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PROJECTIONS OF HOUSEHOLD EXPENDITURES IN INDIA, 1971-1975

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INTRODUCTION

In Indian planning demand projections have played an important role. The usual formula adopted for estimating the expected increase in household expenditure on different items of consumption is :

$$I_t = 100 \left\{ \left[1+p(t) \right]^{\eta} - 1 \right\}, \qquad .. \quad .. \quad .. \qquad (1)$$

where p(t) is the percentage rate of growth of income or, more exactly, total household expenditure per head on all items of consumption over a period of t years; η is the income elasticity of the commodity under study, which is assumed to remain constant throughout the projection period. This formula, though simple, is based on rather restrictive assumptions regarding the behaviour of households. For example, the Planning Commission's (1966) demand projections are based on constant-elasticity Engel curves which are not additive; they also do not take into explicit account the possible change in income distribution as a result of planning.

Roy and Laha (1960) gave a general formulation of the problem of estimating the expected increase in demand caused by planned changes in the distribution of income. They, too, assumed constant-elasticity Engel curves for all the commodities. As for the form of income distribution, Roy and Laha adopted the well-known Pareto distribution and worked out the demand projections for 35 items of household expenditure. Iyengar (1960a) reformulated the same problem using, however, a more realistic assumption that incomes follow the lognormal law of growth, but retaining the assumption of constant elasticities. Using this formulation, Iyengar and Jain (1969) constructed demand projections at constant prices for nearly 60 items of consumption by taking into consideration the possible changes in the distribution of income.

The above studies are subject to two main criticisms; one is that they are based on the assumption of constancy of income elasticities, which, during a period of rapid changes in the distribution of income may not be very realistic, and the other is that constant-elasticity Engel curves, when total expenditure is used instead of income as the explanatory variable, are not additive. To avoid these criticisms, Iyengar and Rao (1968) gave a new formula

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for demand projections, employing what Houthakker (1960) has called the addilog Engel curves. These curves possess many of the cherished properties like additivity, non-negativity, non-linearity, simplicity, conformity with known economic theories of consumer behaviour, and close agreement with observed household expenditure data. The income elasticities derived from the addilog curves are not constant and gradually diminish as income rises. A variable elasticity reflects the observed tendency of households with low incomes to spend a larger proportion of their rise in income, particularly on essential commodities, as compared to households having relatively higher income. However, it may not be as useful as the constant elasticities for demand projections.

The Iyengar-Rao formulation depends on the income-free parameters of the indirect addilog Engel curves. Using their formulation in the present exercise, we have worked out estimates of expected levels of consumption in India in the years 1970-71 and 1975-76, separately for rural and urban sectors. The Iyengar-Rao formula contains an unrealistic assumption that the average budget pattern does not change from year to year. This assumption, however, is done away with by using a slightly modified iterative procedure. The projections obtained through the modified procedure are compared with projections obtained through a more direct approach. The data used in our study are briefly described in section II. Section III contains our main assumptions regarding the growth of national per head consumption in rural and urban areas. An outline of the method of projecting the 1955-56 (base year) expenditure pattern into 1970-71 and 1975-76 is given in section IV. Our main results are reported in section V and a few concluding observations are made in the last section.

An important conclusion of our present exercise is that a positive income elasticity does not necessarily imply an increase in demand when income rises. On the substantive side, our analysis points to a general increase in demand for practically all groups of household expenditure considered in this exercise. In urban areas, however, the per head consumption of cereals tends to fall to some extent though consumption of food as a whole increases. The indication is that the urban households would probably shift away from cereals to processed non-cereal items of food as their living standards rise beyond a certain level of affluence. No such tendency is revealed in the case of rural households.

II

DATA USED

The present study is based on household expenditure data specially tabulated from the Tenth Round National Sample Survey (NSS) as given in Iyengar (1967). The data, which cover the period from December, 1955 to May, 1956, provide the distribution of number of sample households, their average

