Prices, Expenditure and Nutrition in India

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Abstract

Building on a recent important contribution by Deaton and Dreze (2009), our analysis sheds new light on why the calorie Engel curve shifted down-especially in rural India- over the period 1993–2004. The puzzle for the longer period analysed by Deaton and Dreze (2009) is that *despite* higher incomes per capita calorie consumption was lower at a given level of per capita household expenditure, across the expenditure scale, in 2004. In trying to resolve this puzzle, they are emphatic that the decline in calorie intake reflects lower calorie requirements due mainly to better health and lower activity levels. Using a standard demand framework, our resolution is different. The important role of food prices in inducing changes in consumption-through both own and cross-price effects — is confirmed. Although calorie-income/expenditure elasticities are large, stagnation of incomes in rural areas over the period 1993–2004 suggests that prices had a decisive role in lowering calorie intake. Controlling for all these and unobserved effects, there was a significant negative effect of a time dummy which is arguably linked to improvements in health and lower activity levels. Policy interventions designed to stabilise food prices and expand livelihood opportunities in rural areas thus remain an important concern *despite* differing views on whether pervasive nutritional deprivation is real.

Keywords: calories, protein, fats, deprivation, prices, expenditure, India.

JEL codes: C21, D12, I31, I 32,

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I. Introduction

Various sources — including detailed household consumption expenditure surveys conducted by the National Sample Survey Organisation (NSSO) every five years in India (the so-called thick samples) — point to a puzzle. Despite rising incomes, there has been a sustained decline in per capita calorie intake. In an important contribution, Deaton and Dreze (2009) offer a detailed analysis of the decline in calorie intake over the period 1983 to 2004. Their principal findings are summarised below.

- Average calorie consumption was about 10 per cent lower in rural areas in 2004–05 than in 1983. The proportionate decline was larger among the more affluent sections of the population, and about 0 for the bottom quartile of the per capita expenditure scale. In urban areas, there was a slight change in average calorie intake over this period.
- The decline of per capita consumption is not confined to calories. It also applies to proteins and other nutrients, with the exception of fat which has increased in both rural and urban areas over this period.
- As incomes rose over this period, these declines are puzzling. A more contentious view offered by Deaton and Dreze (2009) is that the latter are not attributable to changes in relative prices as an aggregate measure of the price of food — treated synonymous with the price of calories-changed little during the period in question. So the puzzle boils down to this: per capita calorie consumption is lower at a given level of per capita household expenditure, across the expenditure scale, at low levels of per capita expenditure as well as high. In other words, there is a steady downward shift of the calorie Engel curve.
- Deaton and Dreze (2009) are emphatic that the downward shift of the calorie Engel curve is due to lower calorie requirements, associated mainly with better health and lower activity levels. As the evidence offered is fragmentary and patchy, this explanation is largely conjectural. Specifically, they draw attention to major expansions in availability of safe drinking water, vaccination rates, transport facilities,

and ownership of various effort-saving durables. Relying on evidence furnished by the Indian Council of Medical Research (1990) on a sharp rise in calorie requirements following modest increase in activity levels, they claim that the 10 per cent reduction in calorie consumption was in part due to lower activity levels associated with ease of obtaining drinking water, extensive use of bicycles and motor bikes and improved public transportation, among others.

The present study seeks to throw more light on the decline in calorie intake and the explanations offered but over a shorter period (i.e. 1993–2004). Specifically, we will first examine the changes in the pattern of food consumption and intake of calories, proteins and fats over this period. Next, an attempt will be made to examine whether the Deaton–Dreze rejection of the role of relative prices is justified. Finally, new insights emerge from a disaggregation of households by type of activity (e.g. whether self-employed in agriculture or agricultural labour). The analysis is based on unit record data collected for the 50th and 61st rounds of the NSS (corresponding to the years 1993–94 and 2004–05, respectively).

II. Changes in Calorie, Protein and Fat Intake

Let us first examine the changes in the distributions of calories in rural and urban areas over the period 1993–2004.

Until recently, a calorie intake of 2400 per day was considered adequate for a typical adult engaged in physically strenuous work of a certain duration in rural India. More recent assessments have converged to lower calorie 'requirements' (1800 calories).[1]

[1] Srinivasan (1992) is deeply skeptical of such requirements on the grounds that energy expenditure adjusts to intake within a range.

Table 1
Calorie Intake Distributions in Rural India, 1993–2004

Year	Range of Calorie Intake Per Capita Per Day				Total
	<1800	1801–2400	2401–3000	>3000	
1993	31.09 (1491)	40.07 (2084)	19.42 (2650)	9.42 (3636)	100 (2156)
2004	36.68 (1516)	43.11 (2071)	15.07 (2629)	5.14 (3925)	100 (2047)

So if we use the higher calorie requirement of 2400, over 71 per cent of the rural households were undernourished in 1993. With the lower intake of 1800, there is a sharp reduction to well below half the proportion (about 31 per cent), implying a large concentration of households in the calorie intake range of 1800–2400. The proportion of undernourished rises from 71 per cent to nearly 80 per cent in 2004. Also, the proportion below the lower cut-off rises from about 31 per cent to close to 37 per cent. By any standard, these imply high estimates of calorie deprivation. What is also significant is that, while the mean calorie intake of those below 1800 rose slightly (from 1491 to 1516), the mean intake of the larger concentration of households in the next higher range (1801–2400) remained about the same.

Table 2
Calorie Intake Distributions in Urban India, 1993–2004

Year	Range of Calorie Intake Per Capita Per Day				Total
	<1700	1701–2100	2101–2600	>2600	
1993	28.12 (1426)	29.62 (1900)	25.76 (2320)	16.49 (3107)	100 (2074)
2004	29.40 (1440)	34.52 (1900)	24.67 (2313)	11.41 (3252)	100 (2021)

Table 2 contains estimates for urban India. Assuming lower calorie norms of 1700 and 2100 (given less strenuous physical activity in urban areas), more than a quarter of the households (about 28 per cent) consumed less than 1700 calories in 1993. More than twice this proportion (about 58 per cent) were below the higher calorie norm of 2100. Thus well over half of the urban households were deprived in terms of calorie intake. Worse, this proportion

rises to about 64 per cent over the period 1993–2004. While this is much less alarming than the calorie deprivation increase in rural India, it is nevertheless worrying.

Table 3
Protein Intake Distributions in Rural India, 1993–2004

Year	Range of Protein Intake Per Capita Per Day (Gms)				Total
	<45	46–60	61–75	>75	
1993	23.81 (37.1)	33.79 (52.4)	22.79 (66.8)	19.61 (94.4)	100 (60.3)
2004	28.81 (37.4)	38.05 (52.2)	21.46 (66.3)	11.68 (93.9)	100 (55.8)

Following Gopalan et al.(1971), a cut-off of 60 (gms) of protein intake is used here. While protein deficiency is in large measure linked to calorie deficiency, it is noteworthy that well over 57 percent of rural households consumed fewer than the required protein intake in 1993. In fact, just under a quarter of the households consumed <45 (gms) of protein. Besides, the mean intakes were well below the upper limits, implying concentrations of households with relatively low protein intakes. Within both ranges of protein intake, the proportions rose more than moderately (for example, in the lower range, the proportion of households rose from about 24 per cent to about 29 per cent). However, the mean intakes of protein remained unchanged.

Table 4
Protein Intake Distributions in Urban India, 1993–2004

Year	Range of Protein Intake Per Capita Per Day (Gms)				Total
	<45	46–60	61–75	>75	
1993	24.90 (37.1)	37.77 (52.4)	23.11 (66.5)	14.23 (90.7)	100 (57.3)
2004	29.40 (37.8)	34.50 (52.3)	24.69 (66.2)	11.40 (94.9)	100 (55.4)

Although the share of protein-deficient urban households in urban India rose slightly (from about 62.67 per cent to about 64 per cent), the share below the lower cut-off of 45 (gms) rose

more than moderately (from about 25 per cent to over 29 per cent). The mean protein intakes, however, remained unchanged in these ranges.

Table 5
Fat Intake Distributions in Rural India, 1993–2004

Year	Range of Fat Intake Per Capita Per Day (Gms)				Total
	<20	21–30	31–50	>50	
1993	34.30 (14.0)	25.08 (24.7)	26.09 (38.3)	14.54 (72.1)	100 (31.5)
2004	22.59 (15.0)	27.21 (24.9)	33.58 (38.3)	16.62 (74.6)	100 (35.4)

Although a precise range for fat requirements cannot be specified, Gopalan et al. (1971) recommends that a range of 40–60 (gms) of fat intake is desirable.[2] So even if we consider the first three ranges of fat intake, an astonishingly high estimate for rural India (over 85 per cent) in 1993 is obtained. In fact, well over one-third of the households are under the lowest range of <20 (gms). Over the period 1993–2004, the corresponding household share with fat intakes <50 gms fell but slightly (over 83 per cent). However, the share of households consuming <20 gms of fat fell sharply (from over 34 per cent to well over 22 per cent). But the mean fat intakes remained unchanged.

Table 6
Fat Intake Distributions in Urban India, 1993–2004

Year	Range of Fat Intake Per Capita Per Day (Gms)				Total
	<25	26–40	41–60	>60	
1993	25.04 (18.2)	29.84 (32.3)	26.15 (48.6)	18.97 (80.2)	100 (42.1)
2004	15.39 (19.4)	31.02 (32.6)	31.56 (48.9)	22.04 (85.8)	100 (47.4)

[2] Gopalan et al. (1971) observe 'The quantity of fat that should be included in a well balanced diet is not known with any degree of certainty. However, it appears desirable in the present state of knowledge that the daily intake of fat should be such that it contributes no more than 15 to 20 per cent of the calories in the diet. A total of about 40 to 60 gms of fat can therefore be safely consumed daily, and in order to obtain the necessary amounts of essential fatty acids, the fat intake should include at least 15 gms. of vegetable oils' (pg. 8)

Using higher ranges of fat intake for urban India, fat deprivation was pervasive in urban India (about 81 per cent of the households consumed <60 gms of fats in 1993). About a quarter consumed <25 gms. Over the period 1993–2004, the reduction in the proportion of fat-deprived was barely 3 percentage points (from 81 per cent to 78 per cent). However, as in rural India, the proportion consuming fats <25 gms fell sharply. On the other hand, those consuming fats in the range 41–60 gms rose more than moderately. The changes in mean fat intake were negligible.

In brief, taking the norms as valid, the overall picture of nutritional deprivation worsened considerably over the period 1993–2004.

III. Engel Curves

(a) Calories

Deaton and Dreze (2009) drew pointed attention to the downward shift in the calorie Engel curve over the period 1983–2004. Our focus is on the more recent period 1993–2004. The calorie Engel curves for rural India display a downward shift-especially above extremely low levels of monthly per capita expenditure (MPCE) at 2004 prices.[3] The calorie Engel curve for 2004 crosses over the 1993 curve at (approximately) Rs 150, implying slightly higher calorie intake at lower MPCE in 2004. At higher levels of MPCE, there is a reversal with fewer calories consumed. In fact, the proportionate reduction in calorie intake is much higher at higher MPCE in 2004.

[3] Cross-tabulations of expenditure and calorie intake for rural and urban India for 1993 and 2004 are given in tables in A.1-A.8.

Figure 1: Calorie Engel Curves in Rural India, 1993 and 2004

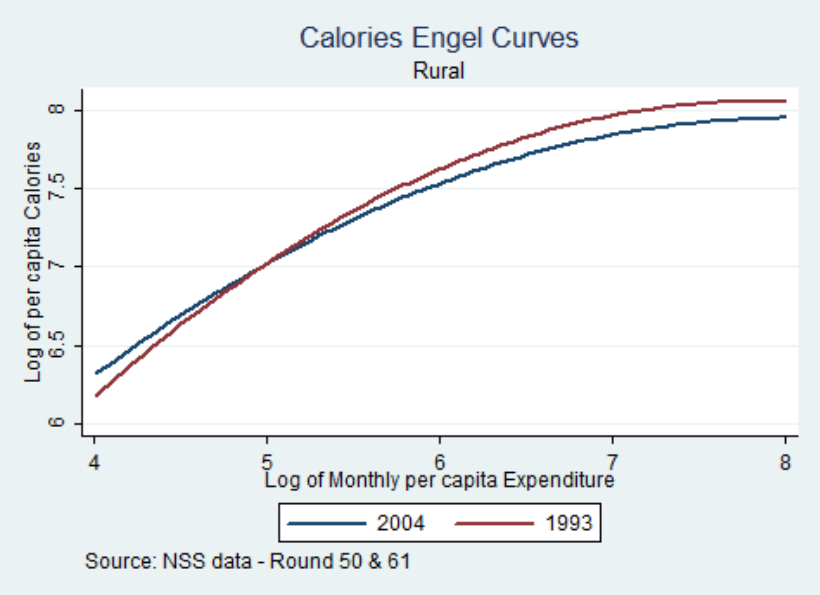
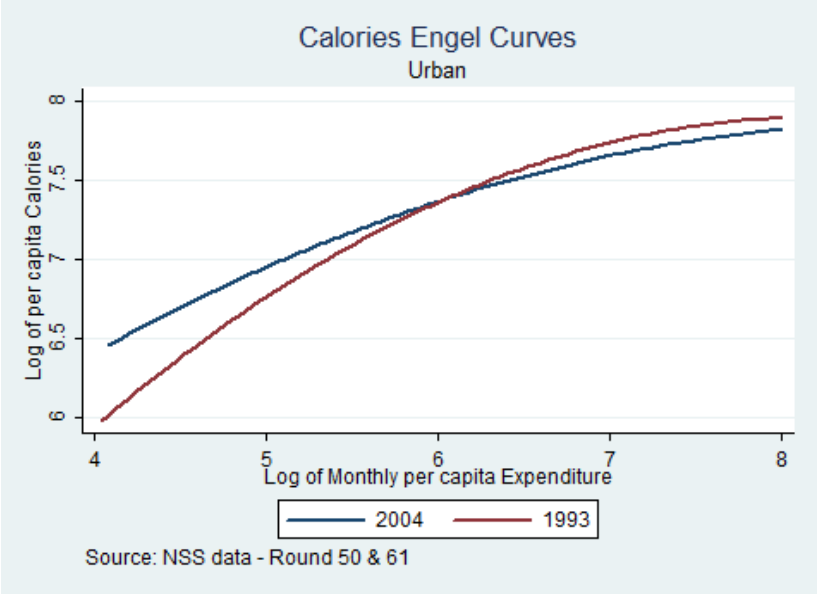


Figure 2: Calorie Engel Curves in Urban India, 1993 and 2004



The calorie Engel curve in urban India for 2004 lies above that for 1993 up to MPCE of (a little over) Rs 500 and then below it. Thus, at MPCE <Rs 500, calorie intake was higher and, above it, lower in 2004. In fact, the proportionate reduction in calorie intake at higher MPCE was larger.

In sum, there is evidence of a downward shift in the calorie Engel curve in both rural and urban India — more so in the former — over the period 1993–2004.

Reduction in Cereal Calories

Deaton and Dreze (2009) also emphasise the reduction in calories from cereals. For rural India, the graphs in Figure 3 illustrate the reduction in calories from cereals across all expenditure classes over the period 1993–2004. In fact, the reduction is much larger at higher MPCE. On average, calories from cereals reduced by 10 per cent. As cereals are the single largest source of calories, this needs investigation. In particular, we need to investigate whether cereal prices are associated with a reduction in cereal consumption and consequently reduction in calorie intake.

Figure 3: Calories from Cereals in Rural India, 1993 and 2004

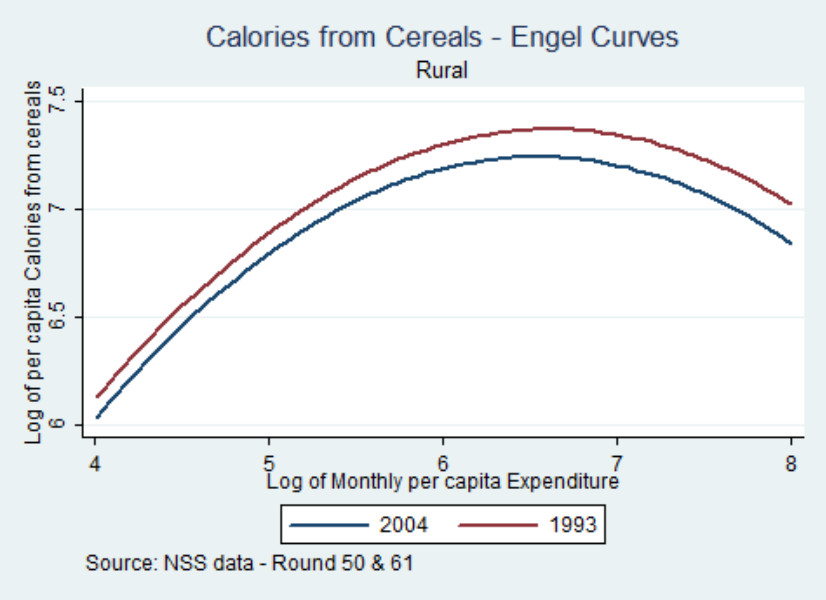
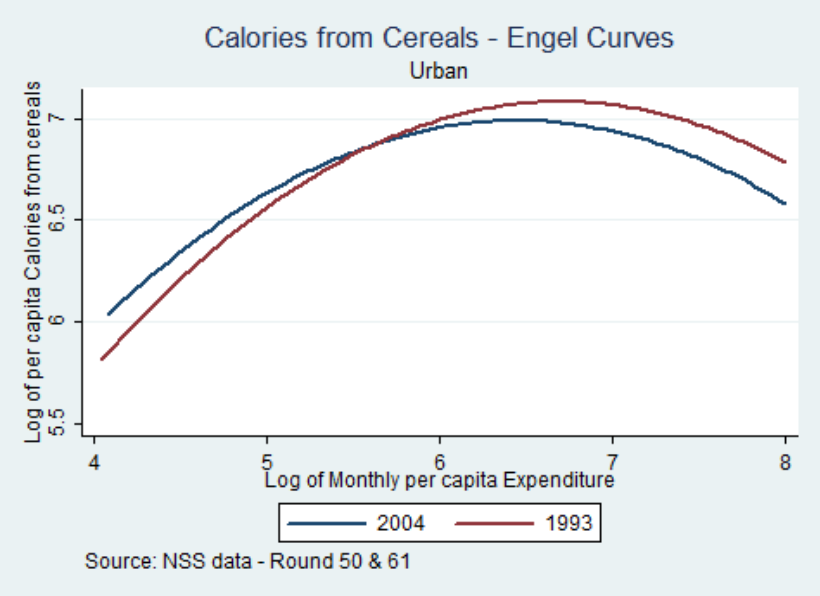


Figure 4 for urban India presents a mixed picture, with the cereal calorie curve for 2004 lying above the 1993 curve (at about Rs 250) and below the latter at higher MPCE. So the reduction in cereal calories is a feature of higher MPCE. What is also striking is that the

reduction in cereal calories gets larger with higher MPCE. It is therefore not surprising that the average reduction of cereal calories is only slightly lower (over 9 per cent) relative to rural India.

Fig: 4 Calories from Cereals in Urban India, 1993 and 2004



(b) Protein

The protein Engel curves for rural and urban India over the period 1993–2004 are given in Figures 5 and 6.[4] The rural–urban contrast in protein intake is striking. In the rural areas, protein intake was consistently lower across expenditure classes in 2004 than in 1993. Somewhat surprisingly, the gap between 1993 and 2004 intakes widens considerably at higher MPCE. In the urban areas, the 2004 curve was above the 1993 curve at low levels of MPCE and, after the cross-over expenditure of about Rs 500, it lies below the 1993 curve.

[4] The cross-tabulations of MPCE and protein intake are given in tables A.9-A.16.

