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Fuelling Calorie Intake Decline: Household-Level Evidence from Rural India

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Summary. — In India, average calorie intake has declined even as real monthly expenditure has increased. Since cross sectional evidence suggests a positive relationship between the two variables, the trend emerges as a major puzzle. Using household-level data from four recent rounds of National Sample Survey data on consumption expenditure and a novel instrumental variable estimation strategy we find that rising expenditure on non-food items is one of the factors that has led to the calorie intake decline. We provide causal evidence for such a food budget squeeze in the case of one type of non-food item, viz. expenditures on cooking fuel.

Key words — calorie consumption puzzle, Asia, India, instrumental variable method

1. INTRODUCTION

One of the most enduring puzzles related to economic development in India over the past few decades is what Chandrasekhar and Ghosh (2003) have called the calorie consumption puzzle. Average calorie intake has declined over time even as real consumption expenditures (and by most measures real per capita incomes) have increased. Since cross sectional evidence shows a robust positive relationship between per capita income and calorie intake, the India time series pattern clearly presents a puzzle. Moreover, the puzzle has been around for a long time. Data collected from large-scale, nationally representative consumption expenditure surveys (CES) conducted roughly every five years by the National Sample Survey Organization (NSSO), show that this trend starts in 1972–73 (NSSO, 1996). [1]

Deaton and Dreze (2009) provide a comprehensive analysis of the facts pertaining to, and possible interpretations of, this puzzle with data running from 1983 to 2004–05. They find that estimated average calorie intake in rural areas declined by about 10% over the two decade period between 1983 and 2004–05, the decline being higher at the upper end of the expenditure distribution. Urban areas witnessed a milder decline in estimated average calorie intake. Real average monthly per capita expenditure (MPCE) increased substantially (about 22% in rural areas in India) over the same period. When we extend the analysis to 2009–10, we find a continuation of the same trend (see Table 1). Over the two-decade period from 1987–88 to 2009–10, average calorie intake in rural India declined by 14%, from 2,291 kcal per capita per day to 1,971 kcal per capita per day. Over the same period, average inflation-adjusted per capita expenditure increased by 28%.

Alternative explanations that have been offered to explain the calorie consumption puzzle in India include declining calorie needs (Deaton & Dreze, 2009; Eli & Li, 2013; Rao, 2000), changes in the relative price of food (Gaiha *et al.*, 2009, Gaiha, Jha, & Kulkarni, 2010; Patnaik, 2010a), dietary diversification (Landy, 2009; Mittal, 2007; Rao, 2000), voluntary choice of luxuries like TVs over food (Banerjee & Duflo, 2011), under-reporting of calorie intake due to eating outside home (Smith, 2013), and a food budget squeeze (Basu & Basole, 2012; Mehta & Venkatraman, 2000; Sen, 2005). [2]

In this paper, we show that a food budget squeeze is one of the important factors driving the calorie intake decline. But before we outline the empirical strategy and contribution of this paper, it might be worthwhile thinking about why we care about declining calorie intake in the first place. First, Deaton and Dreze (2009) show that even though anthropometric measures, such as height-for-age, weight-for-height, and weight-for-age among children, and adult BMI have improved in India, they are still among the worst in the world. For instance India consistently performs worse than many sub-Saharan African countries: according to data collected by the Demographic and Health Surveys, mean BMI in 1998–99 was 19.6 in India, 21.9 in Kenya, 22.6 in Cameroon, and 20.7 in Niger; in 2005–06, it had increased to 19.9, 22.4, 23.4, and 21.6, respectively. Thus, not only is the level of BMI low in India, even improvements have been slow relative to what might be expected given recent rates of economic growth.

Second, for the vast majority of rural Indians per capita calorie intake is still below both the 1972 poverty line norm of 2,400 kcal per capita per day for rural areas and the more recent standards developed by the Indian Council for Medical Research. The question that presents itself is, would people voluntarily reduce calorie intake while falling well short of basic nutritional requirements?