monthly total expenditure per head by its usual commodity break-down, in twelve size classes of monthly total expenditure per head, separately for the rural and urban sectors of India. Since this study is intended to be a follow-up of the earlier work of Iyengar and Rao (1968), we have restricted ourselves to only ten major commodity groups: (*i*) food (cereals) including rice, wheat and other cereals; (*ii*) food (non-cereals) which includes milk and milk products, cereals substitutes, pulses, edible oils, oilseed products, vegetables, fruits and nuts, meat, fish, eggs, sugar, and *gur*, salt, spices, beverages, refreshments, *pan*, *supari* and tobacco; (*iii*) fuel and light; (*iv*) clothing including cotton clothing, silk and woollen clothing, bedding and upholstery; (*v*) education; (*vi*) health including medical services, medicine and drugs; (*vii*) housing including rent only; (*viii*) services; (*ix*) durables; (*x*) miscellaneous, consisting all other items not included above. The estimates of the mean monthly per head expenditure on commodity i (i=1, 2, ...10) in the year t = 0 where '0' represents the base year 1955-56, to be denoted by e_i (0), are given separately for rural and urban sectors in columns (2) and (4) of Table I. The estimated values of the growth factors for the selected commodities ($\bar{b}_i$'s), taken from Iyengar and Rao (1968), are shown in columns (3) and (5). It is implicitly assumed that the average monthly consumer expenditures on various commodities during the financial year 1955-56 are not very different from those relating to the survey period at all-India level, since seasonal variations in expenditures in different regions of India are self-cancelling.

TABLE I—AVERAGE MONTHLY TOTAL CONSUMPTION PER HEAD IN RUPEES $e_i(0)$ AND ESTIMATED SPECIFIC GROWTH FACTORS ($\bar{b}_i$): ALL-INDIA RURAL AND URBAN, 1955-56*

Sr. No.	Commodity	Rural		Urban	
		$e_i(0)$	$\bar{b}_i$	$e_i(0)$	$\bar{b}_i$
	(1)	(2)	(3)	(4)	(5)
1.	Cereals	6.68	—0.4045	5.85	—0.7734
2.	Non-cereals	5.79	0.0022	9.80	—0.0317
3.	Fuel and light	1.19	—0.3806	1.63	—0.3671
4.	Clothing.	1.71	0.6674	1.86	0.5309
5.	Education	0.07	1.1563	0.54	0.6293
6.	Health	0.35	1.0044	0.66	0.9368
7.	Housing	0.03	0.7409	1.02	0.4717
8.	Services	0.56	1.0304	1.31	0.5795
9.	Durables	0.43	1.3507	0.89	1.6699
10.	Miscellaneous	0.59	0.6597	1.84	0.4144
	All items	17.40	—	25.40	—

* The estimated specific growth factor for the ith commodity is given by $\bar{b}_i = \sum_r w_r (b_i - b_r)$, where w_r is the share of the rth commodity in total consumption, $E = \sum_i e_i$; the b_i's are the constant parameters of the assumed addilog-Engel curves in the notations of Iyengar and Rao (1968).

III

GROWTH OF NATIONAL CONSUMPTION

Here also we consider the same sets of assumptions as made in our earlier study (Iyengar and Jain, 1969) regarding the differential pattern of growth in per head total consumption in rural and urban sectors. The assumptions are: (A) That rural and urban household consumption per head, in constant prices of 1955-56, will grow uniformally and equally rapidly in the two sectors during the projection period 1955-56 to 1975-76. This assumption follows from one of the main objectives of the Indian Planning Commission, *viz.*, to raise the existing low standard of living of the masses in the course of fifteen or twenty years. (B) Since Indian planning is somewhat urban-oriented, it is to be expected that per head consumption in urban areas will grow much faster than in rural areas; the extent of this growth differential is assumed to be 25 per cent.

The above two assumptions regarding the uniform annual rate (p) and the overall growth rate p(t) over the period (0, t) are set out in Table II, taking t=15 years and t=20 years, p=2 per cent, 2.5 per cent, 3 per cent, 3.5 per cent and 4 per cent; p_u and p_r represent respectively the growth rates in urban and rural sectors.