Figure 5: Protein Engel Curves in Rural India, 1993 and 2004

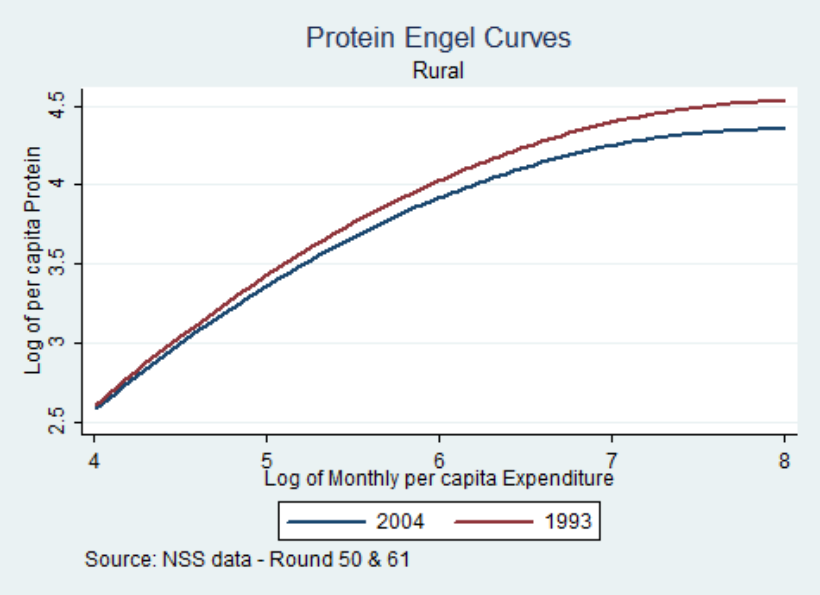
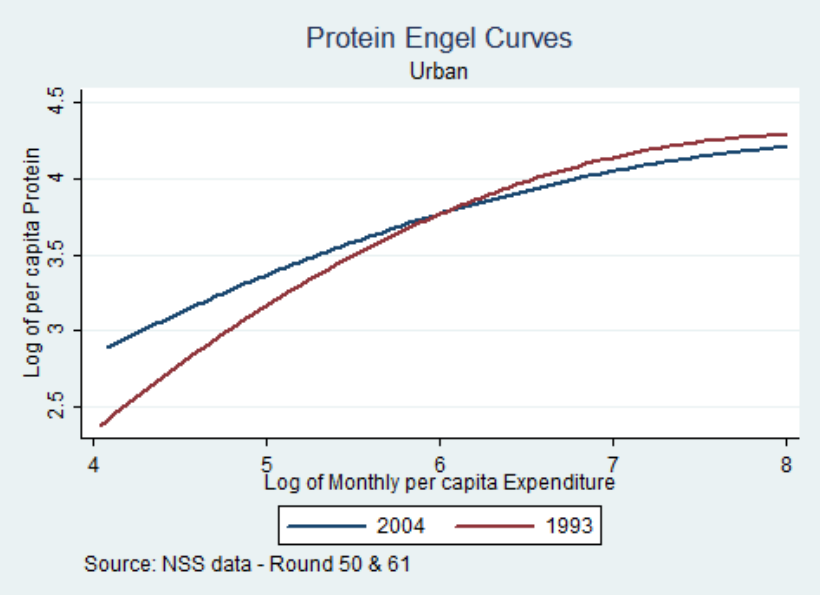


Figure 6: Protein Engel Curves in Urban India, 1993 and 2004



(c) Fats

The fat Engel curves for rural India in 1993 and 2004 largely overlap except in the higher range of expenditure. In the urban areas, by contrast, the 2004 curve lay above the 1993 curve

over a large part of the expenditure scale, with a narrowing of the gap and convergence at about Rs 900.

Figure 7: Fat Engel Curves in Rural India, 1993 and 2004

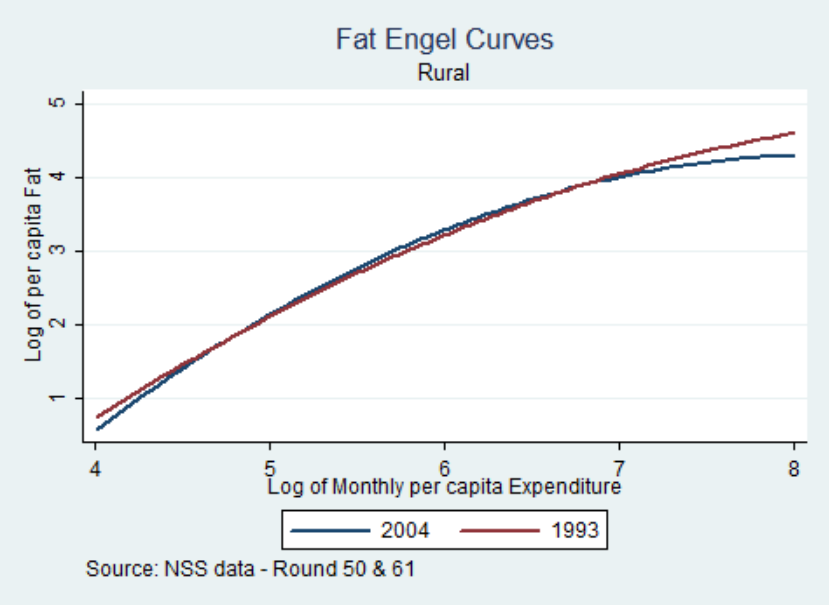
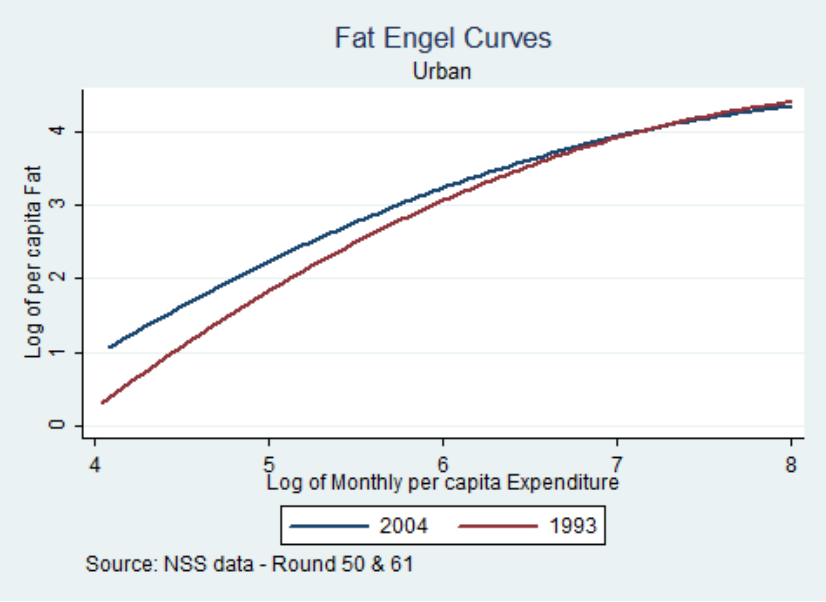


Figure 8: Fat Engel Curves in Urban India, 1993 and 2004



IV. Nutrient Deprivation

Ravallion (1989) extends the FGT class of poverty indices to encompass nutritional deprivation. Just as this class of poverty indices includes the head-count index, the income poverty gap and a distributionally sensitive measure of poverty, similar indices could be constructed for nutritional deprivation. Additionally, Ravallion (1989) makes an important point that, even if calorie-income elasticity is low, the effect on undernutrition may be large if the density of people is high in the neighbourhood of calorie requirement norm. More specifically, the marginal effect of a change in the incomes of the undernourished households on a headcount index of undernutrition is determined by the product of the slope of income —nutrient intake and that of the cumulative distribution function (cdf) of intake, evaluated at the nutrient norm.[5] Thus useful insights may be obtained into nutritional improvement from income transfers under the Public distribution System (PDS) and National Rural Employment Guarantee Scheme (NREG).

Let us first consider calorie deprivation, as shown in Figure 9. Given the debate on the appropriate calorie norm, an advantage of stochastic dominance tests is that comparisons of nutritional deprivation are not limited by a rigid calorie norm or by a specific index (Atkinson, 1987)**.** Using a permissible range of calorie requirements (on which there is likely to be little disagreement, as opposed to a specific value), changes in nutritional deprivation over the period 1993–2004 can be assessed in terms of the FGT class of nutritional deprivation indices.

As may be noted from Figure 9, the cdf for calorie intake in 2004 overlaps with that for 1993 over low calorie intakes (up to about 1300) and then lies above the latter above this cut-off point. This suggests first order stochastic dominance of the 1993 cdf over that for 2004 in

[5] For an application to the NREG and PDS, based on household data collected from three Indian states: Rajasthan, Andhra Pradesh and Maharashtra, see Jha et al. (2010).

rural India. Thus, over a wide range of calorie requirements going well above 2000, there was a worsening of nutritional deprivation in terms of the FGT class of nutritional deprivation indices.

As shown in Figure 10 a similar finding is obtained for urban India, as there is evidence of first order stochastic dominance of the 1993 cdf over that for 2004. Thus, over a wide range of calorie requirements, nutritional deprivation deteriorated in terms of the FGT indices over the period in question.

Figure 9: CDFs of Calorie Intake in Rural India, 1993 and 2004

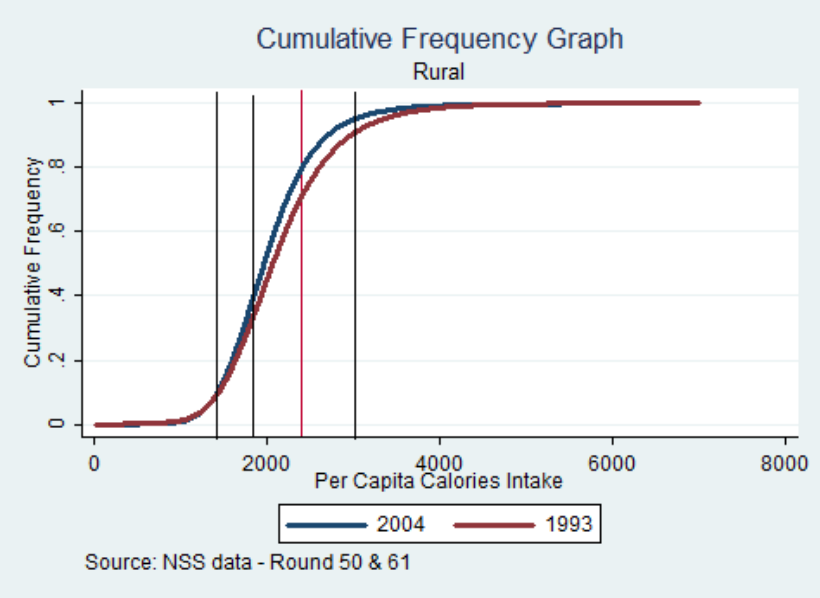


Figure 10: CDFs of Calorie Intake in Urban India, 1993 and 2004

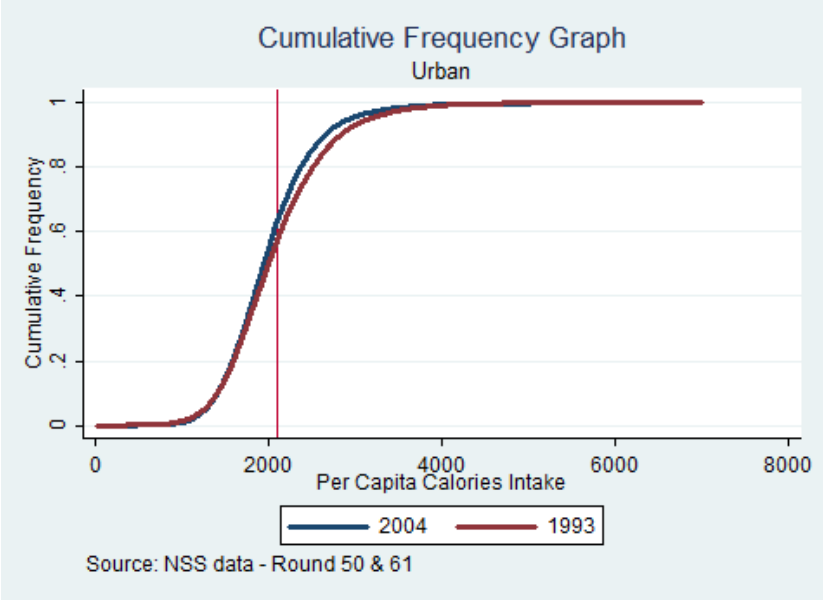


Figure 11: CDFs of Protein Intake in Rural India, 1993 and 2004

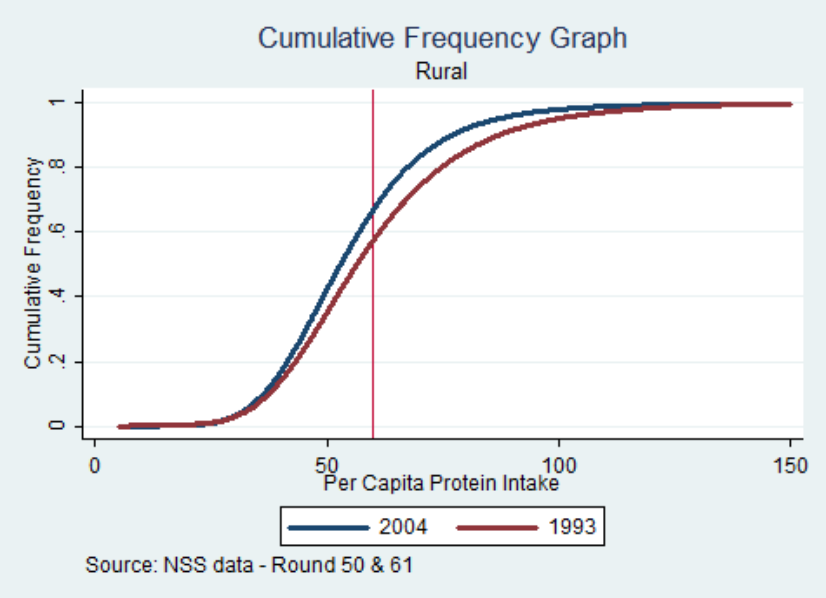
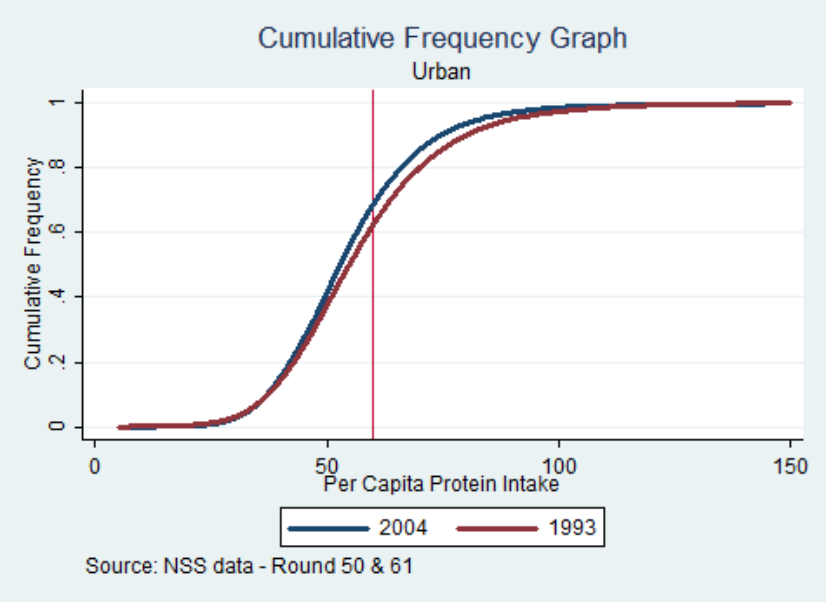


Figure 12: CDFs of Protein Intake in Urban India, 1993 and 2004



Assessment of protein deprivation in rural India over the period is dismal too, with the first order stochastic dominance of the cdf for 1993 over that for 2004, as shown in Figure 11.

The urban cdfs for protein, portrayed in Figure 12, also point to first order stochastic dominance of the 1993 distribution over a wide range of protein requirements (considerably lower than 50 gms and well above this value). One notable difference is of course the narrower gap between the urban cdfs relative to the rural.

In Figure13, other than extremely low fat intakes over which the two cdfs for rural India overlap, the 1993 cdf lies well above that for 2004, implying that the for this range the 1993 distribution stochastically dominates the 2004 distribution. There was thus a worsening of fat deprivation indicators over a wide range of requirements.

Figure 13: CDFs of Fat Intake in Rural India, 1993 and 2004

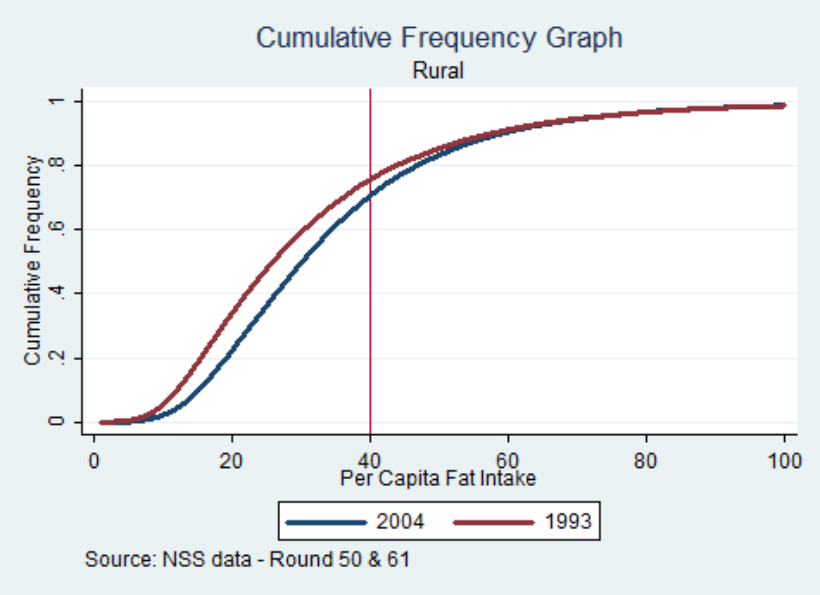
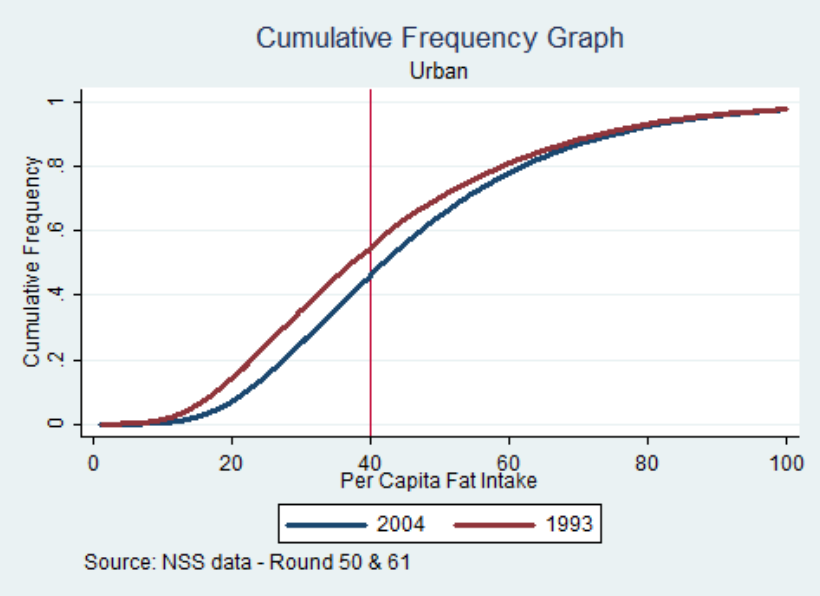


Figure 14: CDFs of Fat Intake in Urban India, 1993 and 2004



A similar finding is obtained from Figure 14 for fat deprivation in urban India. As the cdf for 2004 lies below that for 1993 it is subject to stochastic dominance by the latter. It follows that there was a worsening of fat deprivation indicators (the FGT class) over the period 1993–2004 over a wide range of fat intake.

