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URBAN/RURAL CONTRAST OF CONSUMPTION PATTERNS AND CONSUMER PREFERENCES IN JAPAN, 1952-1962

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INTRODUCTION

Although theoretically shifts in consumer preferences have been defined in terms of changes in the parameters of a demand function or the creation of a new demand function, the exact meaning of the term has never been fully elucidated. In a typically dynamic, uncertain world where consumers' expendable resources, the relative prices of goods and services, and the institutional arrangements as to procurement and distribution of economic goods and services as well as the so-called consumer preferences change, consumption behavior observable ex post is presumably the final result of their compounded influences on the consumer and, therefore, such influences often defy rigid empirical separation and specification.

It seems safe to say that typically empirical attempts at measuring demand functions (including the time-series Engel curves) have assumed away the problem, either under the assumption of constant consumer preferences or by arranging available data in such a way that the influences arising from shifts in consumer preferences can be minimized a priori. I do not, however, intend to suggest that these procedures are necessarily bad. In view of the apparent strength and persistence of whatever factors that determine consumers' preferences, geographic, racial, and cultural traits among others, it seems reasonable to operate on the assumption of constant tastes so long as the population to be studied is well defined and the time periods to be covered are adequately delineated. In a rapidly developing country, nevertheless, where socio-cultural arrangements as well as economic variables are changing very rapidly (and the changes may be consecutive rather than once-for-all), the use of the familiar procedures seems quite unsatisfactory.

In this paper I would like to suggest a new statistical procedure for measuring the effects of change in consumer preferences and apply it to the data from postwar Japan where socio-cultural and institutional changes in recent years can hardly be ignored. Presently, my attention will be focused on urban workers' households and rural farm households during the period 1952 through 1962. Urban-rural constrast of consumption behavior is interesting in its own right. I hope additionally that the present study will prove instructive as well in understanding the process of economic growth entailing inevitably the movement of population from rural to urban areas.

The paper is organized as follows: In the first section I shall construct a basic regression model for measuring empirical demand functions by combining cross-section and time-series observations.[1] In the second section the basic data used will be briefly explained and some general analyses will be performed. In the third section I shall derive empirical estimates of the relevant parameters of the demand functions and also the index reflecting the shifts in consumer tastes. The final section presents some concluding remarks.

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[1] The procedure adopted in this paper is an adaptation of a model I developed for a study of quite a different problem.
See my "Regional Patterns of Technical Change in U.S. Agriculture, 1950-1963," Journal of Farm Economics, 49, 1 (February 1967).

I. THE BASIC STATISTICAL MODELS

Suppose that the real expenditure on goods and services reflect, after adjustment for the interregional and the intertemporal differences in price levels, the real differentials in the size of household and real income as well as consumer preferences. Assume, further, that the demand function shifts over time autonomously.

Write the demand function in the general form as follows:

(1) $D = f(N, Y; t)$,

where D is the real expenditure on goods and services, N the size of household, Y the real income, and t denotes the shift of the function over time. Suppose that, after a generalized form of the conventional Engelian function, the demand function above can be specified as

(2) $D = G(t)AN^{\alpha}Y^{\beta}$,

where A, α, and β are the parameters, and G(t) is an unspecified function of time reflecting the autonomous changes influencing demand. It is to be noted that the function G(t) here need not be a simple (regular) function of time. If, then, the influences of time (including shifts in "tastes") are the only factors at work in the demand situation as specified, it is possible to formulate a statistical model for estimating the variable G(t) by pooling the time-series and the cross-section data together.

Let lower case letters denote logarithms of the original variables, and introduce a stochastic term in the basic equation. We obtain a regression equation

(3) $d_t = a + \alpha n_t \beta y_t + g(t) + u_t$.

All that is necessary for statistical estimation of the parameters then is to specify the method by which the variable g(t) can be dealt with.

Suppose that we want to study demand relationships covering T years and R cross-sections (each one of which may be further subdivided into S subsections). We may approach the problem in the following manner:

(a) Assume that among different cross-sections (though not among subsections within each of them) the influences of time, i.e., the state of "consumer tastes," are different at any time. The parameters α and β (the "size" and the "income" elasticities, respectively) are also different among the different cross-sections, though not over the years in a given cross-section.

(b) Assume that among different cross-sections the influences of time are different in any year. The parameters, however, are the same over all cross-sections.

(c) Over all cross-sections the influences of time are the same in any year. The parameters are also the same over all cross-sections of all time periods.

Corresponding to the three assumptions above three regression models can be constructed and g(t)'s estimated. It suffices here to illustrate the procedure for a simple case. Let the observations from cross-section and time-series be combined. Then, equation (3) can be written in the form

$$(4) \quad d_{rt} = a_r + \alpha n_{rt} + \beta y_{rt} + g(t) + u_{rt},$$

where r is the index of the cross-sectional observations, of which there are R, and t is that of time-series observations, of which tere are T. Assume that the stochastic term is distributed normally with

$$E\left(\sum_{r=1}^{R} u_{rt}\right) = 0, \text{ for } t = 1, \ldots, T, \text{ and}$$

$$E\left(\sum_{t=1}^{T} u_{rt}\right) = 0, \text{ for } r = 1, \ldots, R.$$

For each time period separately, average all the variables over the R cross-sections. Let this average value be denoted by a dot in place of the r subscript, e.g., $d_{.t}$, $y_{.t}$, and $n_{.t}$. With the assumption that the "time" variable affects all cross-sectional observations equally at any moment of time, and, therefore, that the average value of g(t) is the same for all cross-sectional observations, we obtain,