TABLE II—ASSUMPTION REGARDING p AND p(t)

(percentages)

Assumption	p_r	p_u	1970-71		1975-76	
			p_r (t=15)	p_u (t=15)	p_r(t=20)	p_u(t=20)
A.1 ..	2.000	2.000	34.58	34.58	48.59	48.59
A.2 ..	2.500	2.500	44.82	44.82	63.86	63.86
A.3 ..	3.000	3.000	55.79	55.79	80.61	80.61
A.4 ..	3.500	3.500	67.53	67.53	98.97	98.97
A.5 ..	4.000	4.000	80.09	80.09	119.11	119.11
B.1 ..	2.000	2.500	34.58	44.82	48.59	63.86
B.2 ..	2.500	3.125	44.82	58.68	63.86	85.05
B.3 ..	3.000	3.750	55.79	73.71	80.61	108.81
B.4 ..	3.500	4.375	67.53	90.09	98.97	135.47
B.5 ..	4.000	5.000	80.09	107.90	119.11	165.34

IV

METHODOLOGY

(i) The Iyengar-Rao Formulation

Since the prices are constant in cross-sectional observations, the indirect addilog Engel curve for the ith commodity may be written in the form :

$$e_i = \frac{A_i \, E^{1+b_i}}{\sum_r A_r \, E^{b_r}}, \qquad \ldots \quad \ldots \quad \ldots \quad (2)$$

where e_i denotes per head expenditure on commodity i, there being in all N commodities, and E stands for total expenditure on all the commodities, per head, used as proxy for income. (A_i, b_i) are constant parameters $(i=1, 2, \ldots\ldots N)$. The above relationship can be rewritten as :

$$w_i = \frac{A_i \, E^{b_i}}{\sum_r A_r \, E^{b_r}}, \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

where $w_i = e_i/E$ is the proportion of total outlay spent on commodity i. Since $w_i \geq 0$ and $\sum_i w_i = 1$, we may regard $\sum_i w_i \, b_i$ as a weighted average of the b's and write $\bar{b} = \sum_i w_i \, b_i$. Notice that $\bar{b}$ is a function of E which varies over time.

From formula (3) one can easily obtain the following approximate relation for w_i:[1]

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1. The indirect addilog Engel curve for the ith commodity as rewritten in relation (3) is

$$w_i = A_i \, E^{b_i} / \sum_r A_r \, E^{b_r}$$

where $w_i = e_i / E$ is the proportion of total outlay spent on ith commodity. Suppose, because of small change $\triangle E$ in the value of E the resultant change in w is $\triangle w$. Then we may have

$$w_i + \triangle w_i = A_i \, (E + \triangle E)^{b_i} / \sum_r A_r \, (E + \triangle E)^{b_r}$$

$$= A_i \, E^{b_i} (1 + p(T))^{b_i} / \sum A_r \, E^{b_r} \, (1 + p(T)^{b_r}$$

where p(T) denotes $\triangle E/E$, the rate of growth of income (total expenditure) per head over a period of T years.

Or

$w_i + \triangle w_i \lesssim A_i \, E^{b_i} \, [1 + b_i \, p(T)] / \sum_r A_r \, E^{b_r} \, [1 + b_r \, p(T)]$, neglecting the second and higher order terms of small number P(T).

Or

$$w_i + \triangle w_i \lesssim w_i \, [1 + b_i \, p(T)] / [1 + p(T) \sum_r b_r \, w_r]$$

$$\lesssim w_i \, [1 + b_i \, p(T)] \, [1 - \bar{b} \, p(T)]$$

$$\lesssim w_i \, [1 + b_i \, p(T) - \bar{b} \, p(T)]$$

$$\therefore \quad \frac{\triangle w_i}{w_i} \lesssim (b_i - \bar{b}) \, p(T)$$

$$\frac{\triangle w_i}{w_i} \gtreqless (b_i - \bar{b})\ p(T), \qquad (4)$$

where p(T) denotes $\frac{\triangle E}{E}$, the rate of growth of income (total expenditure) per head over a period of T years. The above expression can also be written in the form :

$$\frac{\triangle w_i}{w_i} \gtreqless p(T)\ \sum_r w_r\ (b_i - b_r) \equiv p(T)\ \bar{b}_i . \qquad (5)$$

Iyengar and Rao (1968) have called $\bar{b}_i = \sum_r w_r\ b_{ir}$ the specific growth factor (sgf) for the ith commodity. The projected pattern $[w_i(T)]$ of expenditure for the Tth year from the base year is given by :

$$w_i(T) \gtreqless w_i(0)\ [1 + \bar{b}_i\ p(T)],\ i = 1, 2, \ldots\ldots N . \qquad (6)$$

Because $E(T) = E(0)\ [1 + p(T)]$, the relation (6) can be written as:

$$e_i(T) \gtreqless e_i(0)\ [1 + p(T)]\ [1 + \bar{b}_i\ p(T)] \qquad (7)$$

The above formula affords a simple method for obtaining projections of consumption pattern in a future period, given the initial pattern of consumption, assumptions regarding income changes over the period, and estimates of the specific growth factors for all the commodities. However, its main defect is that it treats $\bar{b}_i$ as constant over time which is not true since $\bar{b}_i$, as already pointed out, is a function of E. Moreover, this formula based as it is on differential calculus, may not give valid projections for large increases in income or total expenditure.

