Patrick

ECONOMIC GROWTH CENTER

YALE UNIVERSITY

Box 1987, Yale Station
New Haven, Connecticut

CENTER DISCUSSION PAPER NO. 21

LONG-TERM CHANGES IN FOOD CONSUMPTION PATTERNS IN JAPAN, 1878-1964

Hiromitsu Kaneda

April 5, 1967

LONG-TERM CHANGES IN FOOD CONSUMPTION PATTERNS IN JAPAN, 1878-1964

By

Hiromitsu Kaneda*

There have been many conspicuous changes in Japanese life during some one hundred years since the beginning of the modernization process in the late 1860's. Although less marked than many, changes in food consumption patterns are equally important.

It is the purpose of this paper to trace the changes that have taken place in the patterns of food consumption as reflected in changing relative importance of various food groups, and to investigate the inter-relationship between aggregate food consumption and changes attendant to economic development. The basic approach adopted here to the problem is that of many studies available on the demand side of food markets, in analyses of household expenditures, and in estimation of consumption functions of various commodities and services. The period of about 90 years covered in this study is divided into three parts depending on the sources of data used for analysis: (1) 1878-1922, for which I rely mainly on the recent estimates by Saburo Yamada and by James I. Nakamura; (2) 1921-1940, for which I depend on Miyohei Shinohara's estimates as well as official statistics of the Ministry of Agriculture and Forestry; and (3) the postwar years, for which the quality of the official data is unquestionably superior to those of the prewar years. It is inevitable that disparities and divergencies appear in different sets

*I would like to thank Professor Bruce F. Johnston and Professor Kazushi Ohkawa for their constant encouragement and valuable suggestions during the course of this study. Without their help this study would not have been completed. I am deeply indebted also to Professor Miyohei Shinohara and Dr. Saburo Yamada for providing me with their data. The Economic Growth Center at Yale University has given me the time and the facilities for completing this study. I am more than grateful for its generous assistance.

of data (especially among the estimates of consumption pertaining to the earlier periods). Attempts will be made to reconcile such divergencies whenever adjustments are possible. It goes without saying that the available data are only the best estimates of some quantities lost in the past.

1. Food Consumption Patterns in 1878-1922

"Many scholars and Japanese government officials have warned against the uncritical use of Japanese government statistics of the Meiji period."[1] However, lacking in alternative sources of data and supplementary information to correct such errors that exist in government statistics, scholars based their estimates of income and rates of growth of agriculture on the available government statistics without correction for errors. Since the publication of James I. Nakamura's essay,[2] such existing estimates have been substantially discredited and the use of government statistics for the early years of Japan's modernization has been effectively discouraged.

That Nakamura has been successful in marshalling generally convincing evidence for discrediting the government statistics of the Meiji period and in destroying systematically the credibility of the existing estimates of the level and the growth rate of agricultural production does not mean that there is now a correct series of estimates to be relied on for future

---

[1] James I. Nakamura, "Growth of Japanese Agriculture, 1875-1920," in William W. Lockwood, ed., The State and Economic Enterprise in Japan, Essays in the Political Economy of Growth (Princeton, 1965), p. 249.

[2] Ibid., pp. 249-324.

studies.[1] Indeed, the controversy surrounding the growth of Japanese agriculture during the early period is not so much about Nakamura's critical examination of the available official data as about the alternative estimates that can be offered under the circumstances. In spite of the disputes inevitable for estimates constructed for this period, in this part of the paper I depend mainly on Nakamura's estimates as well as Saburo Yamada's estimates of agricultural production recently made available.[2]

Columns 1 and 2 in Table 1 show quinquennial averages of agricultural products available for consumption per capita for the period between 1878 and 1922. The figures are in constant prices based on Nakamura's and Yamada's estimates of agricultural production, both adjusted by Tsutomu Noda's data on net imports of agricultural products and changes in inventories.[3] It is clear that the growth rate of agricultural products available for consumption is significantly less for the former than for the latter estimates. It is not surprising that this is so because Nakamura assumes (uses as one of his supporting arguments) that consumption of foods in terms of calories grew at about the

---

[1]Nakamura's basic proposition is that land tax evasion practices "caused a significant understatement of agricultural production during the Meiji period." The author himself acknowledges that "precise corrections are impossible because what is being attempted, in effect, is to measure the extent of tax evasion for which the responsible parties could scarcely have been expected to leave records." Ibid., p. 250.