$$(5) \quad d_{.t} = a_{.} + \alpha n_{.t} + \beta y_{.t} + g(t).$$

Now subtract (5) from (4), we obtain a regression equation involving only the variables measured from their respective (logarithmic) means of period t,

$$(6) \quad d'_{rt} = a'_{r} + \alpha n'_{rt} + \beta y'_{rt} + u_{rt},$$

where the prime indicates the variable measured from the cross-sectional means. Equation (6) contains only those parameters that can be estimated by the use of the ordinary least-squares method. The variable g(t) can be estimated from equation (5), after the parameters are ascertained, according to various assumptions to be made about the nature of a_r. For example, if $a_r = a_.$ is assumed (that is, the "influences of time" are the only unspecified factor at work in the demand situation), so that at the same values of n_{rt} and y_{rt}, the values of d_{rt} are the same for all observations covering all cross-sections, then g(t) can be computed numerically from (5).

Following the same procedure as above, allowing, however, several subsections in each cross-section to be subscripted with s (s = 1, ..., S), we can get three regression models corresponding to the preceding three assumptions (a) through (c).

Model A (5a) $d_{r.t} = a_{r.} + \alpha_r n_{r.t} + \beta_r y_{r.t} + g(t)_r$

(6a) $d'_{rst} = a'_{rs} + \alpha_r n'_{rst} + \beta_r y'_{rst} + u_{rst}.$

The additional assumption here is that $a_{rs} = a_{r.}$ for any single cross-section.

Model B (5b) $d_{r.t} = a_{r.} + \alpha n_{r.t} + \beta y_{r.t} + g(t)_r$

(6b) $d'_{rst} = a'_{rs} + \alpha n'_{rst} + \beta y'_{rst} + u_{rst}$.

The assumption is again $a_{rs} = a_{r.}$ for any cross-section.

Model C (5c) $d_{..t} = a_{..} + \alpha n_{..t} + \beta y_{..t} + g(t)$

(6c) $d''_{rst} = a''_{rs} + \alpha n''_{rst} + \beta y''_{rst} + u_{rst}$,

where " denotes the deviations of the variables from their respective overall means (covering all r and s cross-sections). The assumption is $a_{rs} = a_{..}$ for all the observations.

The statistical results of the three models can be subjected to variance-covariance analysis for testing empirical validity of the alternative assumptions formulated in each of the models. First, we estimate Model A regressions and see whether or not the regressions are successful in explaining the data, if they explain the data at all, we proceed to Model B and compare it with Model A. Specifically, an F-test is performed between the two residual mean squares. If the computed F turns out to be significant, it means that the coefficients α and β cannot be assumed the same for all the cross-sections, and hence Model B and C which assume the same elasticities for different cross-sections must be abandoned. If, on the other hand, the F-ratio is not significant, we may proceed with the assumption that the regression coefficients are the same for all cross-sectional observations. Since Model C assumes also that the influences of time are the same in all sections, an F-test must be carried out between Model B and Model C. If this test proves to be significant we should abandon Model C and go no further.

If the test turns out otherwise, we proceed to the simplest model, Model C.

II. THE DATA

Table 1 summarizes the variables and their definitions used in the present study. The data for the rural patterns of consumption were taken from the Ministry of Agriculture and Forestry, Nōkakeizai Chōsa Hōkoku (The Report on the Farm Household Economy), which publishes annually living expenditures of the farm household among other economic data. The expenditures are for family members only and exclude those attributable to hired hands. Farm household expenditure as defined is the sum of (i) cash expenditure, (ii) value of barter transactions, (iii) imputed value of home consumption of products, and (iv) depreciation of residential buildings. For each of the five scales of operation, classified according to operating acreage, district averages are the observations in the cross-section over ten years from 1952 through 1961. Data were drawn from ten agricultural districts (out of eleven in Japan, excluding northernmost Hokkaido). Thus, the total number of observations amounts to 500 over all the years (10), the districts (10), and the scales (5).

For the urban consumption patterns the data were taken from the Office of the Prime Minister, Kakei Chōsa Sōgo Hōkokusho (General Report on the Family Income and Expenditure Survey, 1946-1962). The observations used here refer only to urban workers' households, whose income and expenditures in cash only were recorded, for the ten year period between 1953 and 1962. In the annual surveys 28 cities were covered and the sample households were classified into quintile groups according to money income. For this set of data, therefore, the cross-section observations are quintile-group averages over the ten year period; and the entire set of observations numbers 50.

TABLE 1

List of Variables and Their Definitions

Variable	Name	Definition
N_t	Persons per household	Not adjusted for sex, age, or other attributes
Y_t	Real disposable income	For Rural Households: (Income from agriculture) + (Income from non-agricultural undertakings) - (Taxes and other imposts) + (Gifts and subsidies). Deflated by the rural cost of living index (1957 = 100). For Urban Households: (Income from employment) + (Income from self-employment, assets, social security benefits, gifts) - (Taxes and social security contributions). Deflated by the all-urban cost of living index (1960 = 100).
D_{it}	Real expenditure	Deflated by P^r_{it} or P^u_{it}, where the superscripts refer to rural or urban cost of living index, respectively. i = 1 -- Food Expenditure 2 -- Clothing, Footwear, Accessories 3 -- Household Light and Fuel 4 -- Housing, Rent, Furniture, etc. 5 -- Medical and Hygene Expenditures 6 -- Transportation, Communication, Education and Recreation 7 -- Social and Entertainment Expenditures 8 -- Miscellaneous Expenditures 9 -- Total Expenditure 10 -- Expenditure on Starchy Staples, including cereals and starchy roots for rural households, but including cereals only for urban households.