V. Cost of Calories and Intake

(a) Rural and Urban Comparisons

More affluent households display a pattern of food consumption that differs from that of others. Specifically, the former switch from cereals to fattier and sweeter foods, such as edible oils, meat, and sugar. As cereals are the cheapest source of calories, these switches imply higher cost per calorie (Deaton and Dreze, 2009). They plot the log of rupees spent per 1000 calories, divided by a general food price index, against log of MPCE. Since the price of food is held constant, movements of the curves, like movements along the curves, are a result of switches from cheaper to more expensive calories, or vice versa.

Figaure15 illustrates two features of food consumption in rural India. One is that there is a positive relation between the cost of calories and MPCE. Specifically, the higher the MPCE, the higher is the cost of calories or the larger are the switches from cheaper to more expensive calories. However, the 2004 curve lies below that for 1993. This implies that while more affluent households continue to switch into more expensive calories, the downward movement of the curve suggests that switches are into less expensive calories than in 1993. Although different from the finding reported by Deaton and Dreze (2009), it is plausible that over time food choices have expanded such that more affluent consumers are able to switch to calories that are less expensive than in 1993.

Figure 15: Costs of 1000 Calories and MPCE in Rural India (2004 Prices), 1993 and 2004

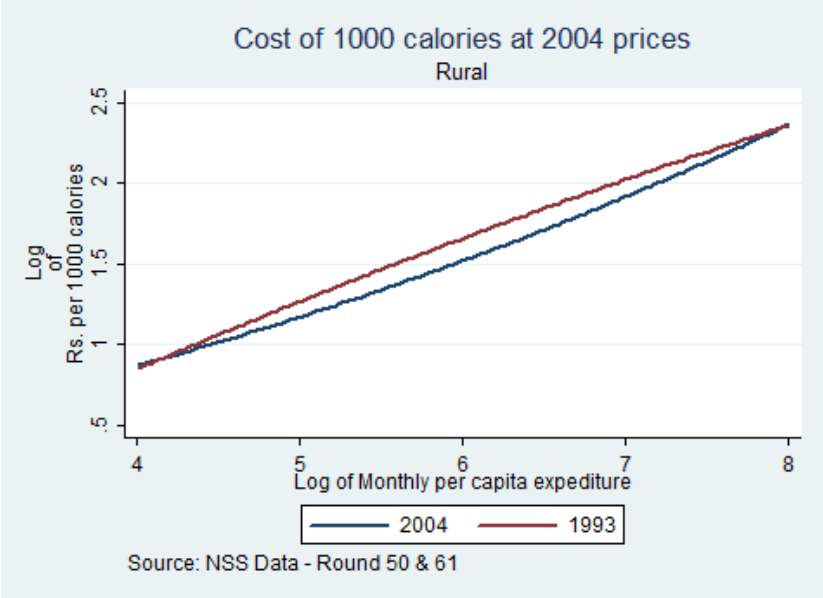
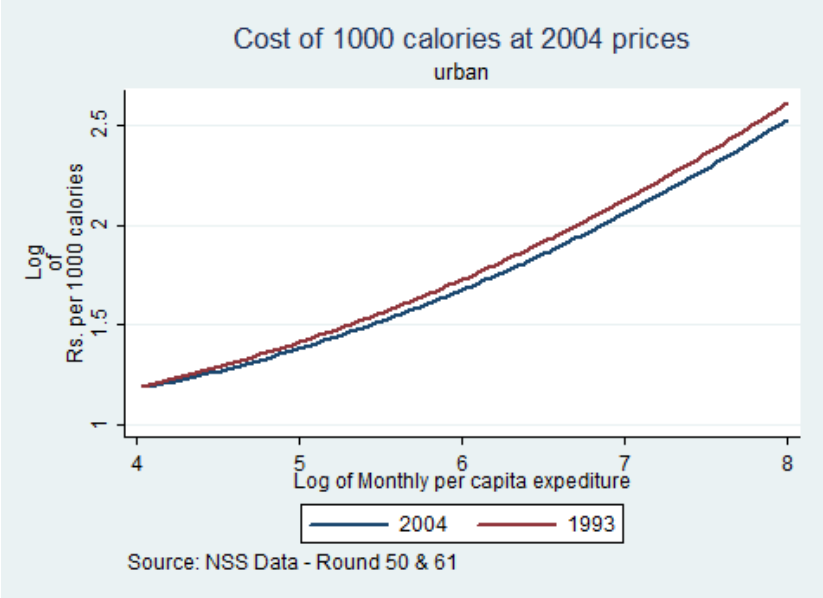


Figure 16: Costs of 1000 Calories and MPCE in Urban India (2004 Prices), 1993 and 2004



The pattern observed for urban India, displayed in Figure 16, is not so different from that for rural India. Both curves rise implying that more affluent consumers switch to more expensive calories. But the 2004 curve lies below that for 1993, and the gap between them is narrower than in Figure 15. It follows therefore that while more affluent consumers in urban areas

switch into more expensive calories compared with others, the switches are slightly less expensive than in 1993.

In sum, in both rural and urban areas, higher MPCE induces shifts into more expensive calories. However, over time, despite greater affluence, these switches were less expensive in 2004 than in 1993. That this reflects expansion of food choices over time is plausible but subject to validation.

(b) Disaggregation by Household Type

A disaggregation by household type offers additional insights in so far as food preferences are shaped not just by incomes and prices but also by activity patterns and group identity/affinity.[6] The disaggregation used is not as refined as we would have liked but serves as a first approximation.

For rural India, the groups are: self-employed in agriculture, self-employed in non — agriculture, agricultural labour, other labour, and others. For urban India, the groups comprise: self-employed, regular wage/salary earners, casual labour, and others.

Let us first consider their economic status in terms of MPCE.

Table 7
MPCE by Household Type in Rural India, 1993 and 2004

Household Type	MPCE (Rs)	
	1993	2004
Self-Employed in Agriculture	602	604
Self-Employed in Non-Agriculture	595	583
Agricultural Labour	445	416
Other Labour	549	520
Others	786	821
Total	565	559

[6] In particular, what is required is data on time use patterns of household members.

Table 7 shows that the MPCE of Others was highest in 1993, followed by self-employed in non-agriculture, and then self-employed in agriculture. Agriculture labour households were the poorest. This ranking was preserved in 2004. Except for Others, all other groups recorded about the same or lower MPCE in 2004. So there was little economic improvement, if any.

Table 8
MPCE by Household Type in Urban India, 1993 and 2004

Household Type	MPCE (Rs)	
	1993	**2004**
Self-Employed	810	982
Regular Wage/Salary Earners	1016	1213
Casual Labour	538	580
Others	1030	1448
Total	875	1053

By contrast, as shown in Table 8, all urban groups recorded gains, some more than others. Others, for example, recorded the largest increase, followed by Regular Wage/Salary Earners. As a result, the average MPCE recorded a substantial increase.

In sum, much of the gains accrued to urban groups during 1993–2004.

Let us now turn to the graphs in Figure 17. The two curves for the self-employed in agriculture overlap over a segment but the 2004 curve lies below that for 1993 over large segments at low and high MPCE. So for the overlapping segments, it follows that the switch to more expensive calories with higher MPCE is largely unchanged between 1993 and 2004. At low MPCE with the 2004 curve lying below that for 1993, consumers switch to more expensive calories with higher MPCE but these are less expensive than in 1993. At the upper end, the 2004 curve not just lies below the 1993 curve but also flattens. The latter implies that the switch into more expensive calories approaches a plateau and these are much less expensive than in 1993.

Figure 17: Cost of 1000 Calories for and MPCE of Self-Employed in Agriculture, 1993 and 2004

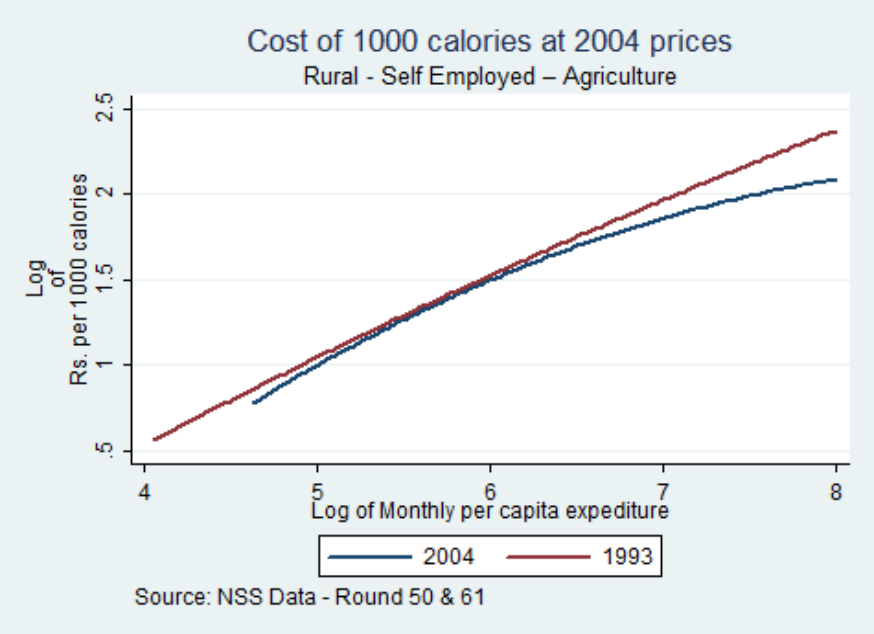
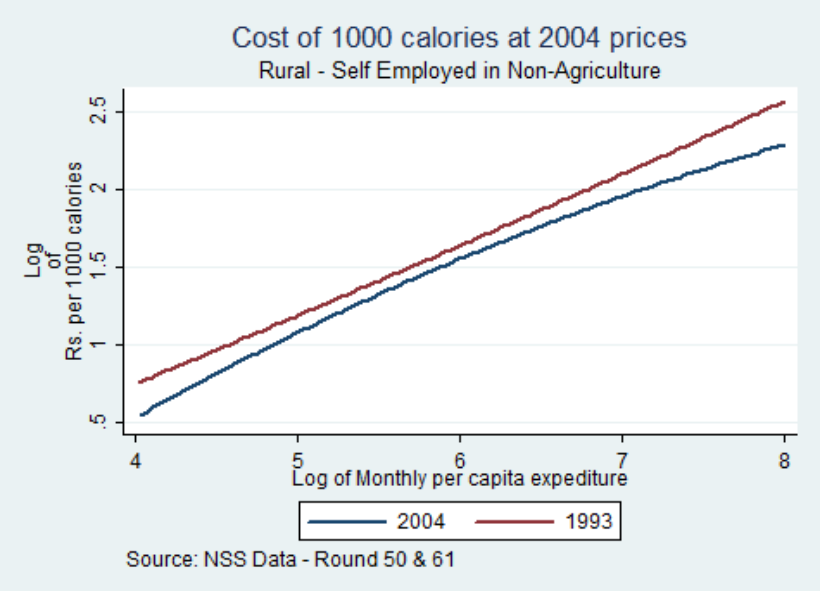


Figure 18: Cost of 1000 Calories for and MPCE of Self-Employed in Non-Agriculture, 1993 and 2004



The 2004 curve for the self-employed in non-agriculture (Figure 18) lies below that for 1993 throughout, implying that these households switch into more expensive calories with higher MPCE but these are less expensive relative to 1993. This is consistent with the earlier finding based on the aggregate sample for rural India.

Agriculture labour households are among the poorest and benefited little over the period 1993–2004. Yet the relations between cost of calories and MPCE show a significant shift. While the 2004 curve lies below that for 1993 throughout, its slope rises first and then flattens out, implying that the switch into more expensive calories — much less expensive than in 1993 — tends to stop.

Other labour households furnish another contrast to the aggregate sample picture of switches into more expensive calories. At MPCE <Rs 190, the 2004 curve lies above that for 1993 and then at higher MPCE shifts below it. So the switches in 2004 *relative* to 1993 reveal a mixed pattern — more expensive at lower MPCE and less expensive at higher MPCE. What is also noteworthy is that, while the slope of the 1993 curve diminishes, that of the 2004 curve is largely unchanged.

Figure 19: Cost of 1000 Calories for and MPCE of Agricultural Labour, 1993 and 2004

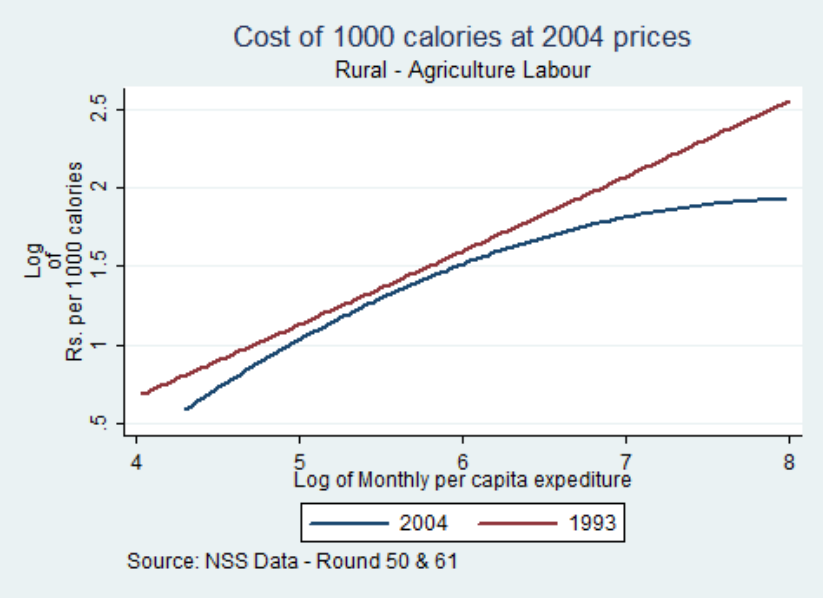


Figure 20: Cost of 1000 Calories for and MPCE of Other Labour, 1993 and 2004

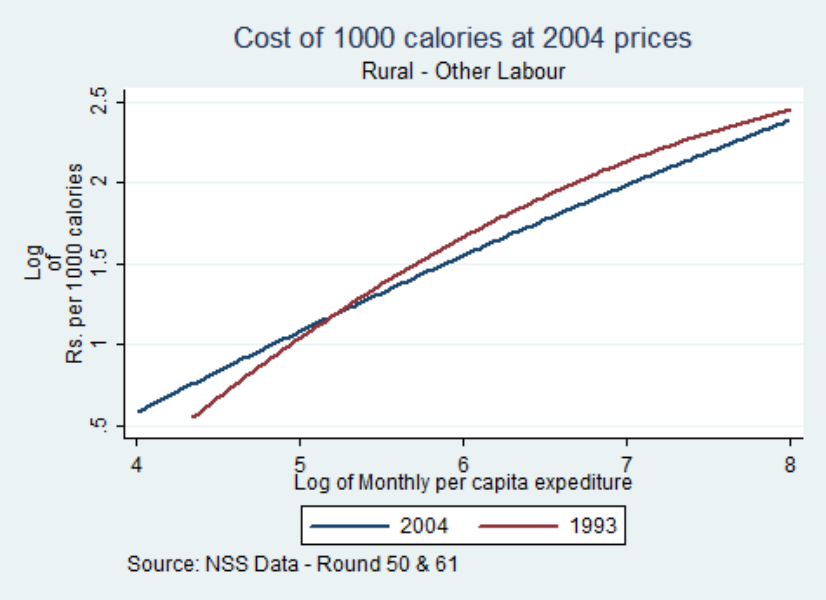
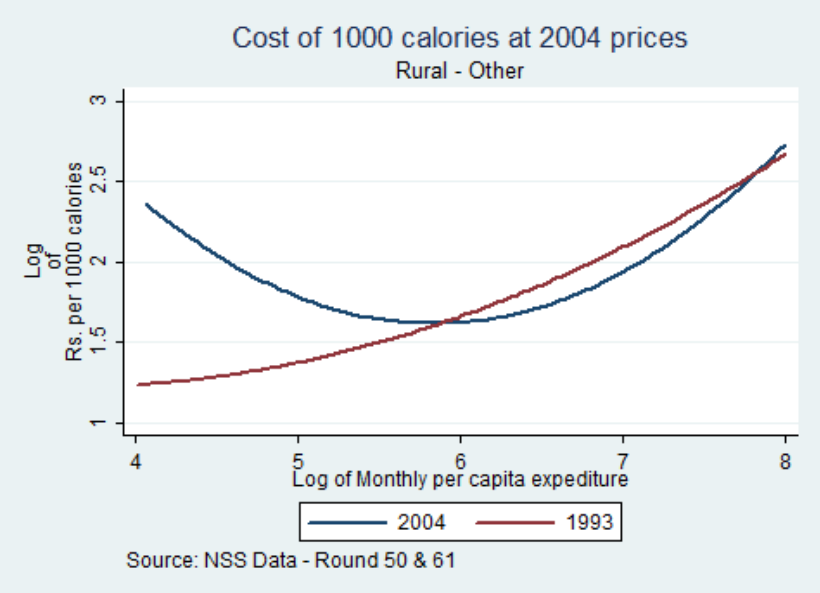


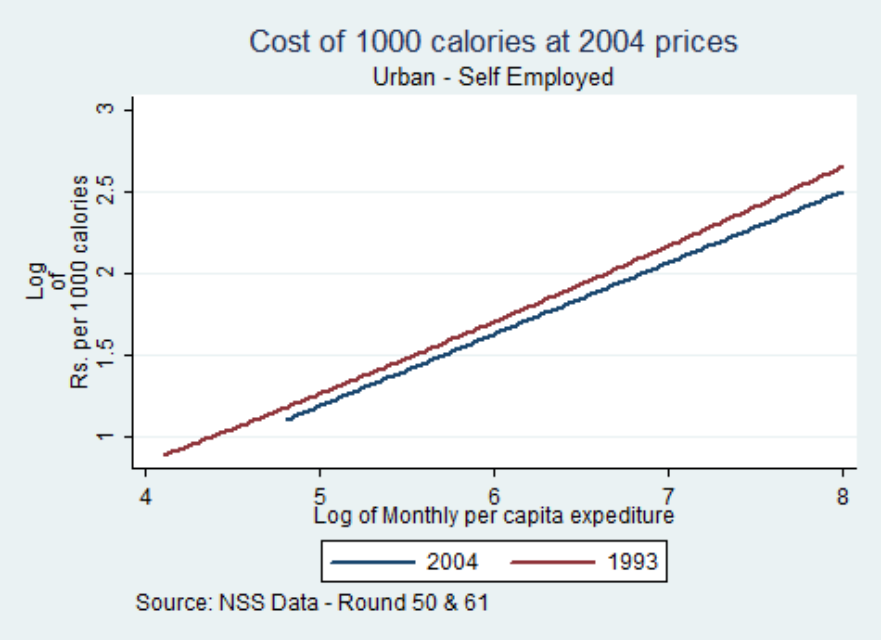
Figure 21: Cost of 1000 Calories for and MPCE of Others, 1993 and 2004



The 1993 curve for the residual group, Others, in Figure 21 rises steadily over the MPCE scale while that for 2004 is U-shaped. The latter lies above the former up to MPCE of (approximately) Rs 370 and then below it at higher MPCE. So on the falling segment of the 2004 curve consumers switch rapidly into less expensive calories and after the cross-over

MPCE to more expensive calories. However, *relative* to 1993, on the falling segment of the 2004 curve the calories are far more expensive while after the first cross-over point as the curve begins to rise there is a sharp reversal, with switches into more expensive calories and a narrowing of the gap between the two curves.