His estimates are based on two quinquennial indices (1873-1877 and 1918-1922) of area planted and those of yield per unit area.

[2]Mataji Umemura, et. al., Choki Keizai Tokei, Vol. 9, Norin-gyo [Estimates of Long-Term Economic Statistics of Japan Since 1868, Vol. 9, Agriculture and Forestry], (Tokyo, 1966).

[3]Tsutomu Noda, "Nosan-butsu Juyo no Choki-henka to Shotoku-danryokusei," [Long-Term Changes in Demand for Agricultural Products and Income Elasticities], in S. Tobata and K. Ohkawa, ed., Nippon no Keizai to Nogyo [Japan's Economy and Agriculture], Vol. 1 (Tokyo, 1956), pp. 159-174.

note includes non-food agr. products (silk)

TABLE 1

Agricultural Products Available for Consumption per Capita, Some Recent Estimates, Five-Year Averages, 1878-1922*

Year	Total Agricultural Products		Rice	
	Nakamura-Noda	Yamada - Noda	Nakamura-NNKT	Yamada - NNKT
	(1)	(2)	(3)	(4)
	--in 1934-36 yen--		--in kilograms--	
1878-1882	51	39	177	137
1883-1887	52	42	175	142
1888-1892	52	44	175	145
1893-1897	54	46	175	138
1898-1902	57	51	175	149
1903-1907	60	55	179	162
1908-1912	61	58	170	159
1913-1917	63	63	167	163
1918-1922	68	68	173	173

*Sources:

(1) J. Nakamura's implied total agricultural production from his "Corrected Index of Total Agricultural Production," under the assumed paddy rice yields of 1.6 and 1.95 koku. Quinquennial average values in 1934-1936 prices were derived on the basis of S. Yamada's estimate of total agricultural output for 1918-1922. To this were added quinquennial averages of net agricultural imports and net inventory adjustment by T. Noda deflated by the linked index of agricultural deflators from Ohkawa, et. al. (in 1928-1932 prices) and from the "Ohkawa Series" (in 1934-1936 prices).

(2) S. Yamada's estimates of total agricultural production in 1934-1936 prices plus T. Noda's estimates of net agricultural imports and inventory adjustment in 1934-1936 prices deflated as above.

(3) J. Nakamura's implied rice production from his "Corrected Index of Rice Production," under the assumed paddy rice yields of 1.6 and 1.95 koku. Quinquennial averages were derived on the basis of Yamada's estimate of rice output for 1918-1922. To this average series were added quinquennial averages of net imports of rice from N. Kayo, ed., Nihon Nogyo Kiso Tokei [Basic Statistics of Japanese Agriculture] (Table K-a-1).

(4) Yamada's estimates of rice output plus quinquennial averages of net imports of rice from NNKT as above.

The population data were obtained from the Bank of Japan, Hundred-Year Statistics of the Japanese Economy (Tokyo, 1966), Table 1.

What happened on inventories

same rate as population. Presumably, a part of growth in the value of agricultural products available for consumption per capita is, therefore, attributable to shifts in consumption from less preferred food items (which are cheaper relatively in terms of calories) to preferred food items. This is a well-known empirical phenomenon observable in many countries (including currently underdeveloped countries) and, as later analyses show, in Japan itself.