Source: Japan, Ministry of Agriculture and Forestry, Noka Keizai Chosa Hokoku (The Report on the Farm Household Economy), annual editions, 1952 through 1961. For P^r_{it}: Japan, Ministry of Agriculture and Forestry, Noson Bukka Chingin Chosa Hokokusho (The Report of Prices and Wage Rates in Farm Villages), 1962.

For urban data: Japan, Office of the Prime Minister, General Report on the Family Income and Expenditure Survey: 1946-1962 (Tokyo, 1964).

Except for minor variations in the concepts and procedures used over the years, each set of data are composed of a fairly homogeneous group of observations. The lack of parallelism is more of a problem when comparisons are made between urban and rural expenditure surveys. It is, therefore, inevitable that some reservations have to be made for the urban/rural contrasts of consumption patterns in this study. It is hoped nonetheless that these sectoral differences are not serious enough to change the present conclusions drastically.

The following two tables (Table 2 and Table 3) present some selected statistics for the purpose of comparing the changes in urban and rural consumption patterns over the respective decades. It is immediately obvious that, looked at across the income classes at a given time, in both urban and rural households the number of persons per household is positively correlated with the amount of income that the household has at its disposal. On the other hand, if looked at in any class over the period, the correlation is inverse: invariably the size of household declines as real income rises. This suggests, of course, that the problems of multicollinearity seep into regression analyses using household size and real income as the two independent variables if either cross-section or time-series methods were used independently of the other.

In the rural sector the decrease in the number of persons range from .5 for the first two classes to a full person for the rest, while in the urban sector about .5 for the entire households during the decade covered. Due to the nature of the classification scheme adopted the urban income classes show a fairly uniform growth of real income among them ranging 55 to 60 percent over the decade. In contrast, the rural classes show the decennial growth rate of 80 and 50 percent for the forst two and about 40 percent for the rest. On the whole there is no denying that the per capita rate of growth of real income was greater in the urban sector than in the rural sector.

TABLE 2

Persons per Household, Disposable Income, and Percentage of Total Expenditure for Major Items, By Classes, Rural Households, 1952-1961

Class	Year	Persons	Disposable Income (yr.)	Food	Housing	Light & Fuel	Clothing
			('000)	%	%	%	%
I	1952	5.15	215	51.8	9.7	6.0	11.2
	1953	5.10	235	49.3	10.9	5.7	12.1
	1954	4.99	254	47.8	11.9	5.6	11.7
	1955	4.97	266	48.9	11.9	5.3	11.2
	1956	4.95	266	49.0	11.8	5.0	11.4
	1957	5.00	295	48.0	11.0	4.8	11.7
	1958	4.95	314	47.1	11.7	4.7	11.8
	1959	4.96	325	45.3	12.9	4.7	11.9
	1960	4.93	363	42.3	14.1	4.8	12.3
	1961	4.84	389	40.3	15.0	4.6	12.7
II	1952	6.12	262	52.1	10.6	5.9	10.5
	1953	6.06	275	50.0	11.0	5.5	11.2
	1954	5.91	277	48.8	12.1	5.5	10.8
	1955	5.90	307	50.2	11.9	5.1	10.2
	1956	5.53	299	51.0	11.6	4.9	10.3
	1957	5.74	311	49.4	11.0	4.9	10.5
	1958	5.72	323	49.0	11.5	4.8	10.6
	1959	5.67	345	47.0	12.7	4.6	10.7
	1960	5.61	365	44.2	13.7	4.8	11.3
	1961	5.58	396	42.3	15.0	4.7	11.7
III	1952	7.05	330	50.1	10.6	5.3	11.1
	1953	6.95	346	48.5	11.2	5.1	11.3
	1954	6.73	345	47.3	12.3	5.1	10.8
	1955	6.80	392	48.0	11.9	4.6	10.4
	1956	6.71	363	49.7	11.9	4.5	10.1
	1957	6.54	371	48.6	11.1	4.7	10.5
	1958	6.44	372	48.2	11.6	4.5	10.2
	1959	6.37	399	46.4	12.5	4.5	10.5
	1960	6.22	423	44.2	13.9	4.7	10.9
	1961	6.12	452	42.4	14.8	4.5	11.0
IV	1952	7.63	382	49.9	10.9	5.3	11.0
	1953	7.46	399	47.0	11.6	5.1	11.2
	1954	7.31	411	45.8	12.2	5.0	11.1
	1955	7.24	465	46.8	12.6	4.5	10.8
	1956	7.28	434	48.3	11.5	4.3	10.3
	1957	7.25	449	46.7	11.0	4.3	10.6
	1958	7.11	464	46.8	11.8	4.2	10.6
	1959	7.02	481	45.1	13.5	4.2	10.3
	1960	6.79	450	43.3	13.6	4.3	11.0
	1961	6.60	531	41.5	15.4	4.3	10.9

