Lecture 5: Is there a nutrition-based poverty trap?

Abhijit V. Banerjee and Esther Duflo

14.73 Challenges of World Poverty

Under-nutrition in the World

- While famine may be history, malnutrition is not.
- The UN agency FAO estimates that, worldwide a billion people are under-nourished.
- Symptoms of malnutrition: anemia, low BMI (bodymass index), small and thin children.
- Large increase in food prices in 2006-2008, and again in 2010. Two consequences on those of the poor who are net consumer of food (i.e. they produce less than they consume, e.g. urban poor).

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- Because a larger portion of their budget is spent on food, this will affects them disproportionately (the real price of their total food basket has increased more).
- Price increase may lead to a decrease in the nutritional status of the poor and start a vicious circle: Pak Solhin's story

The S-Shape curve and the nutrition-based poverty trap: reminder

With your wage, you buy food, which gives you strength, which allows you to get wages: it creates a relationship between income today, and income tomorrow (or with wage level, and the ability of the poorest people to work: at the extremely only those who have some non-labor income and can supplement their daily wage will be able to work).

Necessary condition for a poverty trap: the capacity curve intersects the 45 degree line from below at some point ▸ S-Shape

The S-shape is made of two relations:

- The relationship between wage and nutrition (how much better do you eat if you have a little more income)
- And the relationship between nutrition and productivity (how much stronger to do you become if you have a bit more to eat).

Understanding Food Consumption

If there was a S-Shape curve between nutrition and productivity, the poor should eat as much as they can:

- The share of food in the budget would be very high for them. If you have some unavoidable expense, expenditure on food would first increase more than proportionally, and then less than proportionally.
  - budget: 20 rupees=5 rupees on clothing and house, 15 rupees on food
  - budget: 30 rupees= 5 rupees on clothing and house, 25 rupees on food
  - budget: 45 rupees=10 rupees on clothing on house, 30 rupees on food, 10 rupees on movies

Do the poor eat as much as they can?

The Food share in the budget around the world : ▸ Budgets

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- They could spend the budget they spend on food differently.

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So are calories increasing very rapidly with income for the very poor?

We do that by getting detailed information from people about food consumed last month (or last week) and using a calorie conversion table to estimate how much calories that represents.

Calorie consumption and economic well being

The graph plots the logarithm of calorie consumption against the logarithm of total household expenses per capital (outlay)

▸ Graphs

The slope of this graph is about 0.35.

Interpreting this graph: when total expenditure per capita increase by 1%, the consumption of calories increase by 0.35%

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The calories consumed increase with overall consumption: however, not 1 for 1: when total expenditure increase by 10%, the consumption of calories increases by about 3.5%. The *Engel Curve*

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In summary: a poor household who is 10% richer spends about 7% more on food, and this extra spending is shared in half: half to get more calories, half to get more expensive (better tasting) calories.

Even among very poor people, increase in economic well-being has a positive, but not huge impact on calories consumed.

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Two effect when the price of a good decreases

- An *substitution* effect: you want to consume more of this good because it has become less expensive than other goods.
- An *income* effect
  - Normal good: The income effect is positive (you consume more as income goes up)
  - Inferior good: The income effect is negative (you consume less as income goes up)

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In most cases, even for inferior goods the substitution effect will dominate, because most goods are only a small part of the budget.

But for a staple food that constitutes a large part of the budget, a decrease in the price may have a large income effect: A giffen good is when the (negative) income effect is larger than the (positive) substitution effect

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- Take a sample of households, and randomly chose a subsample of them.
- Distribute vouchers for reduced price of rice in Hunan, reduced price of wheat in Gangsu to the random subsample, for more than month supply
- Make sure that households do not exchange or trade them (otherwise it would be a pure income transfer, there would be no substitution).
- After 6 month, ask households detailed questions about their consumption of rice, wheat, and other stuff.

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What explanation do they give for the different results?