In order to examine more closely the above presumption, quinquennial average quantities of rice available for consumption per capita were estimated from two sources. The estimated quantities are given in columns 3 and 4 in Table 1. It is indeed remarkable that according to the Nakamura estimates there is stability, if not decline,[1] in per capita quantity of rice over some forty years. Even if the assumption is correct that there was no change in per capita intake of calories, it should be expected that the composition of food should change during the period of (real per capita) income growth and, therefore, that per capita consumption of rice should increase at the expense of other, "inferior", starchy staples. There is no question that rice has always been the most preferred among various starchy food products in Japan. Hence, the presumption of substitution among food, if true as indicated in column 1, should be reflected in an increase of rice consumption. This, however, is not

[1] The computed figures show a slight decline over the years. I am nevertheless taking into account possible underestimation of the population figures in the early years.

what column 3 shows.[1] On the contrary, the estimates by Nakamura are tantamount to the supposition that rice consumption has zero elasticity with respect to income (on the per capita basis). This is a doubtful proposition and, in turn, contributes in casting a reasonable measure of doubt on the assumptions involved in his estimating procedures. Since, however, there is no hard evidence to negate the implied zero income elasticity of rice consumption, for the period in question, it seems reasonable to take Nakamura's estimates of total agricultural production as the very minimum of the possible estimates of output growth in agriculture.

[1] One possible counter-argument may be that substitution of foods took place among various food groups, such as among starchy staples, animal protein foods, and other "protective foods" (i.e., those that are rich in vitamins and other nutrients), rather than among individual items within each of the food groups. I find it hard to believe that this process could continue for forty years without changes in the composition of each major food group.

Another possible argument may be made on the basis of Seiki Nakayama's estimates. The Nakayama estimates can be used to show that: of the total calories derived from starchy staples over the period in question, the percentage attributable to rice remained rather stable; that derived from barley first increased and returned to the original level; and the percentage of miscellaneous cereals declined, while potatoes increased their relative importance.

Percent of Calories Attributable to Starchy Food Items*

Years	Rice	Barley	Miscellaneous Cereals	Potatoes	Total Starchy
1878-1882	69%	21%	6%	5%	100%
1898-1902	64	24	5	8	100
1918-1922	67	21	3	9	100

*Computed from: Seiki Nakayama, "Shokuryo shohi suijun no choki henka ni tsuite," [Long term trend of food consumption in Japan, 1878-1955], Nogyo sogo kenkyu, XII, 4 (October 1958), p. 25.

Since Nakayama's data are based on government statistics without the benefit of recent revisions, I am sceptical of their reliability. It is a fair presumption that there would be greater underestimation of output of commodities other than rice than that of rice itself in the early Meiji period. I believe that the actual contribution by barley and potatoes was much greater than what the figures indicate.

Under the assumption of stable relative prices, demand for agricultural products grows at the rate approximately equal to the income elasticity multiplied by the growth rate of per capita real income plus the rate of population growth. This familiar relationship can be expressed as follows:

$$\frac{\dot{D}}{D} = \frac{\dot{N}}{N} + \eta\left(\frac{\dot{Y}}{Y} - \frac{\dot{N}}{N}\right) ,$$

where D denotes demand (in real terms) for agricultural products, N and Y population and real income respectively, and η is the income elasticity of demand, and where dots indicate change in the variable over a unit period.[1] It suggests a rough, but simple, measure of income elasticity of demand for agricultural products during the period under study.

---

[1] Strictly speaking, this familiar relationship must be further qualified.

Under the assumption of stable relative prices,

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

Assuming that changes in tastes are autonomous and shifts over time of the demand function above can be expressed by a multiplicative term A(t), we obtain,

$$D = A(t)F(N, Y).$$

Differentiating this expression with respect to time, we get (after dividing by D)

$$\frac{\dot{D}}{D} = F\frac{\dot{A}}{D} + A\frac{\delta F}{\delta N}\frac{\dot{N}}{D} + A\frac{\delta F}{\delta Y}\frac{\dot{Y}}{D} ,$$

where dots denote the time derivatives.