(TABLE 2 continued)

Class	Year	Persons	Disposable Income (yr.)	Food	Housing	Light & Fuel	Clothing
V	1952	8.37	483	47.0	11.3	4.7	11.2
	1953	8.25	509	45.9	11.2	4.6	11.6
	1954	8.25	505	44.3	12.5	4.5	11.2
	1955	8.26	579	46.1	12.1	4.1	11.0
	1956	8.07	531	46.2	12.4	3.9	10.8
	1957	7.90	559	45.0	12.2	3.9	10.6
	1958	7.83	581	45.4	11.9	3.9	10.2
	1959	7.56	602	43.3	13.5	3.8	10.6
	1960	7.45	638	41.4	14.3	4.0	10.8
	1961	7.31	664	40.1	15.1	3.9	10.9

*Weighted average over the districts

TABLE 3

Persons per Household, Disposable Income, and Percentage of Total Expenditure for Major Items, By Classes, Urban Workers' Households, 1953-1962

Class	Year	Persons	Disposable Income (mo.)	Food	Housing	Light & Fuel	Clothing
I	1953	4.14	11.4 ('000)	51.6%	4.5%	5.2%	9.0%
	1954	4.12	11.1	52.0	4.6	5.3	7.9
	1955	4.03	11.9	51.7	5.2	5.2	8.4
	1956	3.84	12.8	50.3	6.2	5.0	8.7
	1957	3.79	12.8	49.8	6.8	5.0	8.6
	1958	3.58	13.5	49.5	7.0	4.7	8.2
	1959	3.80	14.6	48.8	7.9	4.5	8.4
	1960	3.67	15.6	48.0	8.6	5.4	9.2
	1961	3.60	16.0	45.2	10.7	5.1	10.2
	1962	3.59	17.5	43.1	12.0	5.6	11.6
II	1953	4.43	18.9	47.9	5.0	4.5	10.6
	1954	4.50	19.1	47.5	5.1	5.1	10.2
	1955	4.42	19.9	47.3	5.4	4.9	9.4
	1956	4.18	21.4	45.9	6.6	4.7	9.9
	1957	4.13	21.8	45.4	6.9	4.6	10.2
	1958	4.19	23.3	44.9	7.4	4.4	10.0
	1959	4.16	24.8	43.4	8.7	4.5	9.9
	1960	4.11	26.5	42.2	9.7	4.6	10.4
	1961	3.99	27.3	40.2	11.6	4.9	11.6
	1962	3.93	29.8	38.8	12.1	5.2	12.4
III	1953	4.81	24.3	44.8	5.0	4.6	11.6
	1954	4.79	24.4	44.5	5.4	4.6	10.8
	1955	4.70	25.9	44.3	5.3	4.5	10.6
	1956	4.45	27.2	43.0	6.6	4.3	10.9
	1957	4.47	28.1	41.9	7.2	4.5	11.3
	1958	4.42	30.2	40.9	8.5	4.2	10.6
	1959	4.40	32.3	39.8	9.4	4.0	10.7
	1960	4.37	33.9	39.0	9.9	4.5	11.5
	1961	4.19	35.5	37.5	11.1	4.9	12.7
	1962	4.20	38.2	36.2	12.2	4.9	13.3
IV	1953	5.15	30.8	41.8	5.1	4.1	12.3
	1954	5.14	31.3	41.3	5.1	4.5	12.0
	1955	5.02	32.7	41.2	5.6	4.3	11.3
	1956	4.52	34.4	40.4	6.2	4.2	11.7
	1957	4.68	35.8	38.8	6.9	4.4	12.2
	1958	4.67	38.7	38.3	8.1	4.1	11.3
	1959	4.67	41.1	37.1	9.3	4.1	11.2
	1960	4.66	43.4	36.4	9.0	4.5	11.9
	1961	4.44	45.9	34.7	11.1	4.5	13.1
	1962	4.39	48.3	33.4	11.4	5.0	14.0

(TABLE 3 continued)

Class	Year	Persons	Disposable Income (mo.)	Food	Housing	Light & Fuel	Clothing
V	1953	5.38	46.8	36.5	5.1	4.0	13.9
	1954	5.45	47.0	36.4	5.2	4.2	12.7
	1955	5.39	49.3	35.8	5.4	4.2	12.0
	1956	5.37	52.3	35.1	6.2	3.9	12.5
	1957	5.17	57.0	33.4	7.1	4.1	13.1
	1958	5.18	61.2	32.7	8.6	3.8	12.3
	1959	5.04	64.3	31.6	9.2	3.9	12.3
	1960	5.00	69.6	30.7	9.5	4.3	12.9
	1961	4.87	74.3	30.0	10.2	4.6	13.8
	1962	4.72	75.4	30.0	11.3	4.6	15.1

Notes:

Persons per household: Unadjusted for age, sex or other attributes.

Disposable Income: Given in thousands of 1957 yen for rural households and in thousands of 1960 yen for urban workers' households.

Housing Expenditure: Includes depreciation of residential buildings for rural households but not for urban households.

Food Expenditure: Excludes alcoholic beverages and meals away from home.