(ii) The Modified Procedure

Let p^2 denote the annual rate of growth of income per capita and $\bar{b}_i = \sum_r w_r\ b_{ir}$, where $b_{ir} = b_i - b_r$. The projected pattern $[w_i(1)]$ of expenditure in year '1' is :

$$w_i(1) \gtreqless w_i(0)\ [1 + p\ \bar{b}_i(0)] \qquad (8)$$

where

$$\bar{b}_i = \sum_r w_r(0)\ b_{ir}, \qquad (9)$$

$w_i(0)$ being the initial pattern of expenditure. Since $E(1) = (1+p)\ E(0)$, the above relation can also be written as :

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2. We need not assume this to be fixed for all the years ; the more realistic case would be when it is different for different years.

$$e_i(1) \gtrless e_i(0)\,[1+p]\,[1+p\,\bar{b}_i(0)] \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (10)$$

In fact, relations (9) and (10) provide us with a method of obtaining projections of expenditure for any year 't' given the pattern of consumption in the preceding year (t—1), the annual rate of growth of per capita income (p) and estimates of the structural parameters $[b_{ir}]$ of the income-expenditure relationship. Using these relations one may easily build up demand projections $[e_i(t)]$ systematically for $t = 1, 2, \ldots\ldots, T$, given $[e_i(0)]$ and $[b_{ir}]$ for the initial year.

(iii) The Direct Method

A more direct method would involve the choice of a commodity, *e.g.*, cereals, as *numeraire* and working through relative expenditures. The relative change in expenditure on item i over the period (0, T) is given by :

$$\frac{e_i(T)}{e_i(0)} = \frac{\sum_r A_r [E(0)]^{b_r}}{\sum A_r [E(T)]^{b_r}} \left[\frac{E(T)}{E(0)}\right]^{1+b_i} ;$$

That is,

$$e_i(T) = e_i(0)\,\frac{\sum A_r\,[E(0)]^{b_r}}{\sum A_r\,[E(T)]^{b_r}} \left[\frac{E(T)}{E(0)}\right]^{1+b_i} \quad \ldots \quad \ldots \quad \ldots \quad (11)$$

On dividing $e_i(0)$ by $e_1(0)$ we get the relative expenditure in the base year on item i when item '1' is used as the numeraire. A similar ratio for the terminal year T is obtained. From (11), we have the following relationship between the relative expenditures in the two years :

$$\frac{e_i(T)}{e_1(T)} = \frac{e_i(0)}{e_1(0)} \left[\frac{E(T)}{E(0)}\right]^{b_{il}} , \quad \ldots \quad \ldots \quad \ldots \quad (12)$$

where $b_{il} = b_i - b_1$.

Since $E(T) = E(0)\,[1+p(T)]$, the above relationship can be written as:

$$e_i(T) = e_1(T)\,\frac{e_i(0)}{e_1(0)}\,[1+p(T)]^{b_{il}} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (13)$$

$$= \lambda_i\, e_1(T), \text{ (say)}$$

where

$$\lambda_i = \frac{e_i(0)}{e_1(0)}\,[1+p(T)]^{b_{il}} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (14)$$

Adding up (13) for $i = 1, 2, \ldots\ldots, N$ and writing $\sum_{i=1}^{N} e_i(T) = E(T)$, we have

$$e_1(T) = \frac{E(T)}{\sum_r \lambda_r} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (15)$$

Finally, combining (13) and (15), we have

$$e_i(T) = \frac{\lambda_i}{\sum_r \lambda_r} E(T) \quad .. \quad .. \quad .. \quad (16)$$

where λ's are as defined in (14). Thus for projecting the pattern of consumption $e_i(T)$ in the terminal year we simply need to know the terminal income $E(T)$ and the ratios λ_i $(i=1, 2, \ldots\ldots, N)$.