Figure 22: Cost of 1000 Calories for and MPCE of Self-Employed in Urban India, 1993 and 2004



Let us now turn to the urban groups, beginning with the self-employed in Figure 22. This does not hold any surprises as the 2004 curve lies below that for 1993. So switches into more expensive calories with higher MPCE were as much a feature of the 2004 curve as they were of the 1993 curve with the notable difference that the calories were less expensive in the former throughout the MPCE scale.

Figure 23 points to a widening of the gap between the 1993 and 2004 curves for regular wage/salary earners, implying that the switches at higher MPCE were increasingly less expensive in 2004 *relative* to 1993.

Casual labour households are among the poorest in urban India and yet they switch into more expensive calories with higher MPCE. This pattern holds for both 1993 and 2004 but with the difference that calorie costs remained lower across the MPCE scale in the latter. Figure 24 illustrates this for casual labour in urban India.

Figure 23: Cost of 1000 Calories for and MPCE of Regular Wage/Salary Earners in Urban India, 1993 and 2004

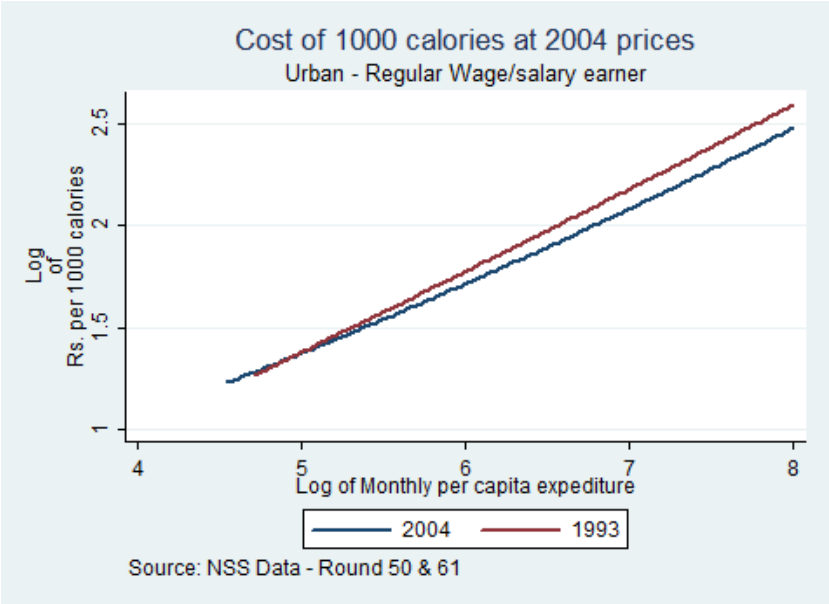
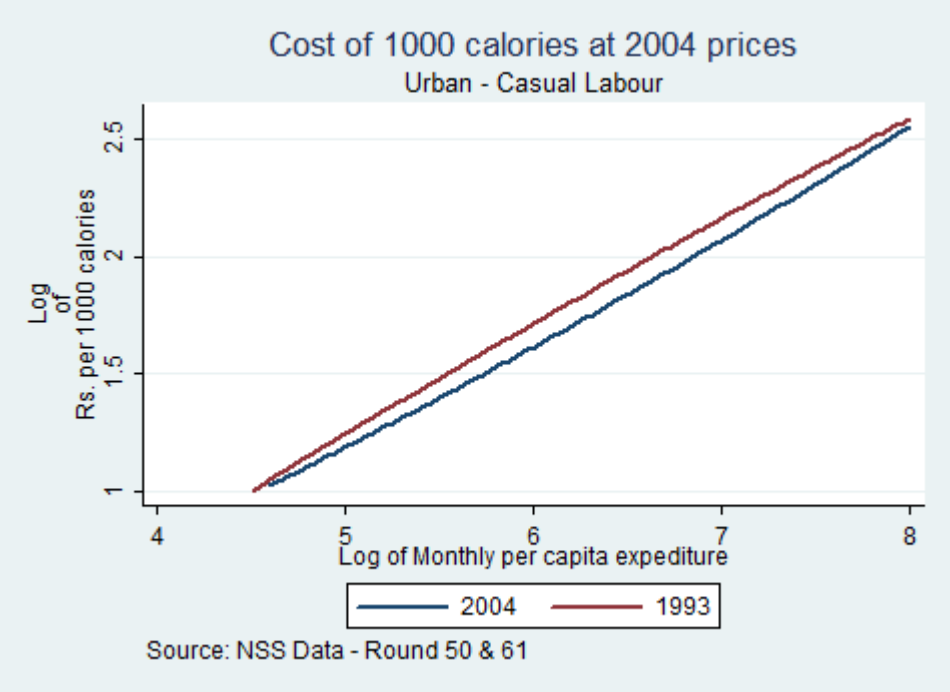


Figure 25 reveals an interesting contrast to the aggregate urban sample, with both 1993 and 2004 curves being U-shaped. The falling segment of the 2004 curve starts considerably higher than the 1993 curve and after MPCE attains a value of (approximately) Rs 900 it begins to rise but remains below the 1993 curve. So switches into more expensive calories take place at high MPCE in 2004 but these calories cost more in 1993.

To summarise the main points, the Deaton–Dreze (2009) argument that the decline in cereal calories is largely the reason for switches into more expensive calories is an overstatement and a trifle misleading. Our analysis suggests (i) that, in both rural and urban samples, the

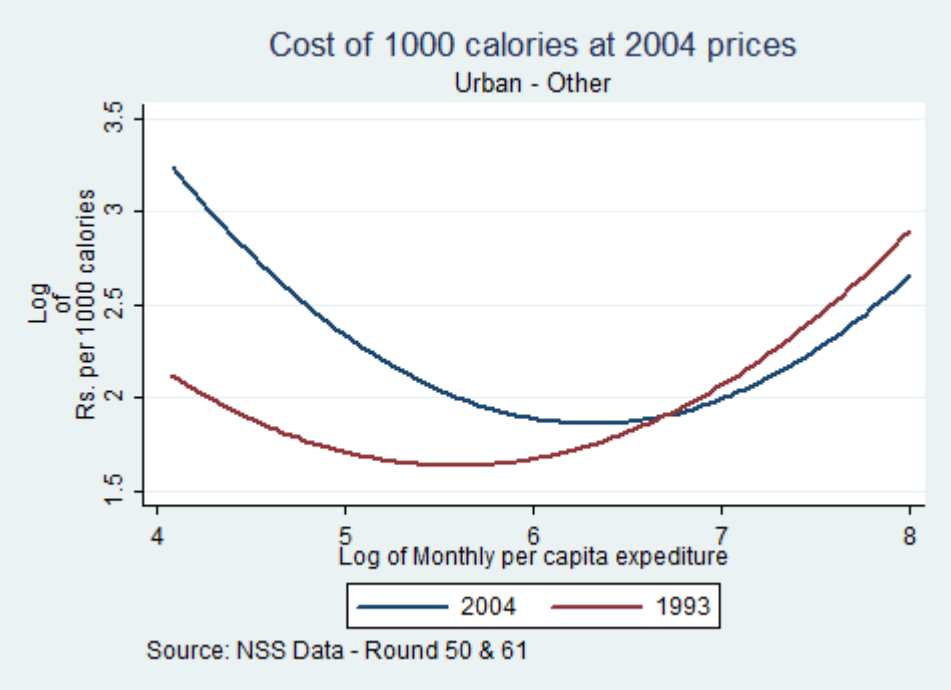
cost of calorie and MPCE curves rise with MPCE, confirming the general proposition that consumers switch into more expensive calories with higher MPCE; and (ii) the 2004 curves lie below the 1993 curves, implying that the calories were less expensive in 2004 across the expenditure scale. (iii) However, disaggregation of rural and urban samples by type of household offers interesting insights pointing to some reversals and threshold effects. One plausible explanation of why calories are cheaper in 2004 (relative to 1993) is that consumer choices may have expanded over the period in question. These are unlikely to be captured through a reduction in cereal calories alone. As for the reversals and threshold effects, a detailed investigation into consumer preferences for food and differences in responsiveness to changes in relative prices is necessary to throw new light on why the 2004 patterns differ in diverse ways from those observed for 1993[7]

Figure 24: Cost of 1000 Calories for and MPCE of Casual Labour in Urban India, 1993 and 2004



[7] For a sample of contributions, see Behrman and Deolalikar (1989), and Jha et al. (2009).

Figure 25: Cost of 1000 Calories for and MPCE of Others in Urban India, 1993 and 2004



VI. Changes in Diets and Nutrition

(a) Rural and Urban Samples

Here we build on the Deaton–Dreze analysis (2009) of food commodities that contributed to reduction in calories, protein and fats. Our analysis of sources of these nutrients is more detailed, as also of changes in food consumption patterns. The results are given in Tables 9–12.

Calories

Let us first consider the results for the rural sample in Table 9. As may be noted, the single largest source of calories is cereals. In 1993, these accounted for about 71 per cent of total calorie intake. Although cereals continued to be the most important source of calories (67.5 per cent), their contribution was lower. In fact, calories from cereals recorded a more than

modest reduction (from 1530 calories to 1383 calories), implying a reduction of 9.6 per cent). Out of the three other important sources of calories (milk/milk products/ghee/butter, Vanaspati-oil, pulses/nuts-dry fruits), the contribution of Vanaspati-oil rose considerably (by about 31 per cent) while that of the remaining two remained largely unchanged. Sugar's contribution fell by about 5 per cent while that of vegetables rose by 15 per cent. Thus altogether calorie intake declined from 2156 to 2047 — a reduction of about 5.5 per cent.

In urban India, calorie intake declined by a lower amount — from 2074 to 2021 — a reduction of about 2.6 per cent. As in the rural sample, much of this reduction reflects reduction in cereal calories — from 1213 to 1133 — a reduction of 6.6 per cent. Among other calorie sources, milk/milk products/ghee/butter contributed a slightly higher amount (their contribution rose from 181 to 189 — about 4.5 per cent); there was a substantial increase in calorie intake from vanaspati-oil (from 168 to 199 — an increase of about 18.5 per cent); by contrast, that of sugar decreased — from 129 to 115 — a reduction of about 11 per cent); and that of pulses/nuts-dry fruits rose but only by a negligible amount.

Protein

Let us now look at changes in sources of proteins shown in Table 10. In rural India, protein intake declined — from 60.3 (gms) to 55.8 (gms) — a reduction of about 7.5 per cent. Much of it reflected a reduction in protein intake from cereals — from 41.8 (gms) to 37.9 (gms), a reduction of about 9.3 per cent. All other sources remained largely unchanged over the period 1993–2004.

By contrast, changes in protein intake in urban India were slight — the average intake fell from 57.3 (gms) to 55.4 (gms), a reduction of barely 3.3 per cent. Most of it was due to reduction in protein intake from cereals — from 34.1 (gms) to 32 (gms), a reduction of over 6 per cent.

Fats

Table 11 indicates that fat intake rose from 31.5 (gms) to 35.4 (gms) in rural India — an increase of 12. 4 per cent. While there was a slight reduction in fat intake from cereals, the main contributor to the higher intake was Vanaspati-oil — its contribution rose from 12.3 (gms) to 16.2 (gms), an increase of just under 32 per cent. Pulses/nuts/dry fruits contributed a slightly higher amount — from 2.4 (gms) to 3.1 (gms), an increase of about 29 per cent.

Urban India also recorded higher intake of fats — it rose from 42.1 (gms) to 47.5 (gms), an increase of just under 13 per cent. As in rural India, much of the increase came from Vanaspati-oil — its contribution rose from 18.6 (gms) to 22.1 (gms), an increase of about 19 per cent. Additional fat intake due to milk/milk products/ghee/butter was small — it increased from 13.2 (gms) to 13.8 (gms). Contribution of pulses/nuts-dry fruits/others also rose by a small amount — 4 (gms) to 5.6 (gms).

Changes in Diets

Underlying these changes in nutrient intakes from different food commodities are the changes in their own consumption. These are given in Table 12.

Let us first examine the changes in food consumed in rural India. There was a sharp reduction in cereal consumption — from 448 (gms) to 404 (gms) — a reduction of about 10 per cent. The intake of sugar decreased too — from 26 (gms) to 24.7 (gms) — a reduction of 5 per cent. Milk products/ghee/butter also recorded a slightly lower intake — from 114. 3 (gms) to 111.8 (gms) — a reduction of about 2.2 per cent. Pulses/nuts/dry fruits recorded a very sharp drop — from 366.3 (gms) to 203.5 (gms), a reduction of about 44 per cent. By contrast, intake of Vanaspati-oil rose more than moderately — from 12.3 (gms) to 16.2 (gms), an increase of about 32 per cent. Intake of eggs, and meat/fish/poultry rose but only slightly.

Consumption of fruits, and vegetables, on the other hand, rose moderately — from 16.4 (gms) to 19.7 (gms), and from 159.5 (gms) to 167.6 (gms), respectively.

Reduction in cereal intake was lower in urban India — the intake fell from 355 (gms) to 331.3 (gms), a reduction of about 6.7 per cent. Pulses/nuts-dry fruits recorded a somewhat drastic reduction — from 523.7 (gms) to 327.2 (gms), a reduction of about 37.5 per cent. Sugar recorded a lower intake too — from 32.4 (gms) to 29 (gms), a reduction of about 10.50 per cent. By contrast, eggs, meat/fish/poultry, and vegetables recorded small increases. While milk/milk products/ghee/butter, and Vanaspati-oil recorded moderately higher intakes — rising from 143.2 (gms) to 149.1 (gms), and from 18.6 (gms) to 22.1 (gms), respectively), vegetables recorded more than a moderate increase — from 168 (gms) to 182.4 (gms), an increase of about 8.51 per cent.

Thus food composition/diet changed considerably in both rural and urban areas over the period 1993–2004.[8] While reduction in cereal intake — the single largest source of calorie and protein intake — ranged from 6.7 per cent to 9.8 per cent, there were more than moderate reductions in the intake of pulses/nuts/dry fruits as well. By contrast, intakes of Vanaspati-oil, and vegetables rose. As these are linked to intakes of calories, proteins and fats with varying importance, an investigation of how food consumption patterns changed in response to changes in income and relative prices is necessary.

(b) Disaggregation by Household Type

First, for each nutrient, rural households are disaggregated by household type. This is followed by an analysis of urban households of different types.

[8] For a rich and insightful analysis of dietary changes in India — specifically, the higher fat consumption by the bottom six expenditure per capita deciles over the period 1993–2004 — see Deolalikar (2010).

Calories

As in an earlier section we found differences in consumer behaviour by household type keeping the cost of calories constant — specifically, switches into more expensive calories with higher MPCE over the period 1993–2004 — an attempt is made below to throw light on changes in nutrient intake by source. The results are given in Tables 13–22. Our comments are brief and selective.

Let us first consider the results for calories in rural India in Tables 13 and 16. Five household types are analysed here. Relative to the reduction in calorie intake in rural India (5.5 per cent), the self-employed in agriculture recorded a slightly larger reduction of a little over 7 per cent. All other household types recorded lower reductions in calorie intake, with the self-employed in non-agriculture recording the lowest reduction (about 2 per cent). It is also noteworthy that both agricultural labour and other labour households recorded lower reductions than the average for rural India.

Change in calorie intake from cereals also varied by household type. The average reduction was 9.6 per cent. While the self-employed in agriculture recorded a larger reduction (about 12 per cent), others recorded a larger reduction but about the same as the aggregate sample. The self-employed in non-agriculture recorded the lowest reduction (6 per cent).

What is interesting to note is that changes in calorie intake from other sources varied too. An important source is milk/milk products/ghee/butter. The average calorie intake was unchanged. However, both the self-employed in non-agriculture and other labour had slightly higher calorie intakes (3 and 4 per cent, respectively) while others had a slightly lower intake (about 4 per cent).

Another important source is Vanaspati-oil. Average calorie intake from it rose by 32 per cent. Each household type also consumed more calories from this source but in varying amounts.

Agricultural labour households recorded the largest increase (about 44 per cent) while other labour and others had smallest increases (about 22 per cent).

Average calorie intake from sugar decreased (about 5 per cent). Variation by household type was by no means small. Calorie intake of others declined sharply (about 11 per cent) and of self-employed in agriculture by a smaller amount (7 per cent). By contrast, agricultural labour households increased their calorie intake by a small amount (about 4 per cent).

Yet another important source is pulses/nuts/dry fruits/others. The average calorie intake rose by a small amount (4 per cent) but there was large variation by household type. Calorie intake of others rose by 24 per cent and that of self-employed in non-agriculture by 8 per cent. Both agricultural labour and other labour households recorded smaller reductions in calorie intake.

While not as important a source of calories as other food commodities discussed earlier, vegetables account for 4 per cent of total calorie intake. The average calorie intake remained unchanged but there was some variation by household type. Agricultural labour households reduced their calorie intake by a small amount (under 4 per cent) while self-employed in non-agriculture consumed slightly higher calories from this source (about 3 per cent).

Let us now examine changes in calorie intake in urban India over the period 1993–2004, based on the results in Tables 19 and 22.

Average calorie intake reduction in urban India was lower than in rural India (2.6 per cent and 5.5 per cent, respectively). Variation by household type was small. Variation in calories from cereals was small too.

Calorie intake from milk/milk products/ghee/butter rose on average by over 4 per cent. It rose among all household types as well but by varying amounts. Casual labour households increased their calorie intake by about 12 per cent, followed by others (9.5 per cent).

Calories from Vanaspati-oil rose sharply. The average was higher by 19 per cent. All household groups consumed higher calories — others by 33 per cent, casual labour by 28 per cent, and self-employed by 20 per cent.

Calories from sugar decreased on average by 11 per cent. Self-employed and regular wage/salary households also recorded large reductions (12 per cent and 11 per cent, respectively) while casual labour households decreased their intake least.

Average calorie intake from pulses/nuts/others remained unchanged. However, there was small variation by household type. While self-employed and regular wage/salary earners had a small increase (4 per cent), others recorded a large reduction (12 per cent).

As far as calories from fruits are concerned, the average fell slightly. However, others increased their consumption by 23 per cent, and casual labour by 8 per cent. By contrast, self-employed reduced their intake by about 6 per cent, and regular wage/salary earners by about 5 per cent.

Vegetables are a more important source of calories than fruits. The average from the former declined by over 2 per cent. Others, by contrast, consumed more calories from this source (4 per cent) while self-employed and regular wage/salary earners decreased their intake (4 per cent 3 per cent, respectively).

Protein

In rural India, average protein intake fell by about 7.5 per cent over the period 1993–2004, as shown in Tables 14 and 17. But, as in the case of calories, the reduction in protein intake

varied by household type. Self-employed in agriculture reduced their intake by 10 per cent while self-employed in non-agriculture did by a little over 3 per cent. Both agricultural labour and other labour had lower but non-negligible reductions (7.5 per cent and 6.6 per cent, respectively).

Much of the reduction in protein intake was due to lower protein intake from cereals. The average reduction of the latter was 9.3 per cent. The contrast between self-employed in agriculture and self-employed in non-agriculture is striking in so far as the reduction recorded by the former was more than twice as large as that recorded by the latter (about 13 per cent and about 5 per cent, respectively). On the other hand, while both agricultural labour and other labour households experienced reductions lower than the average (over 8 per cent and 7 per cent, respectively), these were not small.

Tables 20 and 23 contain the results on protein intakes in urban India in 1993 and 2004. There was a small reduction in the average protein intake (3.3 per cent). Both self-employed and regular wage/salary earners recorded reductions that were slightly larger than the average while casual labour and others experienced reductions smaller than the latter.

The reductions in protein intake were largely due to lower protein intakes from cereals. The average declined by over 6 per cent.

Both self-employed and regular wage/salary earners had about similar reductions as the average (a little over 6 per cent) while casual labour and others had slightly lower reductions (under 6 per cent and 4 per cent, respectively).