Since

$$A\frac{\delta F}{\delta N} = \frac{\delta D}{\delta N} \quad \text{and} \quad A\frac{\delta F}{\delta Y} = \frac{\delta D}{\delta Y} ,$$

by substituting

$$\varepsilon = \frac{\delta D}{\delta N}\frac{N}{D} \quad \left(\text{that is, } \frac{\delta D}{D}\ \frac{N}{\delta N} = \frac{\delta D}{D} \Big/ \frac{\delta N}{N}\right) \quad \text{and}$$

$$\eta = \frac{\delta D}{\delta Y}\ \frac{Y}{D} ,$$

(footnote follows on next page)

By combining national income produced in non-agricultural sectors from K. Ohkawa, et. al., The Growth Rate of the Japanese Economy, together with S. Yamada's estimates of value-added in agriculture, the quinquennial average levels of national income were obtained for the period 1878-1882 through 1918-1922. Similarly, by adding Ohkawa's non-agricultural income and the values of agricultural income implied by J. Nakamura's estimates of total agricultural production, a second quinquennial series of national income estimates was con-

---

(footnote continued)

we obtain

$$\frac{\dot{D}}{D} = \frac{\dot{A}}{A} + \varepsilon \frac{\dot{N}}{N} + \eta \frac{\dot{Y}}{Y} .$$

It is clear that ε is the elasticity of demand with respect to population and η is the familiar income elasticity. The equation states that the growth rate of demand for agricultural products is the sum of shifts over time of the function, the population elasticity multiplied by the growth rate of population and the income elasticity multiplied by the rate of real income growth.

If, for the sake of simplicity, we were to neglect the shift factor altogether (assume that "tastes" remain the same), the growth rate of demand for agricultural products may be projected by the use of the two elasticities and the growth rates of population and real income. It should be noted here that any kind of shift in the function is regarded as change in tastes. Thus defined, tastes may include: (1) the economy's preferences and habits with respect to consumption; (2) the patterns of income distribution; (3) the degrees of urbanization; (4) the stages of development of marketing, transportation, and processing of agricultural products, etc. Moreover, if we impose a condition that the elasticity of demand with respect to population, ε, is $(1-\eta)$, i.e., the demand function postulated is homogeneous of degree one (there is no economies of scale in consumption/demand), then we have the simplified relationship stated in the text.

The technique of derivation is essentially the same as that used by Professor R. M. Solow in his "Technical Change and the Aggregate Production Function," Review of Economics and Statistics (August, 1957), pp. 312-320.

Yoichi Okazaki & Taeuber say that Rop. underestimated for early Meiji. ∴ Rop. growth rate overestimated

structed.[1] On the basis of these quinquennial data, then, along with those used in Table 1, the following annual growth rates in real terms were computed for the forty-year period:

really done by Cabinet Bureau

Population	
The Bank of Japan Estimates	1.0%
National Income Produced	
Nakamura-Ohkawa Estimates	3.2
Yamada-Ohkawa Estimates	3.8

[1] In want of established national income estimates compatible with the two agricultural series used here, I resorted to the following method of procuring the rough estimates.

(1) Yamada-Ohkawa, National Income Quinquennial Estimates

S. Yamada's estimates of value-added in agriculture (1934-1936 prices) plus estimates of national income in non-agriculture by K. Ohkawa, et. al. (in current prices) deflated by the index constructed by linking non-agricultural deflators from the Growth Rate and aggregate deflators (in 1934-1936 prices) from the SSRC Project, Economic Growth in Japan, Basic Statistical Tables (mimeo.), which is known as the "Ohkawa Series" at the Economic Research Institute at Hitotsubashi University.

(2) Nakamura-Ohkawa, National Income Quinquennial Estimates

J. Nakamura's implied total agricultural production was obtained from his "corrected Index of Total Agricultural Production," under the assumed paddy rice yields of 1.6 and 1.95 koku, on the basis of S. Yamada's estimates of total agricultural output (in 1934-1936 prices) for 1918-1922. This series was adjusted by Yamada's estimates of current inputs in agriculture (in 1934-1936 prices) to give national income produced in agriculture. Final estimates were obtained by summing this series and the Ohkawa non-agricultural income described above.