MAIN RESULTS

Instead of using the Iyengar-Rao formula in its original form, we have employed the modified iterative procedure as well as the direct method in our numerical calculations. These two procedures give results which are very close to each other and these are presented in a series of tables corresponding to the ten hypotheses as given in Table II. The projections in Tables III-A to III-F were arrived at under the hypothesis that growth in the rural and the urban sectors follow a uniform pattern and those in Tables III-G to III-J were obtained under the assumption that urban expenditures would grow faster than the rural expenditures.

TABLE III-A—SECTORWISE PROJECTIONS OF AVERAGE MONTHLY CONSUMER EXPENDITURE PER HEAD ON VARIOUS COMMODITY GROUPS, ALL-INDIA 1970-71 AND 1975-76, CONSTANT PRICES OF THE BASE YEAR 1955-56

(ASSUMPTION A.1 : p_r = 2.000 PER CENT, p_u = 2.000 PER CENT)*

Sr. No.	Commodity group	Average monthly per head expenditure in 1955-56 (Rs. 0.00)		Estimated average monthly per head expenditure (Rs. 0.00)			
				1970-71		1975-76	
		Rural	Urban	Rural	Urban	Rural	Urban
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.	Cereals	6.68	5.85	7.89	6.16	8.29	6.23
2.	Non-cereals	5.79	9.80	7.71	12.87	8.44	13.99
3.	Fuel and light	1.19	1.63	1.41	1.94	1.49	2·04
4.	Clothing	1.71	1.86	2.77	2.89	3.24	3.32
5.	Education	0.07	0.54	0.13	0.86	0.16	1.00
6.	Health	0.35	0.66	0.63	1.16	0.76	1.38
7.	Housing	0.03	1.02	0.05	1.55	0.06	1.78
8.	Services	0.56	1.31	1.01	2.06	1.23	2.38
9.	Durables	0.43	0.89	0.86	1.94	1.07	2.49
10.	Miscellaneous	0.59	1.84	0.96	2.75	1.11	3.13
	All items	17.40	25.40	23.42	34.18	25.85	37.74

* p_r and p_u represent respectively the uniform annual rates of growth of overall consumption expenditure per head in rural and urban sectors.

TABLE III-B—ASSUMPTION A.2 : p_r = 2.500 PER CENT, p_u = 2.500 PER CENT

Sr. No.	Commodity group	Average monthly per head expenditure in 1955-56 (Rs. 0.00)		Estimated average monthly per head expenditure (Rs. 0.00)			
				1970-71		1975-76	
		Rural	Urban	Rural	Urban	Rural	Urban
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.	Cereals	6.68	5.85	8.18	6.21	8.68	6.27
2.	Non-cereals	5.79	9.80	8.25	13.69	9.20	15.14
3.	Fuel and light	1.19	1.63	1.47	2.01	1.57	2.13
4.	Clothing	1.71	1.86	3.12	3.20	3.77	3.79
5.	Education	0.07	0.54	0.15	0.96	0.20	1.16
6.	Health	0.35	0.66	0.72	1.32	0.91	1.64
7.	Housing	0.03	1.02	0.06	1.72	0.07	2.02
8.	Services	0.56	1.31	1.17	2.30	1.48	2.74
9.	Durables	0.43	0.89	1.01	2.34	1.33	3.19
10.	Miscellaneous	0.59	1.84	1.07	3.03	1.30	3.54
	All items	17.40	25.40	25.20	36.78	28.50	41.62

TABLE III-C—ASSUMPTION A.3 : p_r = 3.000 PER CENT, p_u = 3.000 PER CENT

Sr. No.	Commodity group	Average monthly per head expenditure in 1955-56 (Rs. 0.00)		Estimated average monthly per head expenditure (Rs. 0.00)			
				1970-71		1975-76	
		Rural	Urban	Rural	Urban	Rural	Urban
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.	Cereals	6.68	5.85	8.48	6.25	9.07	6.28
2.	Non-cereals	5.79	9.80	8.80	14.54	10.00	16.31
3.	Fuel and light	1.19	1.63	1.53	2.08	1.64	2.23
4.	Clothing	1.71	1.86	3.49	3.54	4.38	4.32
5.	Education	0.07	0.54	0.18	1.07	0.24	1.33
6.	Health	0.35	0.66	0.83	1.50	1.09	1.95
7.	Housing	0.03	1.02	0.06	1.89	0.08	2.29
8.	Services	0.56	1.31	1.34	2.55	1.78	3.13
9.	Durables	0.43	0.89	1.19	2.81	1.65	4.05
10.	Miscellaneous	0.59	1.84	1.21	3.34	1.50	3.98
	All items	17.40	25.40	27.11	30.57	31.43	45.87