Implications for nutrition

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It must be *negative*.

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- Those who eat more may be more productive and have more money (reverse causality)
- Those who have more income may be have different tastes, and would may be eat more even if they were poorer (for example, people who smoke may both eat less and earn less).

The Engel Curve over time

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What could be happening?

Does eating more make people more productive?

Why are poor households not eating more and not seizing every available opportunity to eat more?

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Over time, in India, need for calories have gone down: less "backbreaking work", fewer illnesses.

Households in China where poor urban households.

Does eating more make people more productive?

A study by John Strauss: impact of calories on productivity in Sierra Leone (results do not come an experiment, but Strauss used the fact that people eat less when the price of food goes up).

▸ Result Calories makes people more productive, but it looks like an inverted L-shape curve: it is highest for the poorest: when their calorie consumption increase by 1%, their productivity increase by 0.4%, and after that it goes down.

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What do the poor spend their money on?

	As a Share of Total Consumption			
	Food	Alcohol/ Tobacco	Education	Health
Living on less than $1 a day				
Rural				
Cote d'Ivoire	64.4%	2.7%	5.8%	2.2%
Guatemala	65.9%	0.4%	0.1%	0.3%
India - Udaipur	56.0%	5.0%	1.6%	5.1%
Indonesia	66.1%	6.0%	6.3%	1.3%
Mexico	49.6%	8.1%	6.9%	0.0%
Nicaragua	57.3%	0.1%	2.3%	4.1%
Pakistan	67.3%	3.1%	3.4%	3.4%
Panama	67.8%		2.5%	4.0%
Papua New Guinea	78.2%	4.1%	1.8%	0.3%
Peru	71.8%	1.0%	1.9%	0.4%
South Africa	71.5%	2.5%	0.8%	0.0%
Timor Leste	76.5%	0.0%	0.8%	0.9%