Two other observations emerge quite clearly from the tables. First, the high growth rates of per capita real income in both sectors are amply reflected in the substantial (and rapid) reduction in the percentage of expenditure devoted to food (the so-called Engel coefficient) in both urban and rural sectors over the respective decades. Impressive also is the increase in the percentage of expenditure devoted to housing, particularly in the urban sector where it seems to take up the full share released by the decline in the relative importance of food expenditure. It is indeed instructive to study how much of these changes can be accounted for by changes in income and family size and to what extent other factors are responsible in creating such changes.

III. THE RESULTS OF REGRESSION ANALYSES

The Rural Households

The classification scheme employed in the rural household survey reports enables us to fully utilize the regression models outlined above. There are five regression equations based on Model A for the five scales (used as the five income classes here), within each of which the districts are the cross-section observations and the years covered are the time-series observations. First in our statistical procedure these regressions were carried out and five sets of regression coefficients, residual sum of squares and other statistics were calculated. Secondly, the single regression equation of Model B, utilizing d'_{rst}, n'_{rst}, and y'_{rst} from the five regressions of the preceding model combined together, was then estimated. Another set of coefficients, residual sum of squares and other statistics was obtained accordingly. Then, the residual sum of squares of the first model (the sum of the five RSS of Model A) and that of Model B regression were used to compute an F-statistic. Finally, the single regression equation based on Model C was estimated for the purpose of comparing its residual

sum of squares (strictly, the residual mean squares) with that of Model B.

These steps were repeated for ten major expenditure categories for the study of the rural sector. The results are shown in Table 4.

All the F-tests, except for that for Starchy Staple Food, turn out to be insignificant at the 5 percent fiducial level, i.e., there are more than 5 chances in 100 that the disparity between the calculated variances is due to chance. These tests indicate, therefore, the elaborate distinction among the classes in the rural sector is not called for and that of g(t)'s not necessary save for expenditures on starchy staples. In view of these results I assume hereafter that for all but one expenditure categories all the classes in the rural sector have the same "size" and income elasticities as well as the identical preference patterns (or any other influences of time).

The results for the category of starchy staples expenditure reveal that not only the differential treatment of the variable g(t) among the classes proves to be significant but also so does the differential treatment of the two elasticities. Each class, therefore, has to be treated separately from others. The immediate implication is that, so far as expenditures on starchy staples are concerned, the relative position of households in the scale of income distribution in the farm sector makes a substantial difference in their response to changes in income level and family size as well as in their preference patterns.

Table 5 presents the estimated elasticities with respect to family size and income as obtained from Model A regressions for the starchy staple group and from Model C regressions for the rest of the categories. Looking first at the income elasticities, we can acknowledge several points of interest. The elasticity for food is significantly below unity and therefore confirms Engel's law that the proportion of income spent on food declines as income rises. The

TABLE 4

Summary of Variance-Covariance Analyses: Models A, B, and C*

Farm Households, 1952-1961

Category of Expenditure	Residual Sum of Squares	Mean Squares	F	Differential Treatment Between Models:
Total Expend.				
(1) Model C	.265066	.0005443	1.062	Not significant
(2) Model B	.229016	.0005123	1.059	Not significant
(3) Model A	.210481	.0004839		
Food				
(1) Model C	.216293	.0004441	1.002	Not significant
(2) Model B	.198080	.0004431	1.115	Not significant
(3) Model A	.172912	.0003975		
Clothing				
(1) Model C	1.048754	.0021535	1.072	Not significant
(2) Model B	.897822	.0020085	1.119	Not significant
(3) Model A	.780970	.0017953		
Light & Fuel				
(1) Model C	1.043378	.0021424	1.010	Not significant
(2) Model B	.947899	.0021205	1.008	Not significant
(3) Model A	.915355	.0021043		
Housing				
(1) Model C	1.865305	.0038302	1.022	Not significant
(2) Model B	1.749475	.0039138	1.018	Not significant
(3) Model A	1.672877	.0038457		
Medical Health				
(1) Model C	1.918882	.0039402	1.000	Not significant
(2) Model B	1.761818	.0039414	1.007	Not significant
(3) Model A	1.702261	.0039132		
Cultural				
(1) Model C	2.193138	.0045033	1.053	Not significant
(2) Model B	1.911337	.0042759	1.065	Not significant
(3) Model A	1.747026	.0040161		
Social				
(1) Model C	2.234843	.0045892	1.010	Not significant
(2) Model B	2.071163	.0046334	1.004	Not significant
(3) Model A	2.008311	.0046168		

(TABLE 4 continued)

Category of Expenditure	Residual Sum of Squares	Mean Squares	F	Differential Treatment Between Models:
Miscellaneous				
(1) Model C	8.187190	.0168114		
(2) Model B	7.595353	.0169918	1.011	Not significant
(3) Model A	7.431844	.0170847	1.005	Not significant
Starchy Staples				
(1) Model C	.387614	.0007959		
(2) Model B	.287246	.0006425	1.239	Significant
(3) Model A	.237478	.0005459	1.177	Significant

*Degress of freedom permitted for the three models are:

Model A: 500 - 5 (3 + 10) = 435

Model B: 500 - (3 + 50) = 447

Model C: 500 - (3 + 10) = 487.