As J. Nakamura points out, rightly I think, in his monograph, in the Meiji period there is a possible undermeasurement of income produced in non-agricultural sectors as well. I made no adjustment for this factor in the calculations above.

Agricultural Products Available for Consumption	
Nakamura-Noda Estimates	1.7%
Yamada-Noda Estimates	2.4
Agricultural Food Products Available for Consumption[1]	
Nakamura-Noda Estimates	1.4
Yamada-Noda Estimates	2.1
Rice Available for Consumption	
Yamada-NNKT Estimates	1.6

If these growth rate estimates are approximately what the actual rates were, and if the terms of trade between agricultural products and other commodities remained rather stable during these years, the implied, rough, income elasticities of demand for agricultural products may be derived from the relationship discussed above. These elasticity estimates are as in the following:

Agricultural Products Available for Consumption	
Nakamura-Noda Estimates	.32
Yamada-Noda Estimates	.50
Agricultural Food Products Available for Consumption	
Nakamura-Noda Estimates	.18
Yamada-Noda Estimates	.39
Rice Available for Consumption	
Yamada-NNKT Estimates	.21

[1]The quinquennial averages were constructed by subtracting non-food products in agriculture (such as, industrial crops, green manure and forage crops, sericulture and straw products) from the two estimates of total agricultural production. These data were added to the series of imports of agricultural food products (obtained by subtracting imports of cotton from total agricultural imports) used by T. Noda in his "Juyo to Boeki no Choki-henka," [Long-term Changes in Demand and International Trade] in K. Ohkawa, ed., Nihon Nogyo no Seicho Bunseki (Tokyo, 1963).

According to Yamada's estimates of starchy staples output (in 1934-1936 prices, not adjusted for imports), production of this food group grew at the annual rate of 1.4 percent during the forty year period. This implies an income elasticity of demand for this food group of about .14.

These are no doubt crude estimates. Given the degree of uncertainty associated with the data used, however, it does not seem advisable to employ sophisticated estimating procedures on them. Nonetheless, comparison of the present estimates with those previously obtained by other scholars seems to be in order. The following are some of the well-known estimates:[1]

Products	Scholar	Years Covered	Income Elasticity
Agricultural Products	T. Noda (1956)	1878-1917	.74
		(1913-1937)	(.26)
Agricultural Food Products	T. Noda (1956)	1878-1921	.63
		(1922-1937)	(.23)
Starchy Staple Food	Nakayama (1958)	1878-1922	.38
		(1918-1942)	(-.27)
Agricultural Products	T. Noda (1963)	1878-1917	.82
		(1915-1937)	(.36)
Agricultural Food Products	T. Noda (1963)	1878-1917	.59
		(1915-1937)	(.18)

[1] All the estimates were derived on the basis of constant-price aggregates, except for Nakayama's starchy staple food which was totaled on the basis of calories. In the present estimates rice only is in terms of weight. All the above estimates were based on the time-series regression of demand (per capita in logarithms) on real income (per capita in logarithms). Mathematically, this source is the same as the present procedure.

Sources: T. Noda (1956), op. cit.
S. Nakayama (1958), op. cit.
T. Noda (1963), op. cit.

It is clear that for the period in question the present estimates of income elasticities are very much smaller than those given in the tabulation above. Evidently, the discrepancy between the two sets of estimates can be attributed to two causes, namely, (1) the significant upward revision of the levels of agricultural output during the early years embodied in the two sources used here, and, as its consequence, (2) a similar revision of the levels of national income for the early years (thus reducing its estimated growth rate) in the present data. The more interesting aspect of the present estimates, however, is their relative proximity to the estimates pertaining to the second interval of years (given in parentheses) in the tabulation above.