TABLE III-D—ASSUMPTION A.4 : p_r = 3.500 PER CENT, p_u = 3.500 PER CENT

Sr. No.	Commodity group	Average monthly per head expenditure in 1955-56 (Rs. 0.00)		Estimated average monthly per head expenditure (Rs. 0.00)			
				1970-71		1975-76	
		Rural	Urban	Rural	Urban	Rural	Urban
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.	Cereals	6.68	5.85	8.77	6.27	9.44	6.27
2.	Non-cereals	5.79	9.80	9.38	15.40	10.83	17.51
3.	Fuel and light	1.19	1.63	1.58	2.15	1.71	2·31
4.	Clothing	1.71	1.86	3.90	3.91	5.05	4.89
5.	Education	0.07	0.54	0.21	1.19	0.29	1.52
6.	Health	0.35	0.66	0.95	1.71	1.30	2.30
7.	Housing	0.03	1.02	0.07	2.08	0.09	2.58
8.	Services	0.56	1.31	1.54	2.82	2.13	3.56
9.	Durables	0.43	0.89	1.40	3.37	2.03	5.13
10.	Miscellaneous	0.59	1.84	1.35	3.65	1.75	4.47
	All items	17.40	25.40	29.15	42.55	34.62	50.54

TABLE III-E—ASSUMPTION A.5 : p_r = 4.000 PER CENT, p_u = 4.000 PER CENT

Sr. No.	Commodity group	Average monthly per head expenditure in 1955-56 (Rs. 0.00)		Estimated average monthly per head expenditure (Rs. 0.00)			
				1970-71		1975-76	
		Rural	Urban	Rural	Urban	Rural	Urban
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.	Cereals	6.68	5.85	9.06	6.28	9.80	6.24
2.	Non-cereals	5.79	9.80	9.98	16.28	11.69	18.71
3.	Fuel and light	1.19	1.63	1.64	2.22	1.78	2.39
4.	Clothing	1.71	1.86	4.36	4.30	5.82	5.52
5.	Education	0.07	0.54	0.24	1.32	0.35	1.73
6.	Health	0.35	0.66	1.09	1.94	1.55	2.69
7.	Housing	0.03	1.02	0.08	2.28	0.11	2.89
8.	Services	0.56	1.31	1.77	3.12	2.53	4.04
9.	Durables	0.43	0.89	1.64	4.02	2.50	6.46
10.	Miscellaneous	0.59	1.84	1.48	3.98	2.00	4.98
	All items	17.40	25.40	31.34	45.74	38.13	55.65

TABLE III-F—ASSUMPTION B.1 : p_r = 2.000 PER CENT, p_u = 2.500 PER CENT

Sr. No.	Commodity group	Average monthly per head expenditure in 1955-56 (Rs. 0.00)		Estimated average monthly per head expenditure (Rs. 0.00)			
				1970-71		1975-76	
		Rural	Urban	Rural	Urban	Rural	Urban
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.	Cereals	6.68	5.85	7.89	6.21	8.29	6.27
2.	Non-cereals	5.79	9.80	7.71	13.69	8.44	15.14
3.	Fuel and light	1.19	1.63	1.41	2.01	1.49	2.13
4.	Clothing	1.71	1.86	2.77	3.20	3.24	3.79
5.	Education	0.07	0.54	0.13	0.96	0.16	1.16
6.	Health	0.35	0.66	0.63	1.32	0.76	1.64
7.	Housing	0.03	1.02	0.05	1.72	0.06	2.02
8.	Services	0.56	1.31	1.01	2.30	1.23	2.74
9.	Durables	0.43	0.89	0.86	2.34	1.07	3.19
10.	Miscellaneous	0.59	1.84	0.96	3.03	1.11	3.54
	All items	17.40	25.40	23.42	36.78	25.85	41.62