Fats

Fat intake increased in rural India by 12.4 per cent over the period 1993–2004, as shown in Tables 15 and 18. The increase varied by household type. Agricultural labour increased their

intakes most (about 19 per cent), followed by self-employed in agriculture (16.5 per cent) and then other labour, self-employed in agriculture and others (their intakes were higher by 10 per cent).

Vanaspati-oil, which accounts for about 39 per cent of fats, contributed to higher fat intake. Agricultural labour increased their intake by 44 per cent, followed by self-employed in non-agriculture (33 per cent), and then self-employed in agriculture (29 per cent). Other labour and others increased their fat intakes too but by lower amounts (23 per cent and 22 per cent, respectively).

Another contributor to higher fat intakes but far less important than Vanaspati-oil was pulses/nuts/others (this group accounted for 8 per cent of fats consumed). The average intake rose by 29 per cent. Self-employed in non-agriculture increased their intakes by 46 per cent, followed by others (37 per cent), and then self-employed in agriculture (33 per cent) and agricultural labour (10 per cent).

Changes in fat consumption for urban India are given in Table 21 (for 1993) and Table 24 (for 2004) Average fat consumption in urban India rose by under 13 per cent. Casual labour and others increased their fat intakes more than other household types (over 17 per cent and over 21 per cent, respectively).

Although milk/milk products/ghee/butter did not contribute much to fat intake — the average rose by just 4.5 per cent — casual labour and others consumed (proportionately) more than other household types. Nor did pulses/nuts-dry fruits/others contribute much. The main increase came from higher consumption of Vanaspati-oil. Average fat intake from this source rose by under 19 per cent, with others and casual labour recording higher intakes.

Table 9
Mean Per Capita Calorie Intake by Food Commodities, 1993 and 2004

Rural/Urban Year	Cereals	Milk Products Ghee/Butter	Vanaspati-Oil	Sugar	Eggs	Meat/Fish /Poultry	Pulses/Nuts /Dry Fruits	Fruits	Vegetables	Total
Rural										
1993	1530	137	111	103	2	12	151	20	89	2156
2004	1383	137	145	98	3	12	156	23	90	2047
Urban										
1993	1213	181	168	129	5	16	231	37	94	2074
2004	1133	189	199	115	6	16	235	36	92	2021

Table 10
Mean Per Capita Protein Intake (Gms) by Food Commodities, 1993 and 2004

Rural/Urban Year	Cereals	Milk Products Ghee/Butter	Vanaspati-Oil	Sugar	Eggs	Meat/Fish /Poultry	Pulses/Nuts /Dry Fruits	Fruits	Vegetables	Total
Rural										
1993	41.8	5.3	0	0	0.2	2.0	7.8	0.2	2.9	60.3
2004	37.9	5.3	0	0	0.3	2	7.3	0.3	2.8	55.8
Urban										
1993	34.1	6.7	0	0	0.4	2.6	10	0.4	3.1	57.3
2004	32.0	7	0	0	0.5	2.7	9.8	0.4	3.1	55.4

Table 11
Mean Per Capita Fat Intake (Gms) by Food Commodities, 1993 and 2004

Rural/Urban Year	Cereals	Milk Products Ghee/Butter	Vanaspati-Oil	Sugar	Eggs	Meat/Fish /Poultry	Pulses/Nuts /Dry Fruits	Fruits	Vegetables	Total
Rural										
1993	5.4	9.7	12.3	0	0.2	0.3	2.4	0.7	0.4	31.5
2004	4.8	9.7	16.2	0.0	0.3	0.2	3.1	0.8	0.4	35.4
Urban										
1993	4.0	13.2	18.6	0	0.4	0.4	4	1.1	0.4	42.1
2004	3.7	13.8	22.1	0	0.5	0.3	5.6	1.1	0.4	47.5

Table 12
Mean Per Capita Consumption of Food Commodities (Gms), 1993 and 2004

Rural/Urban Year	Cereals	Milk Products Ghee/Butter	Vanaspati-Oil	Sugar	Eggs	Meat/Fish /Poultry	Pulses/Nuts /Dry Fruits	Fruits	Vegetables
Rural									
1993	448	114.3	12.3	26	1.2	10.4	366.3	16.4	159.5
2004	403.9	111.8	16.2	24.7	1.9	11.3	203.5	19.7	167.6
Urban									
1993	355.2	143.2	18.6	32.4	2.9	13.9	523.7	32.4	168.1
2004	331.3	149.1	22.1	29	3.3	14.2	327.2	33.1	182.4

Table 13
Mean Per Capita Intake of Calories: 1993 — Rural

Household Type		Total	Cereals	Milk/Products / Ghee/Butter	Vanaspati-oil	Sugar	Eggs	Meat/Fish/ Poultry	Pulses/Nuts-DryFruits/ others	Fruits	Vegetables
1	Self Employed in Non-Agriculture	2083	1460	122	113	102	3	16	150	24	94
2	Agriculture Labour	1933	1475	60	90	74	2	11	127	13	79
3	Other Labour	1966	1406	88	106	95	2	14	149	22	83
4	Self Employed — Agriculture	2354	1641	194	118	119	2	11	155	20	95
9	Other	2241	1431	184	139	125	4	17	208	32	101
Total		2156	1530	137	111	103	2	12	151	20	94

Table 14
Mean Per Capita Intake of Protein: 1993 – Rural

Household Type		Total	Cereals	Milk/Products / Ghee/Butter	Vanaspati-oil	Sugar	Eggs	Meat/Fish/ Poultry	Pulses/Nuts-DryFruits/ others	Fruits	Vegetables
1	Self Employed in Non-Agriculture	57.5	39.3	4.7	0.0	0.0	0.2	2.6	7.4	0.3	3.0
2	Agriculture Labour	52.6	38.9	2.4	0.0	0.0	0.1	1.9	6.5	0.1	2.7
3	Other Labour	54.3	38.4	3.4	0.0	0.0	0.2	2.3	7.1	0.2	2.6
4	Self Employed — Agriculture	67.4	46.2	7.6	0.0	0.1	0.1	1.8	8.4	0.2	3.0
9	Other	62.0	38.9	7.0	0.0	0.0	0.3	2.7	9.4	0.3	3.3
Total		60.3	41.8	5.3	0.0	0.0	0.2	2.0	7.8	0.2	2.9

Table 15
Mean Per Capita Intake of Fat: 1993 — Rural

Household Type		Total	Cereals	Milk/Prducts/ Ghee/Butter	Vanaspati-oil	Sugar	Eggs	Meat/Fish/ Poultry	Pulses/Nuts-DryFruits/ Others	Fruits	Vegetables
1	Self Employed in Non-Agriculture	30	5	9	13	0.0	0.2	0.4	2.4	0.8	0.4
2	Agriculture Labour	22	5	4	10	0.0	0.1	0.3	1.9	0.5	0.4
3	Other Labour	28	5	6	11	0.0	0.2	0.3	2.4	1.0	0.4
4	Self Employed — Agriculture	37	6	14	13	0.0	0.1	0.2	2.4	0.6	0.4
9	Other	39	5	13	15	0.0	0.3	0.4	3.5	1.1	0.5
Total		31	5	10	12	0.0	0.2	0.3	2.4	0.7	0.4

Table 16
Mean Per Capita Intake of Calories: 2004 — Rural

Household Type		Total	Cereals	Milk/Prducts/ Ghee/Butter	Vanaspati-oil	Sugar	Eggs	Meat/Fish/ Poultry	Pulses/Nuts-DryFruits/ Others	Fruits	Vegetables
1	Self Employed in Non-Agriculture	2043	1368	126	149	96	4	15	161	25	97
2	Agriculture Labour	1851	1356	60	130	76	3	9	121	17	77
3	Other Labour	1888	1305	91	130	91	3	15	142	26	82
4	Self Employed — Agriculture	2186	1443	192	1523	110	2	10	155	22	95
9	Other	2176.	1300	176	170	111	5	16	258	35	101
Total		2047	1383	137	145	98	3	12	156	23	90

Table 17
Mean Per Capita Intake of Protein: 2004 — Rural

Household Type		Total	Cereals	Milk/Products/ Ghee/Butter	Vanaspati-oil	Sugar	Eggs	Meat/Fish/ Poultry	Pulses/Nuts-DryFruits/ others	Fruits	Vegetables
1	Self Employed in Non-Agriculture	55.7	37.3	4.9	0	0	0.3	2.4	7.5	0.3	3
2	Agriculture Labour	48.7	35.6	2.4	0	0	0.3	1.6	6.2	0.2	2.4
3	Other Labour	51.2	35.7	3.6	0	0	0.3	2.4	6.5	0.3	2.5
4	Self Employed — Agriculture	60.9	40.5	7.4	0	0	0.2	1.8	7.7	0.3	2.9
9	Other	58.6	35.7	6.8	0	0	0.4	2.7	9.4	0.4	3.2
Total		55.8	37.9	5.3	0	0	0.3	2	7.3	0.3	2.8

Table 18
Mean Per Capita Intake of Fat: 2004 — Rural

Household Type		Total	Cereals	Milk/Products /Ghee/Butter	Vanaspati-oil	Sugar	Eggs	Meat/Fish/ Poultry	Pulses/Nuts-DryFruits/ others	Fruits	Vegetables
1	Self Employed in Non-Agriculture	35.4	4.4	9.0	16.6	0.0	0.3	0.3	3.5	0.9	0.4
2	Agriculture Labour	26.5	4.3	4.2	14.4	0.0	0.3	0.2	2.1	0.7	0.4
3	Other Labour	30.4	4.6	6.5	14.5	0.0	0.3	0.3	2.7	1.3	0.3
4	Self Employed — Agriculture	40.7	5.3	13.8	16.9	0.0	0.2	0.2	3.2	0.6	0.4
9	Other	43.0	4.1	12.6	18.9	0.0	0.4	0.3	4.8	1.3	0.4
Total		35.4	4.8	9.7	16.2	0.0	0.3	0.2	3.1	0.8	0.4

Table 19
Mean Per Capita Intake of Calories: 1993 — Urban

Household Type		Total	Cereals	Milk/Prducts/ Ghee/Butter	Vanaspati-oil	Sugar	Eggs	Meat/Fish/ Poultry	Pulses/Nuts-DryFruits/ others	Fruits	Vegetables
1	Self Employed	2054	1225	191	162	131	4	16	193	36	96
2	Regular wage/salary	2140	1198	202	189	137	6	17	250	41	100
3	Casual Labour	1842	1273	76	116	94	3	16	164	24	75
9	Other	2312	1138	200	156	127	5	15	534	43	94
Total		2074	1213	181	168	129	5	16	235	36	92

Table 20
Mean Per Capita Intake of Protein: 1993 — Urban

Household Type		Total	Cereals	Milk/Prducts/ Ghee/Butter	Vanaspati-oil	Sugar	Eggs	Meat/Fish/ Poultry	Pulses/Nuts-DryFruits/ others	Fruits	Vegetables
1	Self Employed	57.7	35.0	7.1	0.0	0.0	0.3	2.6	9.1	0.4	3.1
2	Regular wage/salary	58.8	33.5	7.4	0.0	0.0	0.5	2.7	10.8	0.4	3.4
3	Casual Labour	50.2	34.2	3.0	0.0	0.0	0.2	2.5	7.5	0.2	2.4
9	Other	61.9	31.9	7.4	0.0	0.0	0.4	2.5	16.1	0.5	3.1
Total		57.3	34.1	6.7	0.0	0.0	0.4	2.6	10.0	0.4	3.1

Table 21
Mean Per Capita Intake of Fat: 1993 — Urban

Household Type		Total	Cereals	Milk/Prducts/ Ghee/Butter	Vanaspati-oil	Sugar	Eggs	Meat/Fish/ Poultry	Pulses/Nuts-DryFruits/ others	Fruits	Vegetables
1	Self Employed	41.6	4.2	14.0	18.0	0.0	0.3	0.4	3.3	1.0	0.4
2	Regular wage/salary	46.6	3.8	14.8	21.0	0.0	0.5	0.4	4.4	1.1	0.5
3	Casual Labour	27.0	4.0	5.4	12.9	0.0	0.2	0.4	2.6	1.1	0.3
9	Other	46.9	3.6	14.6	17.4	0.0	0.4	0.4	9.0	1.1	0.4
Total		42.1	4.0	13.2	18.6	0.0	0.4	0.4	4.0	1.1	0.4

Table 22
Mean Per Capita Intake of Calories: 2004 — Urban

Household Type		Total	Cereals	Milk/Prducts/ Ghee/Butter	Vanaspati-oil	Sugar	Eggs	Meat/Fish/ Poultry	Pulses/Nuts-DryFruits/ others	Fruits	Vegetables
1	Self Employed	1995	1142	198	194	115	5	14	200	34	92
2	Regular wage/salary	2076	1112	206	219	122	7	15	260	39	97
3	Casual Labour	1799	1189	85	149	90	5	18	161	26	76
9	Other	2293	1098	219	208	120	6	19	471	53	98
Total		2021	1133	189	199	115	6	16	235	36	92

Table 23
Mean Per Capita Intake of Protein: 2004 — Urban

Household Type		Total	Cereals	Milk/Prducts/ Ghee/Butter	Vanaspati-oil	Sugar	Eggs	Meat/Fish/ Poultry	Pulses/Nuts-DryFruits/ others	Fruits	Vegetables
1	Self Employed	55.5	32.8	7.4	0.0	0.0	0.4	2.5	9.0	0.4	3.1
2	Regular wage/salary	56.4	31.3	7.6	0.0	0.0	0.5	2.7	10.6	0.4	3.2
3	Casual Labour	49.0	32.3	3.3	0.0	0.0	0.4	3.0	7.1	0.3	2.6
9	Other	61.2	30.7	8.3	0.0	0.0	0.5	3.2	14.7	0.5	3.2
Total		55.4	32.0	7.0	0.0	0.0	0.5	2.7	9.8	0.4	3.1

Table 24
Mean Per Capita Intake of Fat: 2004 — Urban

Household Type		Total	Cereals	Milk/Prducts/ Ghee/Butter	Vanaspati-oil	Sugar	Eggs	Meat/Fish/ Poultry	Pulses/Nuts Dry Fruits/ others	Fruits	Vegetables
1	Self Employed	46.5	3.9	14.4	21.5	0.0	0.4	0.3	4.6	0.9	0.4
2	Regular wage/salary	51.8	3.6	15.1	24.3	0.0	0.5	0.3	6.5	1.1	0.4
3	Casual Labour	31.6	3.8	6.0	16.5	0.0	0.4	0.3	3.0	1.2	0.4
9	Other	56.9	3.5	15.8	23.1	0.0	0.5	0.4	11.6	1.6	0.5
Total		47.5	3.7	13.8	22.1	0.0	0.5	0.3	5.6	1.1	0.4

VII. Prices, Expenditure and Nutrition

(a) Demand Equation

So far the focus was on dietary and nutrient intake changes in rural and urban India over the period 1993–2004. Although interesting insights emerged into dietary changes and their nutritional implications, it is necessary to supplement this analysis with regression analysis to isolate the effects of different food prices and expenditure (as a proxy for income).[9] As we have two cross-sections, we have constructed a panel data set for regression analysis with fixed effects. The specification used is given below:

$$\ln C_{it} = \alpha + \sum_{k=1}^{10} \beta^k \ln P^k_{it} + \kappa \ln E_{it} + \gamma_i + \lambda D_t + \varepsilon_{it} \text{.....(1)}$$

where C_{it} denote per capita daily calorie intake, i denotes state and t denotes year, P^k_{it} denotes unit price of a food commodity (cereals, vegetables, and so on, varying from k= 1 to 10),[10] E_{it} represents monthly per capita expenditure in a state i (at constant prices),[11] γ_i denotes a time invariant state fixed effect, D_t is a dummy variable that takes the value 0 for 1993 and 1 for 2004, and ε is an error term. This specification is also used for protein and fats, and estimated using robust regression. An advantage of this specification is that it allows a reduced form demand relation to be estimated (Pitt, 1983, and Pitt and Rosenzweig, 1985, Behrman and Deolalikar, 1988).[12] As changes in price induce substitutions between commodities, the price effects incorporate both direct and indirect effects (through substitutions). All continuous variables are transformed logarithmically.

[9] There is a continuing debate on whether NSS expenditure estimates are reliable. For a recent assessment, see Deaton (2010).

[10] These are nominal prices computed from the NSS data.

[11] We treat monthly per capita expenditure as given partly because of the tedious procedure involved in instrumenting it. In a sequel based on household data, this refinement is carried out.

[12] A caveat is necessary. As Deaton and Dreze (2009) point out, demand relations for calories, proteins and fats are misleading in so far as people do not buy calories and other nutrients but food commodities. This is a fair point but we have decided to follow the conventional terminology (e.g. Pitt, 1983, and Pitt and Rosenzweg, 1985).

(b) Results

First, the results for the demand equations for calories, protein and fats for rural India are discussed, followed by those for urban India.

Calories

The results for calories are given in Table 25. Given that calories, prices and income are in logs, their coefficients are elasticities. The main findings are noted below.

- The higher the price of rice and wheat, the lower was the calorie intake.
- The higher the price of inferior cereals, the lower was the calorie intake.
- The higher the price of milk/milk products, the higher was the calorie intake, implying large substitution effects.
- The higher the price of sugar, the lower was the calorie intake.
- The higher the price of eggs, the higher was the calorie intake.
- However, the higher the price of meat/fish/poultry, the lower was the calorie intake.
- The higher the price of vegetables, the higher was the calorie intake, implying important substitution effects.
- The higher the MPCE, the greater was the calorie intake.
- Controlling for these effects, there was a lower intake in 2004 relative to 1993.
- There were several significant state fixed effects, implying that after controlling for all effects, some states had larger and others lower calorie intakes, relative to the omitted state of Jammu and Kashmir.
- The overall specification is validated by the F-test.

Some comments are in order. Since the coefficients of price and expenditure variables are elasticities, they are directly comparable. One important point is that price effects are significant and in some cases large (e.g. vegetables, rice and wheat).That these influenced diets and consequently calorie intake is corroborated. In fact, higher cereal and inferior cereal prices are linked to lower calorie intake. On the other hand, expenditure is associated positively with calorie intake. Even though expenditure increases are likely to be

Table 25
Demand Equation for Calories in Rural India

Robust regression — Number of obs = 42; F(32, 9) = 919.98; Prob > F = 0.0000

Log Per capita Calories Intake	Coef.	Std. Err.	t	P>t
Log prices — Rice & Wheat	-0.1424889	0.020950	-6.80	0.0000
[1]Log prices — Inferior Cereals	-0.0314462	0.005579	-5.64	0.0000
Log prices — Milk-&-Prducts/ Ghee-Butter	0.0739062	0.019549	3.78	0.0040
Log prices — Vanaspati-oil	-0.0305219	0.025920	-1.18	0.2690
Log prices — Sugar	-0.0741987	0.022907	-3.24	0.0100
Log prices — Eggs	0.0524478	0.010633	4.93	0.0010
Log prices — Meat/Fish/Poultry	-0.134273	0.019158	-7.01	0.0000
Log prices — Pulses/Nuts-DryFruits/others	0.0047918	0.004172	1.15	0.2800
Log prices — Fruits	0.0303364	0.026843	1.13	0.2880
Log prices — Vegetables	0.3261172	0.037664	8.66	0.0000
Log Per capita Expenditure (mpce)	0.3694742	0.033675	10.97	0.0000
Time Dummy (0=1993, 1=2004)	-0.3842348	0.029684	-12.94	0.0000
Himachal Pradesh	-0.0359896	0.005762	-6.25	0.0000
Punjab	-0.0707189	0.008251	-8.57	0.0000
Haryana	2.73E-14	0.017565	0.00	1.0000
Rajasthan	-0.0617302	0.013134	-4.70	0.0010
Uttar Pradesh	0.1026715	0.012879	7.97	0.0000
Bihar	0.1528524	0.019781	7.73	0.0000
Sikkim	-0.2805058	0.010796	-25.98	0.0000
Arunachal Pradesh	-0.1458193	0.028386	-5.14	0.0010
Tripura	-0.1296602	0.017351	-7.47	0.0000
Assam	6.26E-15	0.016150	0.00	1.0000
West Bengal	0.037522	0.018410	2.04	0.0720
Orissa	0.053874	0.019157	2.81	0.0200
Madhya Pradesh	-0.0003148	0.012330	-0.03	0.9800
Gujrat	-0.2640606	0.011641	-22.68	0.0000
Maharastra	-6.31E-15	0.008583	0.00	1.0000
Andhra Pardesh	1.16E-14	0.008196	0.00	1.0000
Karnataka	5.19E-15	0.024749	0.00	1.0000
Goa	-0.6497217	0.019837	-32.75	0.0000
Kerala	-0.4015696	0.021234	-18.91	0.0000
Tamil Nadu	1.47E-14	0.014654	0.00	1.0000
_cons	5.81899	0.167418	34.76	0.0000

Omitted State: Jammu & Kashmir

1. Inferior cereals comprise jowar, barley, bajra, maize, millets, ragi, and other cereals.

underestimated, their effect on calorie intake was large.[13] So the effects of price changes are to some extent offset by higher expenditure. Over and above these changes, there was a

[13] Our comment here applies to the calorie-expenditure elasticity. If, however, expenditure stagnated for large sections of the rural population, as our earlier analysis suggests, the calorie decline would largely reflect the role of of prices and the residual effect of the time dummy..

dampening of calorie intake over the period 1993–2004. As this effect is large, it is plausible that some of the changes in life styles and improvements in the epidemiological environment resulting in lower calorie requirements underlie this dampening effect over time.