TABLE 5

Estimated Elasticities with Respect to Family Size and Income

Rural Households, 1952-1961

(standard errors are in parentheses)

Category of Expenditure	Model	Size Elasticity	Income Elasticity
Total Expend.	C	.16106 (.02414)	.79777 (.01363)
Food	C	.55609 (.02181)	.41551 (.01231)
Clothing	C	-.05209[a] (.04802)	.88133 (.02710)
Light & Fuel	C	.22658 (.04790)	.37482 (.02703)
Housing	C	-.38822 (.06404)	1.21535 (.03614)
Medical, Health	C	.23270 (.06495)	.71038 (.03666)
Cultural	C	-.17691 (.06944)	1.03018 (.03919)
Social	C	-.19105 (.7009)	1.27062 (.03956)
Miscellaneous	C	.06694[a] (.13417)	1.65229 (.07572)

(TABLE 5 continued)

Category of Expenditure	Model		Size Elasticity	Income Elasticity
Starchy Staples				
	A	I	.96573	.14111
			(.10851)	(.03606)
		II	.83145	.18017
			(.08335)	(.05495)
		III	.90764	.11132
			(.11156)	(.04896)
		IV	.83860	.08225
			(.07628)	(.03884)
		V	.79688	.06095[a]
			(.06680)	(.05220)

[a]Not significantly different from zero at 5 percent.

elasticities for starchy staple food are substantially below that for total food, thus confirming indirectly M. K. Bennett's hypothesis that the proportion of food calories contributed by starchy staples declines as income rises.[1] It is indeed interesting to note, moreover, that the income elasticity of starchy staple expenditure depends on the level of income, rising higher as income level goes lower. Technically speaking, the income elasticities that are significantly higher than one, as for housing, social, and miscellaneous expenditures, indicate that these items are luxuries whose consumption presumably goes up more than proportionally to the rise in income. In view of the income elasticity for total expenditure of about .8, it seems safe to say that the expenditures on transportation, communication, education, and assorted recreational activities (here called cultural expenditures), and even clothing expenditure, rises more than proportionately as total expenditure moves up.

One interesting aspect of these comparisons among various expenditure categories is that housing is indicated to be a luxury item in the present result. According to the usual reckoning of the human necessities, housing along with food and clothing should be classified as a necessity in the technical sense. The reason why the estimated income elasticity for this category turned out the way it did may be attributed to the inclusion in the data of furniture and household appliances which can easily be suspected as highly income elastic.

Looking at the elasticities with respect to family size now, we can observe also some interesting points. The most striking feature of the results is that in general for those expenditure items for which the income elasticity is relatively high the size elasticities are relatively low, and vice versa. This is quite

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[1] M. K. Bennett, The World's Food (New York, 1954).

clear by looking at the luxury items and also food and starchy staple expenditures. Following H. S. Houthakker, if we classify the influences of family size on consumption into two effects, vis. (1) the specific effect, resulting from the increase in the "need" for various commodities when family size increases, and (2) the income effect (that is, an increase in family size makes people relatively poorer), we may say that if the specific effect is stronger than the income effect the size elasticities will be positive, otherwise they will be negative.[1] The present results show that for food, light and fuel, and medical and health expenditures the specific effect is stronger than the income effect of family size. The basic need for food energy (calories) is reflected quite impressively in the very high size elasticities for the starchy staple category. The reverse case can be seen in cultural and social expenditures and, especially, in housing where the income effect of family size weighs more heavily than the specific effect.

It is interesting to focus our attention to the three necessity items in this regard, namely food, clothing and housing. The very high size elasticity for food, and therefore the specific effect, indicated for food taken together with the insignificant size elasticity for clothing and a substantial negative elasticity for housing reveals that the specific effect of family size on food was large enough to engulf the specific effect on clothing and, particularly, that of housing. Crowded living quarters and less up-to-date appliances and furnitures takes only a second place to basic need for food and clothing in a large farm household.

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[1] H. S. Houthakker, "An International Comparison of Household Expenditure Patterns, Commemorating the Centenary of Engel's Law," Econometrica, 25, 4, (October, 1957), pp. 544.

The Urban Workers' Households

The data available for the urban workers' households do not permit us to follow the same statistical procedure used for the farm households. With only one cross-classification (income quintile groups) given at any year all we can do is limited to a variant of Model C above omitting one of the two cross-section subscripts. Under the constraints of only 50 observations at hand and only one model to apply them to, the following results were obtained for a limited number of expenditure items.

So far as the size elasticities are concerned, judged from the magnitudes of standard errors, the estimated values are not highly significant except possibly for clothing and food. Consequently, it is not proper to place much confidence in the values and draw exact implications from them. However, the size elasticity for food indicates the importance of the specific effect in the urban workers' households as was the case for the farm households. The lower elasticities for urban food expenditure relative to the rural ones seem to be the reflection of a smaller average size of family and a higher average (geometric mean) level of income in the former. It is important to keep in mind that the conventional elasticity is a point concept referring only to the average level of size and income (and other characteristics) of the groups included in the study. In the same token, it is safe to say that the elasticity for cereals expenditure, with respect to income would have been smaller if it had been possible to include starchy roots, decidedly inferior goods, as was done for the rural study.