TABLE III-G—ASSUMPTION B.2 : p_r = 2.500 PER CENT, p_u = 3.125 PER CENT

Sr. No.	Commodity group	Average monthly per head expenditure in 1955-56 (Rs. 0.00)		Estimated average monthly per head expenditure (Rs. 0.00)			
				1970-71		1975-76	
		Rural	Urban	Rural	Urban	Rural	Urban
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.	Cereals	6.68	5.85	8.18	6.26	8.68	6.28
2.	Non-cereals	5.79	9.80	8.25	14.76	9.20	16.61
3.	Fuel and light	1.19	1.63	1.47	2.10	1.57	2.25
4.	Clothing	1.71	1.86	3.12	3.63	3.77	4.46
5.	Education	0.07	0.54	0.15	1.10	0.20	1.37
6.	Health	0.35	0.66	0.72	1.55	0.91	2.03
7.	Housing	0.03	1.02	0.06	1.94	0.07	2.36
8.	Services	0.56	1.31	1.17	2.62	1.48	3.23
9.	Durables	0.43	0.89	1.01	2.94	1.33	4.30
10.	Miscellaneous	0.59	1.84	1.07	3.40	1.30	4.11
	All items	17.40	25.40	25.20	40.30	28.50	47.00

TABLE III-H—ASSUMPTION B.3 : p_r = 3.000 PER CENT, p_u = 3.750 PER CENT

Sr. No.	Commodity group	Average monthly per head expenditure in 1955-56 (Rs. 0.00)		Estimated average monthly per head expenditure (Rs. 0.00)			
				1970-71		1975-76	
		Rural	Urban	Rural	Urban	Rural	Urban
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.	Cereals	6.68	5.85	8.48	6.28	9.07	6.26
2.	Non-cereals	5.79	9.80	8.80	15.84	10.00	18.11
3.	Fuel and light	1.19	1.63	1.53	2.19	1.64	2.35
4.	Clothing	1.71	1.86	3.49	4.10	4.38	5.20
5.	Education	0.07	0.54	0.18	1.26	0.24	1.62
6.	Health	0.35	0.66	0.83	1.82	1.09	2.49
7.	Housing	0.03	1.02	0.06	2.18	0.08	2.73
8.	Services	0.56	1.31	1.34	2.97	1.78	3.80
9.	Durables	0.43	0.89	1.19	3.68	1.65	5.76
10.	Miscellaneous	0.59	1.84	1.21	3.80	1.50	4.72
	All items	17.40	25.40	27.11	44.12	31.43	53.04

TABLE III-I—ASSUMPTION B.4 : p_r = 3.500 PER CENT, p_u = 4.375 PER CENT

Sr. No.	Commodity group	Average monthly per head expenditure in 1955-56 (Rs. 0.00)		Estimated average monthly per head expenditure (Rs. 0.00)			
				1970-71		1975-76	
		Rural	Urban	Rural	Urban	Rural	Urban
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.	Cereals	6.68	5.85	8.77	6.28	9.44	6.20
2.	Non-cereals	5.79	9.80	9.38	16.94	10.83	19.61
3.	Fuel and light	1.19	1.63	1.58	2.27	1.71	2.45
4.	Clothing	1.71	1.86	3.90	4.61	5.05	6.02
5.	Education	0.07	0.54	0.21	1.43	0.29	1.90
6.	Health	0.35	0.66	0.95	2.13	1.30	3.02
7.	Housing	0.03	1.02	0.07	2.44	0.09	3.14
8.	Services	0.56	1.31	1.54	3.35	2.13	4.42
9.	Durables	0.43	0.89	1.40	4.59	2.03	7.65
10.	Miscellaneous	0.59	1.84	1.35	4.24	1.75	5.40
	All items	17.40	25.40	29.15	48.28	34.62	59.81

TAELB III-J—ASSUMPTION B.5 : $p_r = 4.000$ PER CENT, $p_u = 5.000$ PER CENT

Sr. No.	Commodity group	Average monthly per head expenditure in 1955-56 (Rs. 0.00)		Estimated average monthly per head expenditure (Rs. 0.00)			
				1970-71		1975-76	
		Rural	Urban	Rural	Urban	Rural	Urban
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.	Cereals	6.68	5.85	9.06	6.26	9.80	6.10
2.	Non-cereals	5.79	9.80	9.98	18.05	11.69	21.08
3.	Fuel and light	1.19	1.63	1.64	2.35	1.78	2.53
4.	Clothing	1.71	1.86	4.36	5.17	5.82	6.93
5.	Education	0.07	0.54	0.24	1.61	0.35	2.21
6.	Health	0.35	0.66	1.09	2.47	1.55	3.65
7.	Housing	0.03	1.02	0.08	2.72	0.11	3.59
8.	Services	0.56	1.31	1.77	3.77	2.53	5.12
9.	Durables	0.43	0.89	1.64	5.70	2.50	10.07
10.	Miscellaneous	0.59	1.84	1.48	4.71	2.00	6.12
	All items	17.40	25.40	31.34	52.81	38.13	67.40

