. Tying such elements back to politics, Harriss and Kohli (2009) emphasize that crucial differences in whether a particular state's political landscape allows the poor and marginalized to have political voice, and in the quality of institutions, have an important bearing upon nutrition outcomes that can be achieved with given endowments of wealth and other observables.

In a regression context, the differences in nutrition outcomes across states explained by differences in observed covariates can be termed *covariate effects*. Differences explained by differing strengths of relationships between covariates and outcomes, in other words the "returns" to specific endowments, can be termed *coefficient effects*. Understanding the drivers of differences in nutrition outcomes between better and worse performing Indian states, and the relative roles of covariate and coefficient effects is important because, (i) given the size and diversity of India, a one-size-fits-all national picture is unlikely to be sufficiently informative for nutrition-related programing and policymaking, (ii) not only are there large gaps between states at the two ends of the spectrums of most social and economic development indicators, but many of these gaps are also widening (Purfield, 2006). Furthermore, three of the states of the bottom of the nutrition league, Bihar,

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Madhya Pradesh, and Uttar Pradesh are also where the bulk of the projected population increase in the next decades will come from (Visaria & Visaria, 2003), (iii) A comprehension of the relative roles of covariate and coefficient effects can provide an understanding of the extent to which nutrition convergence can be attained by improving basic endowments that impinge on nutrition, and the extent to which more directly nutrition-related programing and the general quality of institutions and policy-making, as reflected in coefficient effects, are important.

A vibrant literature, reviewed below, has emerged that empirically explores the determinants of child anthropometric outcomes in India. This literature has significantly advanced appreciation of the correlates of improved child nutrition for the nation as a whole. However, less attention has been paid to unpacking heterogeneity in outcomes across specific states. This paper aims to fill this gap in the literature by an empirical case-study approach that compares a set of states displaying relatively poor child nutrition outcomes - Bihar, Madhya Pradesh, Uttar Pradesh, Odisha, and Gujarat, [1] with a benchmark state displaying relatively good outcomes: Tamil Nadu. Given the higher prevalence of malnutrition in rural than in urban areas, the heterogeneity in the characterization of rural *versus* urban nutrition (Smith, Ruel, & Ndiaye, 2005; Srinivasan, Zanello, & Shankar, 2013), and in consonance with the recent literature (Spears, 2013; Headey et al., 2012), we focus on rural areas. We use the last available nationally representative National Family Health Survey (NFHS-3) data and counterfactual decomposition methods to assess covariate and coefficient effects to explain HAZ differentials between benchmark and comparison states. This is done first for mean HAZ differentials using Oaxaca–Blinder decompositions, and then for the entire HAZ distribution using decompositions based on quantile regressions. The latter are termed "Quantile Regression-based Counterfactual Decomposition" (QR-CD) methods, and allow the covariate and coefficient effects to differ along the entire distribution of nutrition outcomes. For example, are covariate *versus* coefficient contributions to cross-state comparisons different at the lower tail of the HAZ distribution (where severe stunting is likely to be prevalent) compared to the middle and upper parts of the HAZ distribution? In a policy atmosphere where targeting of the most vulnerable is important, such distribution-wide insights can be valuable (Srinivasan et al., 2013).

The paper proceeds as follows: Section 2 places this study within the context of previous literature. Sections 3 and 4 present the data and decomposition methods respectively. Section 5 discusses the decomposition results and Section 6 concludes with a discussion of our findings.

2. PREVIOUS LITERATURE

Two literatures of central interest to this study are briefly reviewed in this section: one on the empirical modeling of child anthropometry in India and the other on cross-state political and institutional differences impacting development outcomes.

Among several puzzles surrounding trends in growth, poverty, and nutrition in India, Deaton and Drèze (2009) highlight the very slow improvements in child anthropometric outcomes despite vigorous growth in income. This stagnation, and international comparisons that paint a worrying picture of child nutrition in India, have been debated extensively (see Panagariya, 2013, and the ensuing discussion in the *Economic and Political Weekly*).

A number of studies have carried out regression modeling to explain variation in child anthropometry in India. The UNICEF conceptual framework on child nutrition outcomes (UNICEF, 1990) has underpinned the specification of these studies. The models have typically included a variety of controls capturing observable and quantifiable basic and underlying causes of nutrition, but have often trained special focus on particular aspects of interest. [2] Spears (2013) highlights the importance of the relationship between sanitation and child height in India as well as in other countries and regions. Given the centrality of food intakes to nutrition outcomes, the increasing recognition of the multiple pathways through which agriculture could influence nutrition, and the importance of the agricultural sector to rural Indian livelihoods, a strand of the literature has focused on the links between agriculture and nutrition in India. Bhagowalia, Headey, and Kadiyala (2012), using the cross-sectional India Human Development Survey data, and Headey et al. (2012), using NFHS data, examine the connections between agricultural production conditions, diet diversity, and anthropometric outcomes, finding that while some agricultural variables such as livestock ownership and irrigation have associations with nutrition outcomes, many relationships along the agriculture–nutrition pathways in India are relatively weak and less than clear-cut.

The influence of the relative bargaining power of women in the household as measured by mother's schooling relative to father's on child nutrition outcomes has been examined by Imai, Annim, Gaiha, and Kulkarni (2014), who find a statistically significant positive influence. Other foci in this literature have included the impact of specific programs such as the Integrated Child Development Services (ICDS) on HAZ (Jain, 2015; Kandpal, 2011). Much of the literature has focused on modeling mean anthropometric outcomes. However, a small set of studies (Borooah, 2005; Imai et al., 2014; Kandpal & McNamara, 2009) has modeled the entire distribution of an outcome such as HAZ by using quantile regression methods. They all have found evidence of heterogeneous effects of key covariates on different parts of the outcome distribution, highlighting the value of allowing for such flexibility.

The above-reviewed literature has highlighted some of the key sets of routine observables that help explain variation in outcomes considering India as a whole. Cross-state heterogeneity has been recognized in the literature, for example in the form of controlling for state-specific intercepts (fixed effects). Less attention has been paid, however, to *explicit* consideration of cross-state differences, particularly the differential strengths of association between observables and outcomes across states.

Nonetheless, a separate literature has documented strong cross-state disparities in several dimensions that can impinge on the strength of association between endowments and nutritional outcome (in other words, the returns to endowments). These aspects, such as strength of community and civic society, *quality* and *reach* of public services, institutional quality, and the policy, governance, and political economy aspects they are related to, have been shown to influence development outcomes, although they are not usually measured in datasets like the NFHS. Mayer (2001) constructs an index of state institutional performance, including quality dimensions of medical and educational service provision and access to the public distribution system, and finds strong differences, with Hindi belt states, including Uttar Pradesh, Bihar, Madhya Pradesh, and Odisha at the bottom, and Kerala and Tamil Nadu at the top. Furthermore, he shows that the institutional performance index correlates well with the Human Development and the Gender Development Indices. Besley, Burgess, and Esteve-Volart (2007) and Besley and Burgess (2002) study the links between poverty, growth, and policy in India over