Calorie and Total expenditure per capita

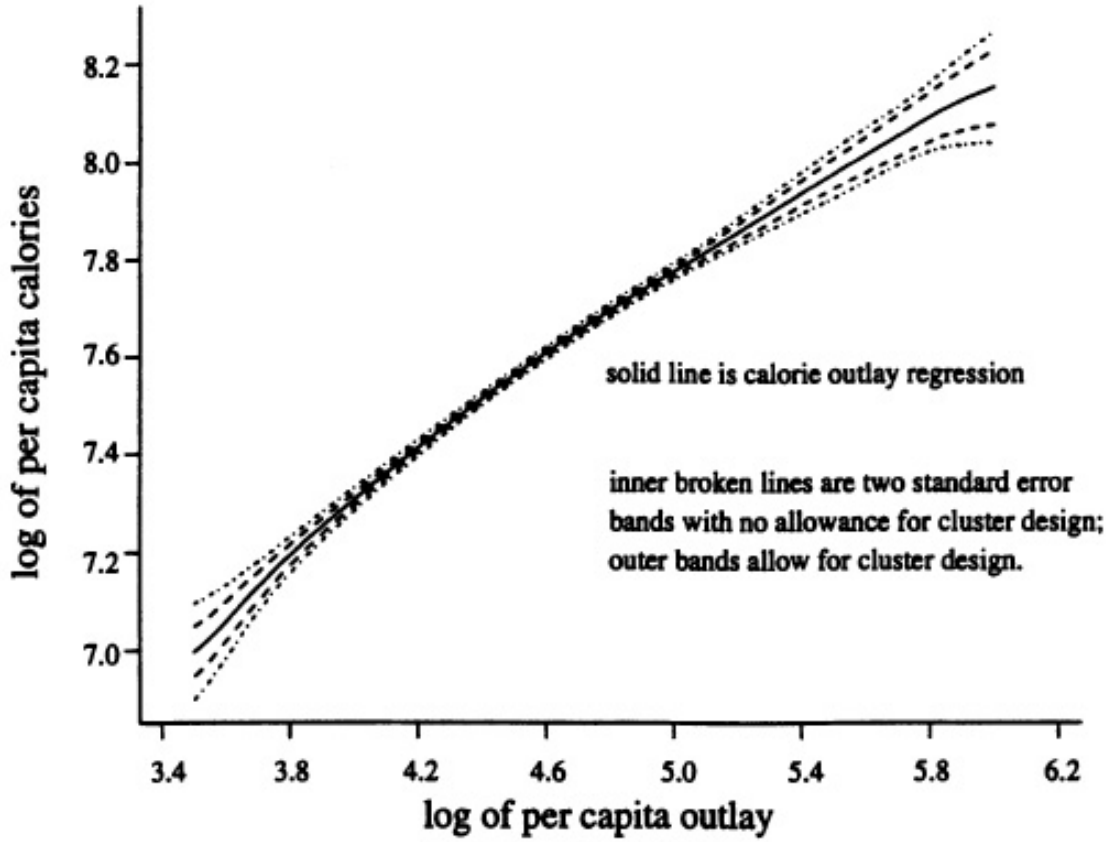


FIG. 2.—Regression function for log calories and log per capita expenditure, Maharashtra, India, 1983.

Deaton and Subramanian, Table 1

TABLE 1

EXPENDITURE PATTERNS, CALORIE CONSUMPTION, AND PRICES PER CALORIE, RURAL MAHARASHTRA, 1983

	Expenditure Shares (%)			Calorie Shares (%)			Price per Calorie (Rupees per 1,000 Calories)		
	Mean (1)	Bottom 10% (2)	Top 10% (3)	Mean (4)	Bottom 10% (5)	Top 10% (6)	Mean (7)	Bottom 10% (8)	Top 10% (9)
					A. Food Groups				
Cereals	40.7	46.0	31.0	70.8	77.3	57.3	.64	.51	.79
Pulses	8.9	10.2	7.8	6.6	6.2	7.2	1.51	1.44	1.60
Dairy	8.1	4.9	11.8	2.8	1.3	4.9	3.69	3.59	3.92
Oils and fats	9.0	9.2	9.2	5.9	4.8	7.6	1.74	1.67	1.81
Meat	5.1	3.4	6.4	.7	.4	1.0	11.7	11.0	12.2
Fruits and vegetables	10.5	8.5	12.0	3.5	2.3	5.4	3.90	3.83	3.85
Sugar	6.5	7.4	5.9	7.2	7.0	8.0	1.01	.94	1.09
Other food	11.3	10.4	16.1	2.5	0.8	8.6	17.4	16.8	15.9
					B. Cereals				
Rice	11.6	9.0	10.9	15.2	10.1	16.5	.95	.89	1.02
Wheat	5.6	3.8	7.9	8.5	4.7	14.4	.79	.73	.82
Jowar	18.2	27.4	9.3	37.8	52.9	21.6	.50	.43	.55
Bajra	3.0	2.7	1.3	6.6	4.9	3.2	.48	.48	.50
Other coarse cereal	1.2	2.8	.3	2.2	4.5	.6	.66	.58	.99
Cereal substitutes	1.1	.5	1.3	.6	.2	.8	2.23	2.22	2.22
Total food (or total calories)	67.4	73.4	54.1	2,120 2,098	1,385 1,429	3,382 3,167	1.14	.88	1.50

NOTE.—Mean refers to mean over the whole sample, bottom 10% to mean over households in the bottom decile of per capita household expenditure, and top 10% to mean over households in the top decile of per capita household expenditure. The figures in the last row of panel B are unadjusted and adjusted total calories, respectively, where the adjustment corrects for meals given to others or not received from others; see the text for a full description. Shares of calories and of expenditures are calculated on an individual household basis and are averaged over all appropriate households. Calorie prices are averages over consuming households.