Third, an implication of increasing average real expenditure and declining average calorie intake is the divergence between

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Table 1. *Summary statistics for key variables*[a]

	Mean/standard deviation			
	1987–88	1993–94	2004–05	2009–10
Calorie intake (kcal per capita per day)	2291.478	2219.362	2086.684	1970.767
	(672.912)	(622.146)	(542.139)	(513.744)
Total expenditure (1960–61 rupees per capita)	24.384	24.347	28.213	31.173
	(23.848)	(20.474)	(17.060)	(21.738)
Fuel expenditure (1960–61 rupees per capita)	1.484	1.391	2.577	2.566
	(1.224)	(5.029)	(1.879)	(1.794)
Household size (adjusted for age and sex)	4.234	4.067	4.036	3.870
	(2.076)	(1.937)	(1.953)	(1.836)
Age of household head (years)	43.652	43.780	45.156	45.857
	(13.707)	(13.587)	(13.380)	(13.060)
Meals eaten outside home	7.135	72.723	368.587	353.575
	(23.578)	(17.473)	(186.605)	(175.459)
Diet diversification index	34.219	31.736	26.933	24.962
	(12.922)	(11.192)	(8.149)	(7.439)
Access to safe water	0.516	0.675	0.821	0.854
	(0.219)	(0.196)	(0.182)	(0.172)
Cooking source dummy (Mkt = 1, NonMkt = 0)	0.048	0.094	0.140	0.162
	(0.214)	(0.291)	(0.347)	(0.368)
Price ratio (food/all)	18.398	17.498	17.794	19.158
	(2.244)	(3.025)	(2.293)	(2.622)
Price ratio (cereals/non-cereals)	37.753	43.839	40.048	11.448
	(17.876)	(19.375)	(16.834)	(11.055)
Observations	60,307	51,739	59,689	45,976

[a] Data are from rounds 43 (1987–88), 50 (1993–94), 61 (2004–05) and 66 (2009–10) of the consumption expenditure survey of the NSSO. Access to safe water is measured at the state-region level as follows: the proportion of households with access to safe potable water. All other variables are measured at the household level. Sampling weights have been used for computing averages.

expenditure-based measures of poverty and calorie-based measures of under-nutrition. Even as the head count ratio has declined over time, prevalence of under-nutrition has increased, a paradoxical phenomenon that has been studied previously (Mehta & Venkatraman, 2000; Patnaik, 2007; Ray, 2007; Smith, 2013).

Taken together, the continued poor performance of India in improving child and adult nutrition and the relatively low levels of calorie intake in a significant proportion of the population suggest that purely voluntary explanations such as reduced intake due to reduced needs or diversification of the diet may not suffice. [3] Factors outside the control of households may also be at work.

We offer evidence for one such mechanism: a squeeze on the food budget (Deaton & Dreze, 2009; Mehta & Venkatraman, 2000; Sen, 2005). Although expenditures on food as well as non-food items are a result of household-level decision-making processes, these decisions occur in the larger context of structural changes in the economy such as loss of access to common property resources, increasing informalization of the labour market, decline in livelihood options in rural areas, and changes in the supply of social services by the State, all of which can affect expenditures on healthcare, education, fuel, transportation, and other services. A food-budget squeeze can arise if rapidly rising expenses on such non-food essentials absorb all the increases in total expenditures and keep real expenditures on food from rising.

Basu and Basole (2012) had used a state-level pseudo-panel dataset to investigate the calorie consumption puzzle, and had found evidence in support of the food budget squeeze hypothesis even after controlling for alternative factors like dietary diversification, improvements in the epidemiological environment, and changes in share of the agricultural workforce. But the empirical analysis had two shortcomings. First, by using state-level aggregation, they were not using information available at the household level. Second, the empirical model did not allow them to cleanly identify the effect of non-food expenditures on calorie intake. Since expenditure on food and non-food items are jointly determined by households, their key explanatory variable of interest is potentially endogenous.

In this study, we improve upon the analysis in Basu and Basole (2012) by addressing both these shortcomings. First, we use household-level consumption data for rural India from four recent thick rounds—1987–88 (43rd round), 1993–94 (50th round), 2004–05 (61st round), and 2009–10 (66th round)—of the CES conducted by the NSSO. [4] Second, we use an instrumental variable empirical method to deal with the potential problem of endogeneity. We instrument real expenditure on fuel with a dummy variable for the source of cooking energy (0 for predominantly non-commercial sources, 1 for commercial sources).

The switch from non-commercial fuel sources like fuelwood or dung to commercial ones like LPG or kerosene is positively correlated with income (Pachauri & Jiang, 2008). [5] But controlling for income, change in fuel usage is also a function of supply-side changes beyond the control of individual households such as improved distribution networks and availability of commercial fuels, deforestation, loss of access to common property resources, acquisition of forest land for mining, industrial and infrastructural projects, and changing opportunity costs of women's time due to increased availability of non-farm employment (Cooke, Köhlin, & Hyde, 2008; Gundimeda & Köhlin, 2008; Heltberg, Arndt, & Sekhar, 2000; Joon, Chandra, & Bhattacharya, 2009; Pachauri & Jiang, 2008; Rao & Reddy, 2007; Vishwanathan & Kumar,