An important general result of our study is that demand for a commodity need not always increase with income when its mean income elasticity is positive. To those who have been using the 'constant' income elasticities based on double-log Engel curves, this result might appear rather unconvincing at the outset. But it should be noted that the addilog Engel curves possess declining income elasticities; and this property is indeed reflected by the sign of the specific growth factors. A commodity may be characterized as a 'necessary' or as a 'luxury' according as whether its specific growth factor is negative or positive. According to this criterion, the items 'cereals' and 'fuel and light' appear to be 'necessary' for both rural and urban households. All other items, except 'non-cereals' in urban areas, appear to belong to the category of 'luxuries.'

Our empirical results show that there will be general rise in demand for all items of consumption, in either sector. In the case of cereals, however, the demand tends to grow only upto a point when it attains an asymptote. This tendency is particularly discernible in the urban sector. While there is a fall in per capita consumption of cereals in this sector, the demand for food as a whole appears to grow even after the point of saturation for cereals is reached. This situation would arise if households, particularly in urban areas, prefer to move away from cereals towards non-cereal items of food as they attain higher living standards. However, we do not observe any such tendency in the case of households in rural India.

When $p=0$ there is no growth. When there is growth, one can easily find values of $p(t)$ for which the demand for non-luxury items attains saturation. For such commodities the specific growth factor will have a large negative value in the range $(-1, 0)$. For cereals in the urban sector, for example, this seems to be the case ($\bar{b}_1 = -0.7735$). Table IV gives projected levels of consumption of cereals for different rates of growth in the urban sector.

TABLE IV—PROJECTED LEVELS OF AVERAGE MONTHLY EXPENDITURE PER HEAD ON CEREALS FOR DIFFERENT VALUES OF p, URBAN INDIA, 1970-71 AND 1975-76

(at constant prices of the base year 1955-56)

Sr. No.	p (per cent)	Estimated average monthly per head expenditure (Rs. 0.00) on cereals	
		1970-71	1975-76
1.	2.000	6.1622	6.2256
2.	2.500	6.2113	6.2057
3.	3.000	6.2479	6.2821
4.	3.125	6.2551	6.2824
5.	3.500	6.2715	6.2741
6.	3.750	6.2784	6.2609
7.	4.000	6.2820	6.2414
8.	4.375	6.2810	6.2006
9.	5.000	6.2623	6.1019

It is easy to observe that as p exceeds 4 per cent, the per capita consumption of cereals in the urban sector tends to decline in 1970-71 itself, whereas in 1975-76, it would start declining as p exceeds 3.1 per cent. The urban demand for this item would, however, continue to rise and remain steady until 1970-71 for p varying between 2 and 4 per cent. When $p = 3.5$ per cent we find a situation in which the per capita consumption of cereals will remain practically constant between 1970-71 and 1975-76.

VI

CONCLUDING REMARKS

Our present work is in the nature of an exercise in methodology. It merely points to certain theoretical and practical advantages of using alternative models for constructing demand forecasts; and in particular it shows that the addilog model of Houthakker provides a better description of data than the non-additive double-log model as the latter does not possess any asymptotic property.

It should be pointed out that though the underlying demand functions are non-linear, the projection formula is linear. As such the projection formula affords a simple method of determining the household consumption vector exegenously in a multisector planning model.

The present study is limited to ten commodities, but it can be extended to cover more commodities. The base period for such projections could be a more recent year than the one we have adopted. For this one might think of the NSS 16th or 19th Round data on consumer expenditure, and estimate the specific growth factors afresh. Another limitation of our projections is that they are all in constant prices of 1955-56.

We have used the term income in some places and total expenditure in other places. As far as present exercise is concerned, the two terms mean the same, namely, standard of living.

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