The elasticities computed for the clothing category tend to indicate that clothing is more of a necessity in the ruban sector than in the rural sector. Although this remark must be moderated by the consideration that the data for farm households do not include clothing expenditures associated with farm work while

TABLE 6

Estimated Elasticities with Respect to Family Size and Income Based on a Variant of Model C, Urban Workers' Households, 1953-1962

(standard errors are in parentheses)

Category of Expenditure	Size Elasticity	Income Elasticity
Total Expenditure	.66363[a] (.33369)	.56942 (.07041)
Food	.46729 (.16354)	.34111 (.03450)
Clothing	.89946 (.31494)	.77942 (.06645)
Light & Fuel	.21431[a] (.43476)	.52415 (.09173)
Housing	.88005 (.41598)	.56595 (.08777)
Cereals	.29725[a] (.16464)	.18833 (.03474)

[a]Not significantly different from zero.

the data for urban households do (so that we should not be surprised by the results), the large disparity in the size elasticity between the two sectors seems to warrant such an assertion. Furthermore, if we interprete the size elasticity as an indicator of "economies of scale" in consumption (in large households), there is a case for the relative lack of such economies in the urban sectors, since the average family size is considerably smaller and the use of second-hand clothing items may thus be limited.

Another striking intersectoral difference can be observed with respect to housing expenditures. The results for urban households reflect possibly the situation in urban centers that housing is not a luxury item and there is a dire necessity to accommodate family members with living quarters, furniture and appliances. The rather limited responsiveness of housing expenditure to the growth of income in the urban sector points up already, in view of the rapid increase in its importance as seen in Table 3, factors other than income (and family size) play a considerable role in determining its magnitude and growth.

The elasticities with respect to family size are related to each other by an identity, just as the elasticities with respect to income are so related. The sum of the size elasticities (weighted by respective disposition of income) should equal to zero as the weighted sum of the income elasticities should be unity. It is not difficult to imagine, therefore, that in the urban sector too the size elasticities for such items as cultural and social expenditures would assume substantial negative values.

IV. CHANGES IN CONSUMER PREFERENCES

Model C (for starchy food expenditure, Model A) selected in the preceding section yields a set of residual measures of the influences of time from the equation of the form

$$d_{..t} = \alpha n_{..t} + \beta y_{..t} + g(t)$$

for the ten expenditure categories for the rural sector and for the six categories belonging to the urban sector. This means that g(t)'s of any pair of years would differ depending on the values of the independent variables and real expenditure for a given category, since the parameters α and β are assumed to be the same for all years. In other words, it means that for any expenditure category, if all three variables are the same at two points in time, the resulting g(t) would also be the same. If we observe differences over time in the real expenditure for a certain category, therefore, a part of the difference would be attributed to change in the size of family and in the level of real income and the rest of the residual measure of the influences of time (including changes in consumer preferences).

The computed values of g(t)'s can then be made into index numbers by the following procedure: For each expenditure category set the value of G(t), t = 1952 (in the case of urban households, t = 1953), equal to unity and take the percentage change over the previous year on successive years through 1961 (or 1962). Thus, the function denoted by G(t) of the neutral shifts in a given consumption function assumes the form,

$$G(t + 1) = G(t)[1 + \Delta G(t)/G(t)],$$

where $\Delta G(t)$ denotes the increment of G(t) over the previous year. The results of calculation are tabulated in Table 7.

TABLE 7

Changes in Preference Patterns and Other Influences of Time,* Selected Expenditure Items, Rural and Urban Households, 1952 - 1961 and 1953 - 1962

Year	Food	Clothing	Light & Fuel	Housing	Medical	Cultural	Social
			-- Rural Farm Households --				
1952	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1953	.988	1.021	.870	1.009	1.027	1.001	1.001
1954	.993	1.011	.983	1.047	1.042	1.036	1.023
1955	1.016	.937	.595	1.010	1.032	1.001	.992
1956	1.066	.991	.638	1.037	1.091	1.018	1.022
1957	1.045	.986	.642	.999	1.117	1.039	1.006
1958	1.045	.967	.551	.999	1.102	1.042	.985
1959	1.044	.986	.783	1.044	1.087	1.058	.995
1960	1.023	.990	1.038	1.040	1.111	1.030	.974
1961	1.023	1.004	1.194	1.060	1.113	1.060	.953

Year	Misc.	Total	Starchy Staples I	II	III	IV	V
			-- Rural Farm Households --				
1952	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1953	1.008	.994	.956	.975	.966	.975	.966
1954	1.007	1.031	.973	.978	.988	.987	.976
1955	.978	.974	1.021	1.006	1.011	1.025	1.017
1956	1.002	1.086	1.048	1.016	1.050	1.048	1.029
1957	1.008	1.049	1.021	.992	1.012	1.017	1.006
1958	.982	1.025	1.013	.985	1.014	1.010	1.005
1959	.987	1.057	1.016	.983	1.015	1.011	1.003
1960	.997	1.032	1.005	.972	1.008	1.009	.997
1961	.995	1.044	.994	.963	.997	.998	.989

(TABLE 7 continued)

Year	Food	Clothing	Light & Fuel	Housing	Total	Cereals
		-- Urban Workers' Households --				
1953	1.000	1.000	1.000	1.000	1.000	1.000
1954	.983	.972	1.025	1.007	.985	.928
1955	1.009	.964	1.019	1.033	1.019	.941
1956	1.032	.989	1.002	1.107	1.118	.916
1957	1.028	1.003	1.021	1.147	1.169	.873
1958	1.083	.982	1.003	1.210	1.263	.764
1959	1.075	.982	1.008	1.262	1.287	.673
1960	1.102	1.009	1.073	1.296	1.361	.635
1961	1.094	1.055	1.103	1.387	1.459	.416
1962	1.111	1.095	1.153	1.445	1.563	.299

*Based on G(t) as defined in text.