Protein

There was a reduction in the protein intake in rural India. Results from our estimation reported in Table 26 throw light on the underlying factors. The main findings are:

- The price of rice and wheat was associated with a lower protein intake.
- Somewhat surprisingly, the higher price of inferior cereals resulted in a higher intake of protein. This implies substitution into food items that were cheaper sources of protein.
- The effect of higher Vanaspati-oil was negative but weakly significant (at the 13 per cent level).
- The higher the price of eggs, the higher was the protein intake, implying substitution into cheaper sources of protein.
- The higher price of pulses/nuts/others reduced protein intake.
- The price of fruits had a negative effect but it was weakly significant (at the 13 per cent level).
- The price of vegetable, by contrast, had a positive effect on protein intake, implying substitution into cheaper sources.
- MPCE had a positive effect on protein intake (significant at the 11 per cent level), implying that higher expenditures are associated with protein-rich diets.
- There was a negative coefficient of the time dummy, implying a dampening of demand for protein in 2004, relative to 1993.
- Over and above these effects, there were significant state fixed effects, implying lower or higher protein intakes, relative to the omitted state of Jammu and Kashmir.
- The significant F-value corroborates the validity of the specification used.

As in the case of calories, the demand is highly susceptible to price changes. Some of the price effects (prices of rice and wheat, Vanaspati-oil, fruits, and vegetables) are (relatively) large. The effect of expenditure (MPCE) is large too but not strong enough to offset the

effects of price changes.[14] It is not obvious why protein intake dampened in 2004 after controlling for all these effects. Consistent with our view expressed earlier, a properly specified demand relation yields insights into why protein intake has reduced over the period 1993–2004.

Fats

Results for rural India are reported in Table 27. In general, the price effects are weak but with a few exceptions. One reason could be relatively low variation in variables of interest at the state level.

- The price of rice and wheat-despite their low far content-has a significant negative effect on fat intake.
- The price of fruits- a relatively unimportant source of fats- had a negative effect on fat intake presumably due to substitutions into other food items that were cheaper but lower in fat content.
- What is not so surprising is the strong positive relationship between fat-rich diets and high MPCE. The elasticity is 1.21 which implies that a one per cent increase in MPCE is associated with 1.21 per cent higher intake of fats.
- The time dummy does not have a significant negative effect on fat intake.
- Many of the state fixed effects are significant, implying higher or lower fat intakes than in Jammu and Kashmir.
- The overall specification is validated by the F-test.

Although the demand relation is not so robust, there are significant price and income effects.[15] Besides, their magnitudes are large. Large price effects are presumably a result of substitutions between commodities. In a sequel based on household data, we hope to throw further light on these issues.

[14] In any case, since expenditure stagnated for large segments of the rural population, changes in food prices were largely responsible for the reduction in protein intake.
[15] The caveat about stagnating expenditure (as a proxy for income) applies here too, leaving prices to play a larger role.

Table 26
Demand Equation for Protein in Rural India

Robust regression — Number of obs = 42; F(32, 9) = 91.35; Prob > F = 0.0000

Log Per capita Protein Intake	Coef.	Std. Err.	t	P>t
Log prices — Rice & Wheat	-0.41333	0.109845	-3.76	0.0040
[1]Log prices — Inferior Cereals	0.050024	0.029251	1.71	0.1210
Log prices — Milk-&-Prducts/ Ghee-Butter	0.13255	0.1025	1.29	0.2280
Log prices — Vanaspati-oil	-0.22551	0.135901	-1.66	0.1310
Log prices — Sugar	0.064468	0.120103	0.54	0.6040
Log prices — Eggs	0.178705	0.055749	3.21	0.0110
Log prices — Meat/Fish/Poultry	-0.07698	0.10045	-0.77	0.4630
Log prices — Pulses/Nuts-DryFruits/others	-0.09514	0.021876	-4.35	0.0020
Log prices — Fruits	-0.23008	0.140745	-1.63	0.1370
Log prices — Vegetables	0.480628	0.197478	2.43	0.0380
Log Per capita Expenditure (mpce)	0.306612	0.176565	1.74	0.1160
Time Dummy (0=1993, 1=2004)	-0.26883	0.15564	-1.73	0.1180
Himachal Pradesh	-0.04327	0.030209	-1.43	0.1860
Punjab	-0.09499	0.04326	-2.2	0.0560
Haryana	-0.2049	0.092094	-2.22	0.0530
Rajasthan	-0.18905	0.068865	-2.75	0.0230
Uttar Pradesh	-0.07236	0.067529	-1.07	0.3120
Bihar	-0.07399	0.103715	-0.71	0.4940
Sikkim	-0.49976	0.056606	-8.83	0.0000
Arunachal Pradesh	-0.50245	0.148832	-3.38	0.0080
Tripura	-0.57614	0.090974	-6.33	0.0000
Assam	-4.67E-14	0.084675	0	1.0000
West Bengal	-0.2308	0.096528	-2.39	0.0400
Orissa	-0.32686	0.100442	-3.25	0.0100
Madhya Pradesh	-0.15133	0.064646	-2.34	0.0440
Gujrat	-0.41364	0.061035	-6.78	0.0000
Maharastra	-0.30463	0.045001	-6.77	0.0000
Andhra Pardesh	-0.39265	0.042975	-9.14	0.0000
Karnataka	-0.1443	0.129761	-1.11	0.2950
Goa	-0.56149	0.104007	-5.4	0.0000
Kerala	-0.3239	0.111332	-2.91	0.0170
Tamil Nadu	-0.42108	0.076831	-5.48	0.0000
_cons	3.302186	0.877805	3.76	0.0040
Omitted State: Jammu & Kashmir				

1. Inferior cereals comprise jowar, barley, bajra, maize, millets, ragi, and other cereals

Table 27
Demand Equation for Fats in Rural India

Robust regression — Number of obs = 40; F(31, 8) = 62.94; Prob > F = 0.0000

Log Per capita Fat Intake	Coef.	Std. Err.	t	P>t
Log prices — Rice & Wheat	-0.88372	0.246228	-3.59	0.007
[1]Log prices — Inferior Cereals	-0.0795	0.067802	-1.17	0.275
Log prices — Milk-&-Prducts/ Ghee-Butter	-0.22732	0.353782	-0.64	0.538
Log prices — Vanaspati-oil	-0.0056	0.351847	-0.02	0.988
Log prices — Sugar	0.3733	0.366036	1.02	0.338
Log prices — Eggs	0.10876	0.121763	0.89	0.398
Log prices — Meat/Fish/Poultry	-0.1488	0.219033	-0.68	0.516
Log prices — Pulses/Nuts-DryFruits/others	-0.0132	0.049142	-0.27	0.795
Log prices — Fruits	-0.61091	0.306911	-1.99	0.082
Log prices — Vegetables	0.232834	0.493554	0.47	0.650
Log Per capita Expenditure (mpce)	1.211184	0.425331	2.85	0.022
Time Dummy (0=1993, 1=2004)	0.01572	0.371704	0.04	0.967
Himachal Pradesh	0.010996	0.09952	0.11	0.915
Punjab	-0.11263	0.095922	-1.17	0.274
Haryana	-0.36963	0.209083	-1.77	0.115
Rajasthan	-0.07463	0.15528	-0.48	0.644
Uttar Pradesh	-0.36423	0.233349	-1.56	0.157
Bihar	-0.24518	0.350575	-0.70	0.504
Sikkim	-0.24812	0.123305	-2.01	0.079
Arunachal Pradesh	(omitted)			
Tripura	-0.6611	0.358648	-1.84	0.103
Assam	-0.276	0.32338	-0.85	0.418
West Bengal	-0.31191	0.29536	-1.06	0.322
Orissa	-0.60909	0.328379	-1.85	0.101
Madhya Pradesh	-0.1642	0.227655	-0.72	0.491
Gujrat	0.240766	0.150352	1.60	0.148
Maharastra	0.036207	0.113708	0.32	0.758
Andhra Pardesh	-3.56E-14	0.110072	0.00	1.000
Karnataka	0.260601	0.296554	0.88	0.405
Goa	0.216358	0.234472	0.92	0.383
Kerala	0.032381	0.242851	0.13	0.897
Tamil Nadu	-0.07169	0.176908	-0.41	0.696
_cons	-0.88994	2.162794	-0.41	0.692

Omitted State: Jammu & Kashmir

1. Inferior cereals comprise jowar, barley, bajra, maize, millets, ragi, and other cereals

VIII. Urban India

The results for urban India are uneven but some useful insights are obtained. The results are given in Tables 28–30.

Calories

Results are given in Table 28.

- Neither cereal nor inferior cereal prices affect calorie intake.
- However, higher prices of milk/milk products has a significant positive effect, presumably as a result of substitution into cheaper sources of calories.
- Higher price of Vanaspati-oil reduced calorie intake significantly.
- Sugar price also resulted in a significant reduction.
- Although meat/fish/poultry is not an important source of calories, a higher price reduces significantly calorie intake.
- Higher fruit prices lower calorie intake despite the fact that their calorie content is low.
- But higher vegetable prices increase calorie intake significantly presumably as a result of substitution into cheaper sources of calories.
- What is indeed surprising is that controlling for *all* effects higher MPCE reduces calorie intake. So an implication is that keeping prices constant higher MPCE is associated with less calorie- rich diets. .Following this interpretation, cereal-based diets (which are also rich in calories) are akin to an inferior good (with a negative income effect).
- The time dummy does not have a significant coefficient.
- There are significant state fixed effects.
- The F-value is highly significant corroborating the overall specification.

In sum, while the price effects have an important explanatory role-some of the elasticities are large-the income effect is negative. The latter could plausibly be interpreted as implying cereal-based/calorie-rich diets are akin to an inferior good I urban India. So the negative effects of some food prices were in fact reinforced by a negative expenditure effect-especially because urban expenditures rose.

Protein

Results are given in Table 29.

The protein results are weak as none of the price effects are significant. Worse, MPCE does not have a significant coefficient either. The only significant effects are state fixed effects. But the overall specification is validated by the F-test.

Fats

Results are given in Table 30.

The results for fat intake are not robust either, as price effects with two exceptions are not significant. The price of eggs has a positive but weakly significant effect (at the 16 per cent level) *despite* the fact that its fat content is low. Presumably higher egg prices induce substitutions into more fatty foods. The other significant and positive price effect is that of vegetables, resulting from substitutions into fatty foods. Surprisingly, MPCE does not have a significant effect. However, the time dummy has a negative coefficient, implying a lower fat intake in 2004 than in 1993. The overall specification is validated by the F-test.

Table 28
Demand Equation for Calories, Urban India

Robust regression	Number of obs	=	42
	F(32, 9)	=	70.67
	Prob > F	=	0.0000

Log Per capita Calories Intake	Coef.	Std. Err.	t	P>t
Log prices — Rice & Wheat	0.005301	0.103009	0.05	0.960
[1]Log prices — Inferior Cereals	-0.00916	0.024162	-0.38	0.713
Log prices — Milk-&-Prducts/ Ghee-Butter	0.338296	0.146639	2.31	0.046
Log prices — Vanaspati-oil	-0.2996	0.145883	-2.05	0.070
Log prices — Sugar	-0.52224	0.119546	-4.37	0.002
Log prices — Eggs	0.173956	0.160746	1.08	0.307
Log prices — Meat/Fish/Poultry	-0.25591	0.059869	-4.27	0.002
Log prices — Pulses/Nuts-DryFruits/others	-0.0035	0.046744	-0.07	0.942
Log prices — Fruits	-0.19789	0.08719	-2.27	0.049
Log prices — Vegetables	0.52082	0.181883	2.86	0.019
Log Per capita Expenditure (mpce)	-0.21412	0.07688	-2.79	0.021
Time Dummy (0=1993, 1=2004)	0.106536	0.123023	0.87	0.409
Himachal Pradesh	0.050794	0.057688	0.88	0.401
Punjab	0.006792	0.048165	0.14	0.891
Haryana	-0.20763	0.056314	-3.69	0.005
Rajasthan	-0.24294	0.051692	-4.70	0.001
Uttar Pradesh	-1.10E-14	0.066214	0.00	1.000
Bihar	-0.11362	0.071468	-1.59	0.146
Sikkim	-0.25611	0.049456	-5.18	0.001
Arunachal Pradesh	-0.47599	0.161476	-2.95	0.016
Tripura	-0.50238	0.116357	-4.32	0.002
Assam	6.32E-14	0.094657	0.00	1.000
West Bengal	-0.21406	0.071871	-2.98	0.015
Orissa	-0.24212	0.065452	-3.70	0.005
Madhya Pradesh	-0.28593	0.053466	-5.35	0.000
Gujrat	-0.4108	0.049144	-8.36	0.000
Maharastra	-0.37625	0.046173	-8.15	0.000
Andhra Pardesh	-0.2484	0.061512	-4.04	0.003
Karnataka	-0.12309	0.097592	-1.26	0.239
Goa	-0.3907	0.104665	-3.73	0.005
Kerala	-0.30433	0.104384	-2.92	0.017
Tamil Nadu	-0.27158	0.083732	-3.24	0.010
_cons	10.87863	0.780019	13.95	0.000

Omitted State: Jammu & Kashmir

1. Inferior cereals comprise jowar, barley, bajra, maize, millets, ragi, and other cereals

Table 29
Demand Equation for Protein, Urban India

Robust regression	Number of obs	=	42
	F(32, 9)	=	5.77
	Prob > F	=	0.0045

Log Per capita Protein Intake	Coef.	Std. Err.	t	P>t
Log prices — Rice & Wheat	-0.36453	0.302853	-1.20	0.259
[1]Log prices — Inferior Cereals	-0.02218	0.071038	-0.31	0.762
Log prices — Milk-&-Prducts/ Ghee-Butter	0.267065	0.431127	0.62	0.551
Log prices — Vanaspati-oil	0.06754	0.428903	0.16	0.878
Log prices — Sugar	-0.33052	0.351471	-0.94	0.372
Log prices — Eggs	-0.15974	0.472603	-0.34	0.743
Log prices — Meat/Fish/Poultry	-0.16043	0.176019	-0.91	0.386
Log prices — Pulses/Nuts-DryFruits/others	-0.09658	0.137428	-0.70	0.500
Log prices — Fruits	-0.17335	0.256343	-0.68	0.516
Log prices — Vegetables	0.25672	0.534747	0.48	0.643
Log Per capita Expenditure (mpce)	0.07851	0.22603	0.35	0.736
Time Dummy (0=1993, 1=2004)	0.207695	0.361693	0.57	0.580
Himachal Pradesh	-0.05886	0.169606	-0.35	0.737
Punjab	-0.03506	0.141608	-0.25	0.810
Haryana	-0.22709	0.165566	-1.37	0.203
Rajasthan	-0.13717	0.151977	-0.90	0.390
Uttar Pradesh	-0.21809	0.194674	-1.12	0.292
Bihar	-0.08945	0.210121	-0.43	0.680
Sikkim	-0.21633	0.145403	-1.49	0.171
Arunachal Pradesh	-0.27516	0.474747	-0.58	0.576
Tripura	-0.34624	0.342094	-1.01	0.338
Assam	-0.39087	0.278297	-1.40	0.194
West Bengal	-0.26444	0.211303	-1.25	0.242
Orissa	-0.35636	0.192431	-1.85	0.097
Madhya Pradesh	-0.28166	0.157193	-1.79	0.107
Gujrat	-0.32897	0.144486	-2.28	0.049
Maharastra	-0.34299	0.135751	-2.53	0.032
Andhra Pardesh	-0.39212	0.180848	-2.17	0.058
Karnataka	-0.19986	0.286926	-0.70	0.504
Goa	-0.30567	0.30772	-0.99	0.346
Kerala	-0.29013	0.306894	-0.95	0.369
Tamil Nadu	-0.39455	0.246176	-1.60	0.143
_cons	5.748073	2.293296	2.51	0.034

Omitted State: Jammu & Kashmir

1. Inferior cereals comprise jowar, barley, bajra, maize, millets, ragi, and other cereals

Table 30
Demand Equation for Fats, Urban India

Robust regression	Number of obs =	42		
	F(32, 9) =	14.19		
	Prob > F =	0.0001		
Log Per capita Fat Intake	Coef.	Std. Err.	t	P>t
Log prices — Rice & Wheat	-0.37189	0.346418	-1.07	0.311
[1]Log prices — Inferior Cereals	-0.03748	0.081257	-0.46	0.656
Log prices — Milk-&-Prducts/ Ghee-Butter	0.488651	0.493145	0.99	0.348
Log prices — Vanaspati-oil	-0.48205	0.490602	-0.98	0.351
Log prices — Sugar	-0.18251	0.40203	-0.45	0.661
Log prices — Eggs	0.816107	0.540587	1.51	0.165
Log prices — Meat/Fish/Poultry	-0.17344	0.20134	-0.86	0.411
Log prices — Pulses/Nuts-DryFruits/others	0.060243	0.157198	0.38	0.710
Log prices — Fruits	-0.33269	0.293219	-1.13	0.286
Log prices — Vegetables	1.244017	0.611671	2.03	0.072
Log Per capita Expenditure (mpce)	0.215207	0.258544	0.83	0.427
Time Dummy (0=1993, 1=2004)	-0.66344	0.413723	-1.60	0.143
Himachal Pradesh	-0.15136	0.194004	-0.78	0.455
Punjab	-0.01068	0.161978	-0.07	0.949
Haryana	-0.27827	0.189383	-1.47	0.176
Rajasthan	-0.46029	0.173839	-2.65	0.027
Uttar Pradesh	-0.28179	0.222677	-1.27	0.237
Bihar	-0.15422	0.240347	-0.64	0.537
Sikkim	-0.62513	0.166319	-3.76	0.004
Arunachal Pradesh	-1.15462	0.543039	-2.13	0.062
Tripura	-1.07028	0.391305	-2.74	0.023
Assam	-0.83161	0.31833	-2.61	0.028
West Bengal	-0.27195	0.2417	-1.13	0.290
Orissa	-0.64104	0.220113	-2.91	0.017
Madhya Pradesh	-0.37107	0.179805	-2.06	0.069
Gujrat	-0.48187	0.16527	-2.92	0.017
Maharastra	-0.48722	0.155279	-3.14	0.012
Andhra Pardesh	-0.22961	0.206864	-1.11	0.296
Karnataka	0.077726	0.3282	0.24	0.818
Goa	-0.50508	0.351986	-1.43	0.185
Kerala	-0.35456	0.35104	-1.01	0.339
Tamil Nadu	-0.27578	0.281589	-0.98	0.353
_cons	1.26354	2.623188	0.48	0.642

Omitted State: Jammu & Kashmir

1. Inferior cereals comprise jowar, barley, bajra, maize, millets, ragi, and other cereals

IX. Concluding Observations

Some observations are made from a broad policy perspective. Building on the important study by Deaton and Dreze (2009), our analysis sheds new light on the shifts in calorie, protein and fat Engel curves over the period 1993–2004.