How the food budget changes with wellbeing

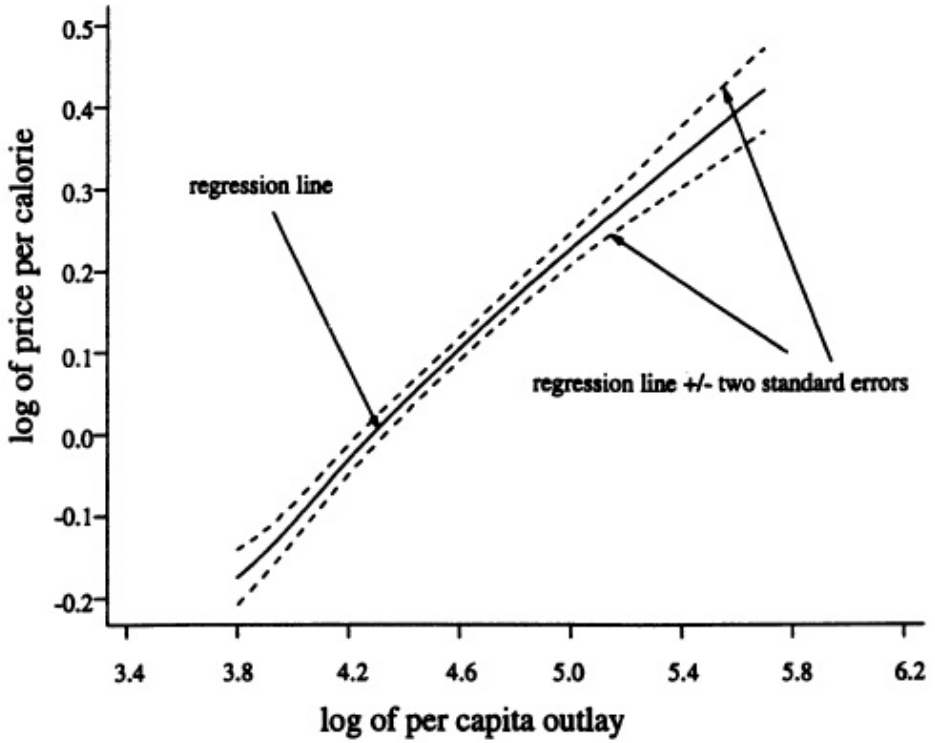


FIG. 4.—Log of price per calorie and log of per capita expenditure, Maharashtra, India, 1983.

Elasticity of consumption of various items with respect to price subsidy: Hunan

Table 4. Consumption Response to the Price Subsidy

	HUNAN									
	Rice	Other Cereal	Fruit & Veg	Meat	Seafood	Pulses	Dairy	Fats	Food Out	Non-Food
%Subsidy(rice)	-0.235*	0.397	-0.623***	0.377	0.482**	-0.791*	-0.054	-0.567*	0.117	0.200
	(0.140)	(0.355)	(0.227)	(0.415)	(0.230)	(0.476)	(0.069)	(0.313)	(0.347)	(0.200)
%ΔEarned	0.043***	-0.001	0.058***	0.002	0.036	-0.052	-0.006	0.022	0.059	0.014
	(0.014)	(0.040)	(0.021)	(0.043)	(0.022)	(0.050)	(0.004)	(0.031)	(0.044)	(0.025)
%ΔUnearned	-0.044*	-0.087	-0.018	0.076	-0.004	-0.037	-0.021	-0.007	0.020	0.089**
	(0.025)	(0.065)	(0.040)	(0.071)	(0.042)	(0.075)	(0.019)	(0.055)	(0.057)	(0.038)
%ΔPeople	0.89***	0.46**	0.63***	0.05	-0.07	0.48**	0.09	0.88***	-0.18	0.15
	(0.08)	(0.19)	(0.11)	(0.24)	(0.10)	(0.23)	(0.05)	(0.16)	(0.18)	(0.13)
Constant	4.1***	7.5***	-0.3	-5.7**	-0.2	8.8***	0.2	-8.3***	-3.5	-52.6***
	(1.0)	(2.5)	(1.4)	(2.8)	(1.4)	(3.0)	(0.6)	(2.1)	(2.5)	(1.5)
Observations	1258	1258	1258	1258	1258	1258	1258	1258	1258	1258
R^2	0.19	0.06	0.11	0.07	0.02	0.03	0.02	0.09	0.02	0.20