Of course, it is impossible to isolate the influences of consumers' preferences from other influences of time rigorously by the method used here. We do not know very well what these factors are that somehow shift consumption functions over time. In view of the particular specification of the demand function adopted here, and most importantly of the absence of the relative prices of various items in the equation (although expenditures are adjusted for changes in their own prices), there is no doubt that the influences of time would include those of changes in relative prices. In part, therefore, the changes in the indices tabulated in Table 7 would be a reflection of changes in relative prices (or, relative availabilities) during the period covered in the study. A rough examination of rural prices indicates that the prices of medical goods and services as well as education costs indeed increased relatively more than others during the decade. I am tempted to think, however, that the price factor left out is not as important as to change the present conclusions drastically. No just attempt is made here to verify this assertion.[1] Fruitful results may be obtained by further research in this area.

Assume, rather heroically here, that the influences of time other than consumers' preferences were similar in the initial year and the terminal year.[2] Then the difference we observe can be attributed to the presumed shift in consumers' preferences. On the basis of this assumption the following conclusions can be

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[1]Nonetheless, it is to be noted that the regression equations computed in this study were all highly significant, even in the worst of which the two independent variables n'_{rst} and y'_{rst} "explained" more than 80 percent of the variations in the dependent variable d'_{rst}. This means that a considerably greater part of the variations in the dependent variable of the original form d_{rst} is "explained" by the independent variables and time function g(t).

[2]This is solely for the sake of convenience and simplicity. The statistical procedure adopted in this paper lets us choose any two years as the initial year and the terminal year.

drawn.

In the rural sector the position of clothing, starchy staple food, and miscellaneous expenditures in the scale of consumer preferences did not change much. Preference for food in general (i.e., types of food consumed) increased moderately whereas that for the social expenditure items decreased moderately. Large rises were registered for the domestic use of light and fuel, medical expenditures, and to a lesser extent, for the housing and cultural expenditures. It seems safe to say that the relative position of the latter expenditure items (light and fuel, medical, housing, and cultural) in the scale of consumer preferences increased over the decade in the 1950's.

So far as the urban workers' households are concerned, drastic changes in preference occurred for the category of housing expenditure, which increased its relative position, and for cereals expenditure, which in contrast lost its ground heavily over the decade. The change in preference for clothing was rather moderate relative to other items under study, although it was substantially larger than that observable in the rural sector. It is interesting to note that the increase in preference for food in general was rather substantial despite the drastic decline in the position of the cereals. Here again it is evident that consumers' emphasis shifted from their preoccupation with food energy to their search for higher culinary satisfaction.

V. CONCLUDING REMARKS

It seems appropriate here to examine some of the factors left unsaid in the present study. Examining the assumptions made for the statistical procedure one may be struck by the fact that $g(t)$ is assumed to be an autonomous and neutral shift variable in the basic equation. On the one hand, it can be argued, mainly

by definitional procedures, that the concept of consumers' preferences is quite independent of changes in income and family size. On the other hand, it is quite possible that the process of change in income and in family size is inextricably bound up with the formation of preference patterns. If this were the case, it is impossible to separate out these factors interacting on each other and the research of the type presented here should be abandoned. So long as we are willing to accept the concept of consumers' preference as something independent of and exogenous to changes in income and family size our results would not have been in vain.

The specification of the basic equation says that real expenditure is a function of family size and current income. Indeed, this is an often used (or misused) procedure to which a substantial degree of doubt can be directed. Under a typically uncertain, dynamic condition, the determinants of expenditure patterns may well be a complicated function of past, present, and expected future incomes. Modern theories of consumption function, such as those by Duesenberry and by Friedman, must be taken into account in further research effort. Moreover, the basic equation does not allow for any consumption lag which might actually be present, and by default assumes that the response of expenditure to changes in income and size is instantaneous (a year). This might be all right for expenditures on goods and services of short duration but not for those with a durability of more than one year. In addition, for those expenditure items which may have either on the demand side or on the supply side institutional rigidities, the procedure cannot be said to be wholly satisfactory. The experiment with various lag models incorporating the effects of rigidities and uncertainty,[1] however,

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[1]Such as those suggested by M. Nerlove in his Distributed Lags and Demand Analysis, U.S.D.A., Agriculture Handbook No. 141 (June 1958).

has to be left for future work.

As mentioned earlier, it is important to consider relative prices in the context of empirical research of this type. Indeed, the neglect of relative prices in this study may be the most serious defect, not only for the interpretation of the calculated G(t) index but also for the estimation of income elasticities.[1] The only excuse I have on this point is the sad fact that I could not obtain the price data for various cross-sections (especially on the basis of agricultural districts) which would have made the necessary additional effort worthwhile if they were readily available.

Despite all these omissions and defects, I hope that the results presented in this paper are instructive and interesting. I hope, further, that this is a modest first step in the right direction.

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[1] H. S. Houthakker says that:

> It is conceivable, and indeed probable, that relative prices may influence the elasticities; thus, it has sometimes been suggested that the income elasticity of a commodity is an increasing function of its price relative to other commodities. It is also possible that the income elasticity is determined not by the relative price of the item as a whole, but by relations among the prices of its components.

See: H. S. Houthakker, Op. cit., p. 542.