Beginning with the downward shift of the calorie Engel curve in rural India, they point out that average calorie consumption was about 10 per cent lower in 2004 than in 1983. The proportionate decline was larger among the more affluent sections of the population. In urban areas, there was a slight change in average calorie intake. Besides, the decline of per capita consumption is not confined to calories. It also applies to proteins and other nutrients, with the exception of fats whose consumption increased over this period.

As incomes rose over this period, the puzzle is why per capita calorie consumption was lower at a given level of per capita household expenditure, across the expenditure scale, in 2004?

In trying to resolve this puzzle, Deaton and Dreze (2009) are emphatic that the decline in calorie intake reflects lower calorie requirements, due mainly to better health and lower activity levels. As the evidence offered is patchy, this explanation is largely conjectural.

Our analysis for the period 1993–2004 confirms lower intakes of calories and protein, and higher intakes of fats — especially in rural India. It also confirms that much of the decline in calorie intake was associated with a reduction in cereal calories — the cheapest source of calories. However, using a standard demand framework, our resolution of the puzzle is different. Our analysis confirms the important role of prices inducing changes in the consumption of different food commodities — through both own and cross-price effects —

and consequently in nutrient intakes.[16] In fact, some of the price effects for calories are large. Also, the calorie-expenditure elasticity is large. However, since rural expenditures /incomes for a large segment of the population stagnated during the period 1993–2004, the price effects had a dominant role in explaining the reduction in calorie intake. But it is also important to note that, controlling for all these effects, there was a significant negative effect of a time dummy which is arguably linked to the improvements in the epidemiological environment and less strenuous activity patterns.

As in the case of cereals, the price effects are large in the protein demand equation. The effect of expenditure is positive and large. In addition, there was a dampening of demand for protein over time. Altogether thus food prices had played a more important role in explaining the lower protein intake as expenditure stagnated.

Although the demand relation for fats was not so robust, there were significant price and expenditure effects. Besides, their magnitudes were large. Given the stagnation of expenditure in rural areas, the price effects were decisive in enhancing fat intake.

The results for urban India were uneven but some useful insights emerged-especially in explaining the demand for calories. While the effects are large, somewhat surprisingly the expenditure elasticity is negative. Given that expenditures rose in urban India, there was a dampening of the demand for calories while price effects ranged widely. Even though the

[16] For illustrative evidence on food price changes in rural and urban areas, see table A.25. A summary of price increases may be helpful. All food prices in rural India rose over the period 1993–2004. Highest increases occurred in the prices of vegetables and inferior cereals (close to doubling)). Slightly lower increases were observed in the prices of meat/fish/poultry, milk/milk products/ghee/butter, and fruits. Prices of cereals, Vanaspati-oil and pulses/nuts-dry fruits/others also rose but at much lower rates. Some food prices in urban India rose more rapidly than in rural India-cereals, inferior cereals, pulses/nuts-dry fruits/others, and fruits-while others-milk/milk products/ghee/butter, meat/fish/poultry, and vegetables-rose at lower rates.

reduction in calorie intake was much lower in urban India, a properly specified demand relation yields useful insights into this reduction.

What do these results imply for policy? While the case for improving rural infrastructure and epidemiological environment is unexceptionable, it is far from obvious that lower calorie requirements are *key* to lower calorie intake. In fact, if our analysis has any validity, changes in prices and incomes-especially the former-had more decisive roles in explaining lower calorie (and other nutrient intakes). Policy interventions designed to stabilise food prices and expand livelihood opportunities in rural areas thus remain an important priority *despite* differing views on whether pervasive nutritional deprivation is real.

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Annexes

Table A.1
Proportions of Households by Calorie Intake and Expenditure in Rural India, 1993[1]

Monthly per capita expediture NSS 50 - 2004 mutiplier	Calories per capita per day 0-1800	1801-2400	2401-3000	> 3000	Total
0 – 235	84.26	14.74	0.91	0.10	100.00
	22.66	3.07	0.39	0.09	8.36
235 – 270	66.62	30.84	2.18	0.36	100.00
	14.60	5.24	0.77	0.26	6.81
270 – 320	50.58	43.89	5.12	0.42	100.00
	19.78	13.32	3.21	0.54	12.16
320 – 365	37.23	50.24	11.43	1.09	100.00
	13.57	14.21	6.67	1.32	11.33
365 – 410	27.97	53.34	16.49	2.20	100.00
	9.41	13.93	8.89	2.45	10.47
410 – 455	21.06	53.37	21.64	3.94	100.00
	6.29	12.37	10.35	3.89	9.29
455 – 510	16.98	48.24	28.47	6.32	100.00
	5.11	11.27	13.72	6.28	9.36
510 – 580	13.39	42.57	31.75	12.28	100.00
	3.82	9.42	14.49	11.56	8.86
580 – 690	8.91	37.53	35.07	18.49	100.00
	2.48	8.09	15.60	16.97	8.64
690 – 890	5.48	29.60	36.81	28.11	100.00
	1.38	5.79	14.86	23.42	7.84
890 – 1155	4.64	22.18	34.27	38.91	100.00
	0.58	2.14	6.81	15.96	3.86
> 1155	3.35	15.34	27.33	53.99	100.00
	0.32	1.15	4.24	17.27	3.01
Total	31.09	40.07	19.42	9.41	100.00
	100.00	100.00	100.00	100.00	100.00

1. The first set of row numbers denote row percentages and the second denote column percentages.

Table A.2
Mean Calorie Intake by Expenditure in Rural India, 1993

Monthly per capita expediture NSS 50 - 2004 mutiplier	Calories per capita per day 0-1800	1801-2400	2401-3000	> 3000	Total
0 – 235	1321.2	1973.3	2530.1	5206.5	1432.0
235 – 270	1483.9	2013.7	2560.9	3438.0	1677.8
270 – 320	1527.7	2032.1	2569.8	3247.3	1809.7
320 – 365	1556.6	2068.7	2603.1	3313.3	1952.7
365 – 410	1566.8	2078.1	2601.9	3337.1	2049.2
410 – 455	1570.7	2093.7	2636.2	3293.2	2148.2
455 – 510	1574.7	2118.2	2642.0	3340.9	2252.2
510 – 580	1574.5	2121.5	2655.0	3337.1	2366.9
580 – 690	1609.0	2125.6	2661.0	3439.6	2510.3
690 – 890	1588.2	2136.6	2687.6	3537.2	2703.1
890 – 115	1555.9	2158.6	2695.7	3689.4	2910.3
> 1155	1465.0	2145.0	2699.7	4382.6	3481.9
Total	1491.8	2084.3	2649.6	3637.7	2156.1

Table A.3
Proportions of Households by Calorie Intake and Expenditure in Rural India, 2004[1]

Monthly per capita expediture – rural grouping	Calories per capita per day				
	0-1800	1801-2400	2401-3000	> 3000	Total
0 – 235	90.97	8.69	0.23	0.11	100.00
	11.87	0.96	0.07	0.11	4.79
235 – 270	78.92	20.05	0.86	0.16	100.00
	10.93	2.36	0.29	0.16	5.08
270 – 320	67.10	31.20	1.62	0.08	100.00
	18.17	7.19	1.07	0.15	9.93
320 – 365	54.41	41.36	3.90	0.32	100.00
	15.55	10.06	2.71	0.66	10.48
365 – 410	42.74	49.83	7.06	0.37	100.00
	11.89	11.79	4.78	0.74	10.20
410 – 455	34.35	54.87	10.05	0.73	100.00
	8.77	11.91	6.24	1.33	9.36
455 – 510	27.41	55.84	15.09	1.67	100.00
	7.41	12.84	9.92	3.21	9.91
510 – 580	20.82	55.96	20.23	2.99	100.00
	5.78	13.21	13.66	5.93	10.18
580 – 690	15.89	51.51	26.70	5.90	100.00
	4.49	12.38	18.36	11.90	10.36
690 – 890	12.05	44.65	32.46	10.85	100.00
	3.21	10.12	21.04	20.61	9.77
890 – 1155	8.12	35.01	36.46	20.40	100.00
	1.10	4.03	12.00	19.69	4.96
> 1155	6.31	27.29	29.78	36.62	100.00
	0.86	3.15	9.85	35.49	4.98
Total	36.68	43.11	15.07	5.14	100.00
	100.00	100.00	100.00	100.00	100.00

1. The first set of row numbers denote row percentages and the second denote column percentages.

Table A.4
Mean Calorie Intake by Expenditure in Rural India, 2004

Monthly per capita expediture – rural grouping	Calories per capita per day				
	0-1800	1801-2400	2401-3000	> 3000	Total
0 – 235	1322.3	1935.2	2517.3	7473.8	1385.3
235 – 270	1461.4	1965.5	2531.7	3666.7	1575.3
270 – 320	1503.3	2003.4	2556.6	4817.0	1679.1
320 – 365	1544.3	2024.4	2552.8	6956.0	1799.8
365 – 410	1566.2	2043.6	2576.3	4163.2	1885.1
410 – 455	1577.5	2059.5	2591.3	4052.1	1962.0
455 – 510	1581.9	2074.1	2592.3	3557.2	2042.1
510 – 580	1605.1	2095.6	2616.4	4077.0	2158.1
580 – 690	1580.6	2112.2	2630.2	4218.1	2290.4
690 – 890	1576.6	2127.8	2643.2	3526.6	2380.4
890 – 115	1588.1	2132.8	2670.3	3523.9	2568.4
> 1155	1553.0	2118.1	2686.4	4210.5	3017.8
Total	1516.5	2071.5	2629.4	3925.6	2047.3

Table A.5
Proportions of Households by Calorie Intake and Expenditure in Urban India, 1993[1]

Monthly per capita expediture NSS 50 - 2004 mutiplier	Calories per capita per day 0-1700	1701-2100	2101-2600	>2600	Total
0 – 335	83.03	13.69	2.97	0.32	100.00
	17.49	2.74	0.68	0.11	5.93
335 – 395	65.94	25.40	7.78	0.88	100.00
	12.13	4.44	1.56	0.28	5.18
395 – 485	52.82	33.52	11.98	1.69	100.00
	20.55	12.39	5.09	1.12	10.95
485 – 580	38.17	38.73	18.68	4.42	100.00
	16.48	15.88	8.81	3.25	12.15
580 – 675	29.70	38.80	26.03	5.48	100.00
	11.43	14.18	10.93	3.59	10.82
675 – 790	19.62	39.24	30.88	10.26	100.00
	7.93	15.06	13.63	7.08	11.37
790 – 930	15.75	34.05	35.09	15.11	100.00
	5.85	12.01	14.23	9.58	10.45
930 – 110	11.01	27.92	40.14	20.92	100.00
	3.40	8.18	13.52	11.01	8.68
1100 – 1380	8.16	24.07	37.45	30.31	100.00
	2.77	7.75	13.87	17.54	9.54
1380 – 1880	4.58	17.91	34.24	43.27	100.00
	1.32	4.90	10.76	21.25	8.10
1880 – 2540	2.29	13.34	28.28	56.08	100.00
	0.32	1.79	4.36	13.51	3.97
>2540	3.05	7.02	22.83	67.10	100.00
	0.31	0.68	2.54	11.68	2.87
Total	28.12	29.62	25.76	16.49	100.00
	100.00	100.00	100.00	100.00	100.00

1. The first set of row numbers denote row percentages and the second denote column percentages.

Table A.6
Mean Calorie Intake by Expenditure in Urban India, 1993

Monthly per capita expediture NSS 50 - 2004 mutiplier	Calories per capita per day 0-1700	1701-2100	2101-2600	> 2600	Total
0 – 335	1248.7	1841.8	2250.0	2746.8	1364.4
335 – 395	1401.7	1859.6	2286.1	2796.5	1599.2
395 – 485	1444.6	1873.5	2282.7	2941.4	1714.0
485 – 580	1473.5	1887.5	2280.4	2864.2	1846.0
580 – 675	1488.8	1894.0	2290.1	2869.7	1930.2
675 – 790	1508.3	1907.9	2305.7	2889.7	2053.1
790 – 930	1505.0	1911.9	2311.6	2927.0	2141.5
930 – 110	1476.5	1919.3	2328.7	3002.1	2261.4
1100 – 13	1506.5	1930.1	2342.2	3016.9	2379.3
1380 – 18	1496.7	1927.7	2362.7	3083.9	2557.1
1880 – 25	1410.8	1952.3	2373.4	3340.3	2837.4
>2540	1269.0	1932.3	2373.8	3560.5	3105.5
Total	1426.4	1899.5	2319.7	3107.1	2073.8

Table A.7
Proportions of Households by Calorie Intake and Expenditure in Urban India, 2004[1]

Monthly per capita expediture – urban grouping	Calories per capita per day 0-1700	1701-2100	2101-2600	> 2600	Total
0 – 335	81.36	16.27	2.14	0.23	100.00
	13.89	2.37	0.44	0.10	5.02
335 – 395	60.39	34.47	4.72	0.42	100.00
	10.44	5.08	0.97	0.18	5.08
395 – 485	55.59	33.89	9.19	1.32	100.00
	18.46	9.59	3.64	1.13	9.76
485 – 580	42.12	38.89	16.15	2.85	100.00
	14.83	11.66	6.77	2.58	10.35
580 – 675	35.59	42.19	18.67	3.55	100.00
	11.77	11.88	7.35	3.03	9.72
675 – 790	27.05	42.90	24.71	5.35	100.00
	9.15	12.36	9.95	4.66	9.94
790 – 930	20.30	43.50	29.36	6.84	100.00
	7.08	12.93	12.20	6.15	10.26
930 – 1100	16.51	38.64	33.33	11.53	100.00
	5.46	10.89	13.13	9.83	9.73
1100 – 1380	11.77	35.17	37.26	15.80	100.00
	4.10	10.43	15.45	14.19	10.24
1380 – 1880	8.86	26.78	39.47	24.90	100.00
	2.98	7.67	15.81	21.59	9.89
1880 – 2540	5.97	21.02	37.86	35.15	100.00
	1.03	3.10	7.80	15.68	5.09
>2540	4.80	14.27	32.56	48.37	100.00
	0.80	2.03	6.49	20.86	4.92
Total	29.40	34.51	24.69	11.41	100.00
	100.00	100.00	100.00	100.00	100.00

1. The first set of row numbers denote row percentages and the second denote column percentages.

Table A.8
Mean Calorie Intake by Expenditure in Urban India, 2004

Monthly per capita expediture – urban grouping	Calories per capita per day 0-1700	1701-2100	2101-2600	> 2600	Total
0 – 335	1303.5	1847.0	2221.4	3735.2	1417.2
335 – 395	1403.5	1859.9	2295.4	2983.8	1609.5
395 – 485	1441.3	1875.9	2270.5	3136.2	1687.2
485 – 580	1448.7	1882.5	2277.5	4330.9	1833.3
580 – 675	1481.4	1890.1	2287.0	2937.7	1856.0
675 – 790	1484.2	1899.8	2289.2	3029.0	1944.0
790 – 930	1496.1	1904.0	2306.5	3142.1	2024.1
930 – 110	1484.4	1914.2	2306.6	3096.4	2110.3
1100 – 13	1515.3	1924.2	2321.8	3091.7	2208.7
1380 – 18	1512.7	1928.5	2335.4	3087.2	2340.8
1880 – 25	1517.3	1936.8	2347.4	3298.7	2545.9
>2540	1469.1	1934.7	2351.4	3570.4	2839.3
Total	1440.4	1899.8	2312.7	3252.0	2020.9

Table A.9
Proportions of Households by Protein Intake and Expenditure in Rural India, 1993[1]

Monthly per capita expediture NSS 50 - 2004 mutiplier	Protein per capita per day 0-45	46-60	61-75	> 75	Total
0 – 235	66.60	26.33	6.04	1.04	100.00
	23.38	6.51	2.22	0.44	8.36
235 – 270	48.50	37.63	11.48	2.38	100.00
	13.88	7.59	3.43	0.83	6.81
270 – 320	39.04	40.33	17.13	3.50	100.00
	19.94	14.52	9.14	2.17	12.16
320 – 365	29.47	40.76	22.73	7.04	100.00
	14.03	13.67	11.30	4.07	11.33
365 – 410	21.40	42.86	24.51	11.23	100.00
	9.40	13.27	11.26	6.00	10.47
410 – 455	16.17	41.15	26.59	16.09	100.00
	6.31	11.32	10.84	7.62	9.29
455 – 510	12.56	36.25	29.96	21.23	100.00
	4.94	10.04	12.31	10.13	9.36
510 – 580	9.70	33.20	28.00	29.10	100.00
	3.61	8.71	10.89	13.15	8.86
580 – 690	6.24	27.83	30.06	35.87	100.00
	2.26	7.12	11.40	15.81	8.64
690 – 890	4.14	20.04	28.56	47.26	100.00
	1.36	4.65	9.83	18.90	7.84
890 – 1155	3.43	14.44	26.54	55.59	100.00
	0.56	1.65	4.50	10.95	3.86
> 1155	2.67	10.78	21.84	64.71	100.00
	0.34	0.96	2.89	9.94	3.01
Total	23.81	33.79	22.79	19.61	100.00
	100.00	100.00	100.00	100.00	100.00

1. The first set of row numbers denote row percentages and the second denote column percentages.

Table A.10
Mean Protein Intake by Expenditure in Rural India, 1993

Monthly per capita expediture NSS 50 - 2004 mutiplier	Protein per capita per day 0-45	46-60	61-75	> 75	Total
0 – 235	33.2	51.2	65.3	98.4	40.5
235 – 270	36.5	51.5	65.2	83.1	46.6
270 – 320	38.1	51.9	65.9	83.9	50.0
320 – 365	38.8	51.9	66.4	83.9	53.6
365 – 410	38.9	52.2	66.5	85.7	56.6
410 – 455	39.0	52.4	66.8	86.3	59.5
455 – 510	38.8	52.9	66.9	87.9	62.8
510 – 580	39.0	53.1	66.9	89.6	66.2
580 – 690	40.0	53.4	67.3	92.7	70.8
690 – 890	40.0	54.0	67.4	96.3	77.2
890 – 115	39.0	53.8	68.0	101.2	83.4
> 1155	36.5	53.6	68.2	118.3	98.2
Total	37.1	52.4	66.8	94.4	60.3

Table A.11
Proportions of Households by Protein Intake and Expenditure in Rural India, 2004[1]