Elasticity of consumption of various items with respect to price subsidy: Gansu

	Wheat	Other Cereal	Fruit & Veg	Meat	Seafood	Pulses	Dairy	Fats	Food Out	Non-Food
%Subsidy(wheat)	0.353	-0.283	0.049	0.130	-0.017	0.240	0.282	0.507**	0.109	-0.021
	(0.258)	(0.335)	(0.190)	(0.299)	(0.017)	(0.320)	(0.207)	(0.251)	(0.276)	(0.180)
%ΔEarned	0.079**	-0.067	0.061**	0.085*	0.000	-0.047	-0.025	0.091***	0.070	0.040
	(0.036)	(0.049)	(0.027)	(0.044)	(0.000)	(0.043)	(0.029)	(0.033)	(0.043)	(0.025)
%ΔUnearned	-0.017	0.130	0.046	0.314***	0.025	0.012	0.108	-0.110	-0.077	0.229***
	(0.092)	(0.106)	(0.077)	(0.091)	(0.025)	(0.104)	(0.073)	(0.091)	(0.097)	(0.070)
%ΔPeople	0.58***	0.52*	1.01***	-0.10	-0.01	0.44**	0.10	0.66	0.00	-0.04
	(0.22)	(0.29)	(0.15)	(0.28)	(0.01)	(0.18)	(0.12)	(0.15)	(0.19)	(0.19)
Constant	-26.1***	23.8***	11.0***	2.4	-0.2	6.0**	-3.4*	7.2	7.5***	-38.2***
	(2.3)	(2.8)	(1.6)	(2.5)	(0.2)	(2.6)	(1.9)	(2.1)	(2.4)	(1.4)
Observations	1269	1269	1269	1269	1269	1269	1269	1269	1269	1269
R^2	0.08	0.06	0.07	0.05	0.03	0.06	0.03	0.07	0.05	0.17

Calories and rice price subsidy

Table 2. Calorie Response to the Price Subsidy

	HUNAN					GANSU				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Full Sample (Calories)	Below Median (Calories)	Above Median (Calories)	Bottom Quartile (Calories)	Full Sample (Protein)	Full Sample (Calories)	Below Median (Calories)	Above Median (Calories)	Bottom Quartile (Calories)	Full Sample (Protein)
%Subsidy(rice/wheat)	-0.206*	-0.042	-0.339**	0.004	-0.096	0.154	0.169	0.132	0.070	0.091
	(0.108)	(0.144)	(0.164)	(0.207)	(0.133)	(0.100)	(0.143)	(0.138)	(0.261)	(0.112)
%ΔEarned	0.031***	0.026*	0.036**	0.037*	0.040***	0.028**	0.027	0.029	0.053	0.017
	(0.011)	(0.014)	(0.018)	(0.021)	(0.013)	(0.014)	(0.021)	(0.019)	(0.034)	(0.016)
%ΔUnearned	-0.022	-0.025	-0.023	-0.037	-0.010	0.046	0.020	0.071*	0.101	0.069
	(0.020)	(0.027)	(0.028)	(0.034)	(0.023)	(0.035)	(0.056)	(0.043)	(0.119)	(0.033)
%ΔPeople	0.94***	1.07***	0.80	1.04***	0.93***	0.91***	1.01***	0.81***	1.08***	0.88***
	(0.07)	(0.08)	(0.11)	(0.10)	(0.07)	(0.08)	(0.10)	(0.12)	(0.13)	(0.09)
Constant	9	1.6	0.5***	2.8*	0.8	-1.9	0.1	-3.9	0.6	-4.0
	(0.8)	(1.1)	(1.1)	(1.5)	(0.9)	(0.8)	(1.1)	(1.1)	(1.7)	(0.9)
Observations	1258	633	625	317	1258	1269	634	635	320	1269
R^2	0.26	0.34	0.21	0.39	0.20	0.18	0.23	0.15	0.29	0.16

Notes: Regressions include county*time fixed-effects. The dependent variable in columns 1-4 and 6-9 is the arc percent change in household caloric intake and in columns 5 and 10 it is the arc percent change in household protein consumption. Standard errors clustered at the household level. %Subsidy (rice/wheat) is the rice or wheat price subsidy, measured as a percentage of the average price. %ΔEarned is the arc percent change in the household earnings from work; %ΔHH Unearned is the arc percent change in the household income from unearned sources (government payments, pensions, remittances, rent and interest from assets); %ΔPeople is the arc percent change in the number of people living in the household. *Significant at 10 percent level. **Significant at 5 percent level. ***Significant at 1 percent level.

Elasticity of consumption of various items with respect to price subsidy: Hunan

Table 4. Consumption Response to the Price Subsidy

	HUNAN									
	Rice	Other Cereal	Fruit & Veg	Meat	Seafood	Pulses	Dairy	Fats	Food Out	Non-Food
%Subsidy(rice)	-0.235*	0.397	-0.623***	0.377	0.482**	-0.791*	-0.054	-0.567*	0.117	0.200
	(0.140)	(0.355)	(0.227)	(0.415)	(0.230)	(0.476)	(0.069)	(0.313)	(0.347)	(0.200)
%ΔEarned	0.043***	-0.001	0.058***	0.002	0.036	-0.052	-0.006	0.022	0.059	0.014
	(0.014)	(0.040)	(0.021)	(0.043)	(0.022)	(0.050)	(0.004)	(0.031)	(0.044)	(0.025)
%ΔUnearned	-0.044*	-0.087	-0.018	0.076	-0.004	-0.037	-0.021	-0.007	0.020	0.089**
	(0.025)	(0.065)	(0.040)	(0.071)	(0.042)	(0.075)	(0.019)	(0.055)	(0.057)	(0.038)
%ΔPeople	0.89***	0.46**	0.63***	0.05	-0.07	0.48**	0.09	0.88***	-0.18	0.15
	(0.08)	(0.19)	(0.11)	(0.24)	(0.10)	(0.23)	(0.05)	(0.16)	(0.18)	(0.13)
Constant	4.1***	7.5***	-0.3	-5.7**	-0.2	8.8***	0.2	-8.3***	-3.5	-52.6***
	(1.0)	(2.5)	(1.4)	(2.8)	(1.4)	(3.0)	(0.6)	(2.1)	(2.5)	(1.5)
Observations	1258	1258	1258	1258	1258	1258	1258	1258	1258	1258
R^2	0.19	0.06	0.11	0.07	0.02	0.03	0.02	0.09	0.02	0.20