Monthly per capita expedeture – rural grouping	Protein per capita per day 0-45	46-60	61-75	> 75	Total
0 – 235	81.81	16.45	1.62	0.11	100.00
	13.58	2.07	0.36	0.05	4.79
235 – 270	61.47	33.76	4.46	0.31	100.00
	10.83	4.51	1.06	0.14	5.08
270 – 320	52.95	38.47	8.14	0.45	100.00
	18.24	10.04	3.77	0.38	9.93
320 – 365	40.39	44.22	13.92	1.47	100.00
	14.69	12.18	6.80	1.32	10.48
365 – 410	31.84	46.25	19.29	2.62	100.00
	11.27	12.40	9.18	2.29	10.20
410 – 455	27.57	44.83	23.17	4.42	100.00
	8.95	11.03	10.11	3.55	9.36
455 – 510	21.16	43.98	27.07	7.79	100.00
	7.28	11.46	12.51	6.61	9.91
510 – 580	15.18	44.09	28.66	12.06	100.00
	5.36	11.79	13.60	10.51	10.18
580 – 690	13.08	38.42	30.44	18.06	100.00
	4.70	10.46	14.70	16.03	10.36
690 – 890	9.67	31.88	32.29	26.17	100.00
	3.28	8.18	14.70	21.89	9.77
890 – 1155	5.97	25.83	30.83	37.36	100.00
	1.03	3.37	7.13	15.87	4.96
> 1155	4.58	19.21	26.13	50.08	100.00
	0.79	2.51	6.07	21.37	4.98
Total	28.82	38.05	21.45	11.68	100.00
	100.00	100.00	100.00	100.00	100.00

1. The first set of row numbers denote row percentages and the second denote column percentages.

Table A.12
Mean Protein Intake and Expenditure in Rural India, 2004

Monthly per capita expedeture – rural grouping	RECODE of protein_p (Protein per capita per day) 0-45	46-60	61-75	> 75	Total
0 – 235	33.0	49.6	63.8	331.4	36.6
235 – 270	36.2	50.6	64.2	92.4	42.5
270 – 320	37.2	51.3	64.2	83.4	45.0
320 – 365	38.0	51.7	65.0	121.3	49.0
365 – 410	38.4	52.0	65.6	88.6	51.3
410 – 455	39.1	52.1	65.9	83.5	53.1
455 – 510	39.2	52.4	66.4	84.9	55.9
510 – 580	39.7	52.5	66.6	86.2	58.7
580 – 690	39.5	52.9	66.6	89.9	62.0
690 – 890	39.0	53.3	66.6	91.8	66.3
890 – 115	39.6	53.4	67.4	93.0	71.7
> 1155	38.8	53.3	67.4	106.7	83.1
Total	37.4	52.2	66.3	93.9	55.8

Table A.13
Proportions of Households by Protein Intake and Expenditure in Urban India, 1993[1]

Monthly per capita expediture NSS 50 - 2004 multiplier	Protein per capita per day 0-45	46-60	61-75	> 75	Total
0 – 335	71.51	23.34	4.22	0.93	100.00
	17.01	3.66	1.08	0.39	5.93
335 – 395	56.57	31.68	10.33	1.42	100.00
	11.76	4.34	2.31	0.52	5.18
395 – 485	46.74	39.20	10.82	3.24	100.00
	20.54	11.36	5.13	2.49	10.95
485 – 580	33.98	44.59	16.20	5.23	100.00
	16.57	14.35	8.52	4.46	12.15
580 – 675	26.91	46.21	20.40	6.49	100.00
	11.69	13.25	9.55	4.93	10.82
675 – 790	17.41	46.87	26.39	9.33	100.00
	7.95	14.12	12.99	7.45	11.37
790 – 930	14.39	44.58	28.44	12.59	100.00
	6.04	12.34	12.86	9.24	10.45
930 – 1100	10.81	38.71	33.57	16.90	100.00
	3.77	8.90	12.61	10.30	8.68
1100 – 1380	6.82	34.51	35.04	23.62	100.00
	2.61	8.72	14.47	15.84	9.54
1380 – 1880	4.00	27.44	34.24	34.32	100.00
	1.30	5.89	12.00	19.53	8.10
1880 – 2540	2.53	20.08	30.51	46.89	100.00
	0.40	2.11	5.24	13.09	3.97
>2540	3.00	12.61	26.09	58.31	100.00
	0.35	0.96	3.24	11.75	2.87
Total	24.90	37.75	23.11	14.23	100.00
	100.00	100.00	100.00	100.00	100.00

1. The first set of row numbers denote row percentages and the second denote column percentages.

Table A.14
Mean Protein Intake by Expenditure in Urban India, 1993

Monthly per capita expediture NSS 50 - 2004 mutiplier	Protein per capita per day 0-45	46-60	61-75	> 75	Total
0 – 335	32.5	50.5	65.9	78.1	38.5
335 – 395	36.4	51.4	65.9	82.9	44.8
395 – 485	37.4	51.2	66.0	83.9	47.4
485 – 580	38.1	51.9	66.2	85.1	51.2
580 – 675	39.1	52.0	66.2	83.4	53.5
675 – 790	39.4	52.4	65.8	86.5	56.9
790 – 930	39.7	52.8	66.1	86.4	58.9
930 – 110	38.8	53.4	66.6	87.6	62.0
1100 – 13	38.8	53.5	66.9	89.2	65.6
1380 – 18	38.9	54.0	67.4	90.4	70.5
1880 – 25	36.1	53.9	67.0	95.8	77.1
>2540	33.2	54.2	67.9	103.3	85.8
Total	37.1	52.4	66.5	90.7	57.3

Table A.15
Proportions of Households by Protein Intake and Expenditure in Urban India, 2004[1]

Monthly per capita expediture – urban grouping	Protein per capita per day				
	0-45	46-60	61-75	> 75	Total
0 – 335	70.87	25.74	3.17	0.23	100.00
	12.87	3.15	0.74	0.12	5.02
335 – 395	52.34	40.22	6.89	0.54	100.00
	9.62	4.98	1.62	0.28	5.08
395 – 485	48.50	38.67	11.57	1.26	100.00
	17.12	9.19	5.24	1.27	9.76
485 – 580	40.35	41.02	14.34	4.29	100.00
	15.10	10.33	6.88	4.58	10.35
580 – 675	35.08	45.04	15.86	4.02	100.00
	12.33	10.66	7.15	4.03	9.72
675 – 790	27.86	45.77	20.57	5.80	100.00
	10.01	11.08	9.48	5.94	9.94
790 – 930	20.47	50.30	22.44	6.80	100.00
	7.59	12.56	10.67	7.19	10.26
930 – 1100	16.83	46.40	28.30	8.47	100.00
	5.92	10.99	12.76	8.50	9.73
1100 – 1380	12.02	44.31	29.91	13.76	100.00
	4.45	11.05	14.20	14.53	10.24
1380 – 1880	8.51	39.34	33.02	19.13	100.00
	3.04	9.47	15.14	19.52	9.89
1880 – 2540	5.43	32.62	35.43	26.52	100.00
	1.00	4.04	8.36	13.92	5.09
>2540	5.32	21.00	34.08	39.61	100.00
	0.95	2.51	7.77	20.10	4.92
Total	27.66	41.08	21.57	9.69	100.00
	100.00	100.00	100.00	100.00	100.00

Table A.16
Mean Protein Intake by Expenditure in Urban India, 2004

Monthly per capita expediture – urban grouping	RECODE of protein_p (Protein per capita per day)				
	0-45	46-60	61-75	> 75	Total
0 – 335	34.1	50.9	64.2	83.3	39.5
335 – 395	36.3	51.8	64.3	82.6	44.7
395 – 485	37.1	51.3	65.5	84.5	46.5
485 – 580	38.1	51.8	65.6	128.5	51.5
580 – 675	38.9	51.6	66.1	85.6	50.8
675 – 790	39.2	52.3	65.7	92.2	53.8
790 – 930	39.6	52.3	65.9	86.3	55.1
930 – 110	39.4	52.6	66.5	92.3	57.6
1100 – 13	39.6	52.9	65.9	89.9	60.3
1380 – 18	39.5	53.3	66.6	89.5	63.4
1880 – 25	40.2	53.9	67.1	97.6	69.4
>2540	38.4	53.9	67.4	102.1	76.8
Total	37.8	52.3	66.2	94.9	55.4

Table A. 17
Proportions of Households by Fat Intake and Expenditure in Rural India, 1993[1]

Monthly per capita expediture NSS 50 - 2004 mutiplier	Fat per capita per day 0-20	21-30	31-50	> 50	Total
0 – 235	86.71	11.71	1.57	0.01	100.00
	21.14	3.90	0.50	0.01	8.36
235 – 270	71.99	22.98	4.98	0.05	100.00
	14.30	6.24	1.30	0.02	6.81
270 – 320	58.47	30.41	10.74	0.38	100.00
	20.73	14.75	5.01	0.32	12.16
320 – 365	45.58	34.11	19.43	0.88	100.00
	15.06	15.41	8.44	0.69	11.33
365 – 410	32.99	35.22	28.54	3.26	100.00
	10.07	14.70	11.44	2.35	10.47
410 – 455	25.06	32.80	36.14	6.00	100.00
	6.79	12.15	12.87	3.84	9.29
455 – 510	18.21	29.94	40.11	11.75	100.00
	4.97	11.17	14.39	7.57	9.36
510 – 580	13.15	24.65	41.45	20.74	100.00
	3.40	8.71	14.08	12.65	8.86
580 – 690	8.01	19.69	41.43	30.87	100.00
	2.02	6.78	13.72	18.35	8.64
690 – 890	4.68	13.30	37.18	44.84	100.00
	1.07	4.16	11.17	24.19	7.84
890 – 1155	2.65	9.36	32.31	55.68	100.00
	0.30	1.44	4.78	14.79	3.86
> 1155	1.76	4.81	19.95	73.48	100.00
	0.15	0.58	2.30	15.22	3.01
Total	34.30	25.08	26.09	14.53	100.00
	100.00	100.00	100.00	100.00	100.00

1. The first set of row numbers denote row percentages and the second denote column percentages.

Table A.18
Mean Fat Intake by Expenditure in Rural India, 1993

Monthly per capita expediture NSS 50 - 2004 mutiplier	Fat per capita per day 0-20	21-30	31-50	> 50	Total
0 – 235	11.7	23.3	33.9	1677.2	13.6
235 – 270	13.2	23.8	34.6	236.9	16.8
270 – 320	14.0	24.2	35.5	54.2	19.6
320 – 365	14.7	24.6	36.3	54.7	22.7
365 – 410	15.3	24.7	37.1	56.7	26.2
410 – 455	15.7	24.9	38.1	57.0	29.3
455 – 510	15.7	24.8	38.6	59.8	32.8
510 – 580	16.0	25.2	38.7	61.7	37.1
580 – 690	15.9	25.4	39.3	65.6	42.8
690 – 890	16.4	25.5	39.9	72.1	51.3
890 – 115	16.4	25.6	40.6	77.7	59.2
> 1155	14.5	25.4	41.2	95.4	79.8
Total	14.0	24.7	38.3	72.1	31.5

Table A. 19
Proportions of Households by Fat Intake and Expenditure in Rural India, 2004[1]

Monthly per capita expediture – rural grouping	Fat per capita per day 0-20	21-30	31-50	> 50	Total
0 – 235	85.49	13.24	1.15	0.13	100.00
	18.10	2.33	0.16	0.04	4.79
235 – 270	67.99	26.97	4.86	0.17	100.00
	15.28	5.03	0.74	0.05	5.08
270 – 320	50.21	37.48	11.97	0.34	100.00
	22.06	13.68	3.54	0.20	9.93
320 – 365	33.83	44.15	21.16	0.86	100.00
	15.69	17.01	6.61	0.54	10.48
365 – 410	23.39	40.23	33.77	2.61	100.00
	10.56	15.09	10.26	1.60	10.20
410 – 455	15.62	37.29	42.42	4.68	100.00
	6.47	12.83	11.82	2.64	9.36
455 – 510	10.38	30.98	49.04	9.61	100.00
	4.55	11.28	14.48	5.73	9.91
510 – 580	7.06	25.46	51.15	16.33	100.00
	3.18	9.52	15.51	10.00	10.18
580 – 690	4.63	18.70	50.81	25.86	100.00
	2.12	7.12	15.68	16.13	10.36
690 – 890	2.89	11.75	45.09	40.27	100.00
	1.25	4.22	13.12	23.67	9.77
890 – 1155	1.66	6.11	32.97	59.26	100.00
	0.36	1.11	4.87	17.70	4.96
> 1155	1.77	4.24	21.65	72.34	100.00
	0.39	0.78	3.21	21.69	4.98
Total	22.60	27.21	33.57	16.61	100.00
	100.00	100.00	100.00	100.00	100.00

1. The first set of row numbers denote row percentages and the second denote column percentages.

Table A.20
Mean Fat Intake by Expenditure in Rural India, 2004

Monthly per capita expediture – rural grouping	Fat per capita per day 0-20	21-30	31-50	> 50	Total
0 – 235	12.2	23.3	32.8	172.8	14.1
235 – 270	14.5	23.6	33.7	69.4	18.0
270 – 320	15.2	24.2	34.6	94.9	21.2
320 – 365	15.9	24.5	35.6	156.8	25.1
365 – 410	16.3	25.1	36.7	66.8	28.0
410 – 455	16.6	25.1	36.9	68.7	30.8
455 – 510	16.3	25.1	38.3	60.8	34.1
510 – 580	16.2	25.5	39.0	74.7	39.8
580 – 690	16.0	25.7	39.4	69.1	43.4
690 – 890	15.8	25.9	40.0	68.5	49.1
890 – 115	15.6	25.6	41.0	74.0	59.2
> 1155	15.7	26.0	41.1	88.2	74.1

Table A. 21
Proportions of Households by Fat Intake and Expenditure in Urban India, 1993[1]

Monthly per capita expediture NSS 50 - 2004 mutiplier	Fat per capita per day 0-25	26-40	41-60	> 60	Total
0 – 335	92.10	7.49	0.38	0.03	100.00
	21.80	1.49	0.09	0.01	5.93
335 – 395	74.77	24.53	0.70	0.00	100.00
	15.45	4.25	0.14	0.00	5.18
395 – 485	57.23	37.64	5.02	0.12	100.00
	25.02	13.80	2.10	0.07	10.95
485 – 580	34.86	51.18	13.36	0.60	100.00
	16.91	20.83	6.21	0.38	12.15
580 – 675	22.88	48.29	25.95	2.88	100.00
	9.89	17.51	10.74	1.64	10.82
675 – 790	11.30	42.44	38.14	8.12	100.00
	5.13	16.17	16.59	4.87	11.37
790 – 930	6.74	32.97	45.72	14.57	100.00
	2.81	11.54	18.27	8.02	10.45
930 – 1100	3.94	24.72	45.80	25.54	100.00
	1.36	7.19	15.21	11.68	8.68
1100 – 1380	2.41	12.95	44.57	40.07	100.00
	0.92	4.14	16.27	20.15	9.54
1380 – 1880	1.61	7.18	32.61	58.60	100.00
	0.52	1.95	10.10	25.01	8.10
1880 – 2540	0.65	4.64	19.62	75.09	100.00
	0.10	0.62	2.98	15.72	3.97
>2540	0.68	5.12	11.90	82.30	100.00
	0.08	0.49	1.31	12.44	2.87
Total	25.04	29.84	26.14	18.98	100.00
	100.00	100.00	100.00	100.00	100.00

1. The first set of row numbers denote row percentages and the second denote column percentages.

Table A. 22
Mean Fat Intake by Expenditure in Urban India, 1993

Monthly per capita expediture NSS 50 - mutiplier	Fat per capita per day 0-25	26-40	41-60	> 60	Total
0 – 335	15.0	28.4	42.4	60.9	16.1
335 – 395	17.7	29.2	44.9	.	20.7
395 – 485	18.7	30.3	45.3	62.3	24.5
485 – 580	19.5	31.7	45.9	66.1	29.5
580 – 675	20.4	32.4	46.4	70.2	34.4
675 – 790	20.6	33.1	47.6	68.8	40.1
790 – 930	20.4	33.2	48.3	69.4	44.5
930 – 110	19.6	34.2	49.4	72.2	50.3
1100 – 13	20.7	34.1	50.1	75.1	57.4
1380 – 18	19.3	35.1	51.2	79.4	66.1
1880 – 25	17.4	34.7	51.2	88.8	78.4
>2540	12.4	35.1	51.3	99.9	90.2
Total	18.2	32.3	48.6	80.2	42.1

Table A. 23
Proportions of Households by Fat Intake and Expenditure in Urban India, 2004[1]

Monthly per capita expediture – urban grouping	RECODE of fat_p (Fat per capita per day) 0-25	26-40	41-60	> 60	Total
0 – 335	80.06	19.12	0.72	0.09	100.00
	26.11	3.10	0.12	0.02	5.02
335 – 395	52.43	45.55	2.01	0.01	100.00
	17.31	7.46	0.32	0.00	5.08
395 – 485	37.18	54.41	8.05	0.37	100.00
	23.58	17.13	2.49	0.16	9.76
485 – 580	23.17	53.43	21.13	2.27	100.00
	15.58	17.83	6.93	1.06	10.35
580 – 675	10.89	50.79	34.05	4.26	100.00
	6.88	15.92	10.49	1.88	9.72
675 – 790	7.48	42.66	42.40	7.46	100.00
	4.83	13.68	13.36	3.37	9.94
790 – 930	2.81	32.37	52.23	12.58	100.00
	1.88	10.71	16.98	5.85	10.26
930 – 1100	2.69	22.32	51.15	23.84	100.00
	1.70	7.00	15.77	10.52	9.73
1100 – 1380	1.59	12.09	48.72	37.59	100.00
	1.06	3.99	15.81	17.46	10.24
1380 – 1880	1.01	6.70	36.81	55.49	100.00
	0.65	2.14	11.54	24.90	9.89
1880 – 2540	0.77	3.31	23.68	72.24	100.00
	0.25	0.54	3.82	16.67	5.09
>2540	0.59	3.16	15.18	81.07	100.00
	0.19	0.50	2.37	18.09	4.92
Total	15.40	31.01	31.55	22.04	100.00
	100.00	100.00	100.00	100.00	100.00

1. The first set of row numbers denote row percentages and the second denote column percentages.

Table A. 24
Mean Fat Intake by Expenditure in Urban India, 2004

Monthly per capita expediture – urban grouping	RECODE of fat_p (Fat per capita per day) 0-25	26-40	41-60	> 60	Total
0 – 335	17.0	29.1	42.6	94.6	19.6
335 – 395	19.4	30.2	43.1	240.3	24.8
395 – 485	20.1	31.3	45.1	177.4	28.8
485 – 580	20.8	32.3	46.0	202.1	36.4
580 – 675	20.8	32.8	46.7	69.4	37.8
675 – 790	21.4	33.3	47.7	71.8	41.4
790 – 930	20.5	34.0	48.9	82.7	47.5
930 – 110	19.8	34.8	49.2	77.5	51.9
1100 – 13	20.3	34.5	50.5	75.4	57.5
1380 – 18	20.4	34.4	50.9	79.2	65.2
1880 – 25	20.5	34.5	51.5	89.6	78.2
>2540	20.9	33.3	51.5	103.8	93.2
Total	19.4	32.6	48.9	85.8	47.4

Table A.25
Food Prices (Rs./Kg)[1] — 1993

Sector	Rice & Wheat	Inferior Cereals	Milk-&-Products/ Ghee-Butter	Vanaspati-oil	Sugar	Eggs	Meat/Fish/ Poultry	Pulses/Nuts-DryFruits/ others	Fruits	Vegetables
Rural	5.7	3.4	8.4	34.1	11.1	24.6	31.9	6.1	10.3	4.1
Urban	6.3	3.8	11.0	35.7	11.4	23.2	36.1	5.7	11.9	5.4
2004										
Rural	9.0 (57.89)	6.5 (91.18)	15.4 (83.3)	54.9 (61.0)	18.1 (63.15)	34.4 (39.84)	59.7 (87.15)	16.4 (68.85)	18.0 (74.75)	8.1 (97.56)
Urban	10.3 (63.49)	7.8 (205.26)	19.0 (72.72)	55.3 (62.17)	18.3 (60.52)	32.4 (39.65)	64.2 (77.84)	13.8 (242.10)	21.0 (76.47)	9.6 (77.77)

1. Nominal prices computed from NSS unit records for 1993 and 2004.
2. Figures in parentheses are percent changes in prices over the period 1993–2004.

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