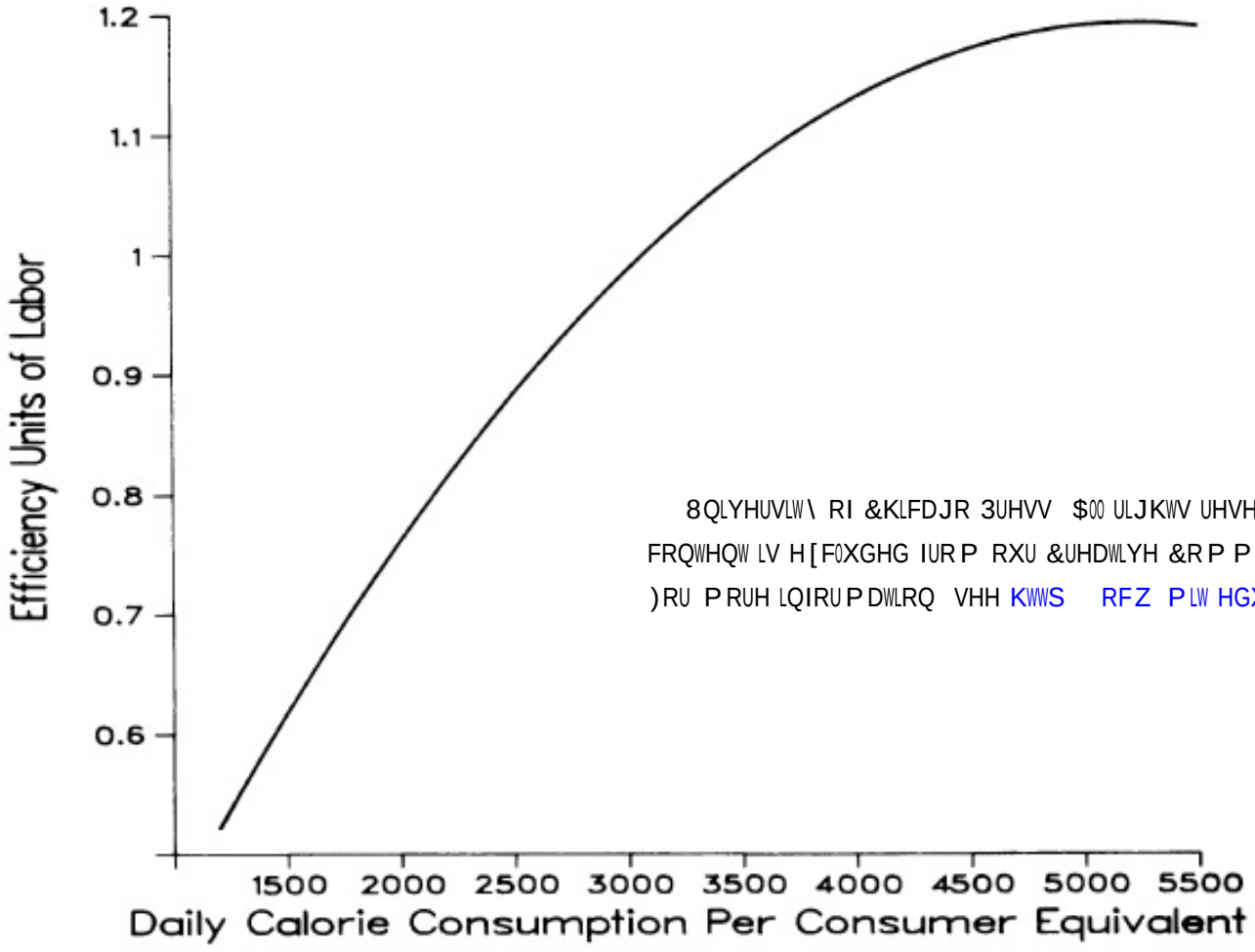
Fractions of the Population Living in Households with per Capita Calorie Consumption below 2,100 Urban and 2,400 Rural

Year	Round	Rural	Urban	All India
1983	38	66.1	60.5	64.8
1987-8	43	65.9	57.1	63.9
1993-4	50	71.1	58.1	67.8
1999-0	55	74.2	58.2	70.1
2004-5	61	79.8	63.9	75.8

Source: *Authors' calculations based on NSS data.*

Figure by MIT OpenCourseWare.

John Strauss: Nutrition and Farm Productivity



8QLYHUVLW\ RI &KLFDJR 3UHVV $00 ULJKWV UHVHUYHG This FRQWHQW LV H[FXGHG IURP RXU &UHDWLYH &RP PRQV 0LFHQVH)RU PRUH LQIRUPDWLRQ VHH KWWS RFZ PLW HGX IDLUXVH

FIG. 2.—Estimated efficiency labor function

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