For some time the drastic change in income elasticities around 1920 apparent in the tabulation has intrigued many scholars Japanese and foreign. What exactly happened in the years around the First World War? What factors account for such a change? These were some of the questions asked without ever being answered to satisfaction. The present results indicate that the drastic change may have been only illusory and that the questions asked may have been inane. Since the present estimating procedure does not yield the statistics for making judgment on the computed elastcities, and since the previous estimates by Noda and Nakayama are not helpful in this regard,[1] it is not possible to say whether or not the difference is statistically significant between the present estimates pertaining to the first forty year period

[1] Both authors do not give the standard errors of the coefficients estimated, nor do they give Student's t-ratio and R-squares, to say nothing of the Durbin-Watson statistic. Although this is not to discredit their estimated values entirely, there is no denying that the practice imposes severe limitations on interpretation of their results.

and the previous estimates for the second. It is reasonable to state nevertheless that the change in the elasticities around 1920 does not seem to have been as drastic as was believed previously. Given the expectation of decline in the values of elasticities during the ordinary process of economic growth, there is nothing strange about the phenomenon. Only relevant question seems to be in regard to a risky task for empiricists to lop off years in order to choose certain periods of preference to others.[1] If James Nakamura is right in theorizing that undermeasurement of production persisted until about 1920 (although Saburo Yamada thinks that the date should be advanced to around 1890), we have no alternative but to choose 1920 as the year for dividing the two periods.

The data used in the present study (Yamada-Ohkawa national income in 1934-1936 prices and the Bank of Japan population figures) yield 155 yen as an estimate of per capita national income for 1918-1922. At the average foreign exchange rate between the U.S. dollar and the Japanese yen prevailing in 1934-1936 (in New York), this figure is equivalent to $45 per year. Although the yen figure will be more than $45 at the U.S. price levels in the recent years (say, double or triple the 1934-1936 prices), still the level of per capita income is low. The striking part of the story of Japanese food consumption is that the elasticities estimated, .2 or .4, are on the substantially low side

---

[1] It is well known that in the case of cross-section data, the characteristics of the group sampled are of crucial importance in interpreting measured elasticities. Similarly, in the case of income elasticities measured from time-series data, the characteristics and, particularly, the length of the period covered are of crucial importance. If Milton Friedman's permanent income hypothesis is accepted, it should be expected that measured elasticities are larger the longer the period covered.

Cf. Marc Nerlove, Distributed Lags and Demand Analysis, U.S.D.A., Agriculture Handbook No. 141 (June 1958), pp. 103-109.

at this meager level of per capita income. In recent years "accepted" values of income elasticity for food have ranged around .6 and .7 for poor countries whose per capita income is roughly comparable to Japan's in the 1920's.[1] Granted that a part of the explanation can be found in (1) the exclusion of transport, storage, retail and other marketing components of food values and in (2) the exclusion of marine products in the present data, I am inclined to think that the main reason must be sought elsewhere. That Japanese income elasticities in the early years of development were so low implies that the Japanese did not change greatly their food consumption patterns as they became wealthier. People were content to eat the same kind of food that they used to eat when they were poorer, although there were gradual changes in the relative composition of food and some occasional improvements in processing and other services. It is my contention that in fact food consumption patterns in Japan did not undergo any sudden, drastic change in the years preceding World War II.

II. Food Consumption Patterns During 1909 Through 1940

According to Simon Kuznets' calculations of the share of foods in private consumption expenditures, on the basis of the data in K. Ohkawa, et. al., The Growth Rate of the Japanese Economy, the food share in total consumer expenditures declined markedly--from over 75 percent in 1878-1882 to less than half

---

[1] Colin Clark and M. R. Haswell, The Economics of Subsistence Agriculture (London, 1964), Chapter 8, pp. 139-156.

H. S. Houthakker, "An International Comparison of Household Expenditure Patterns, Commemorating the Centenary of Engel's Law," Econometrica, 25, 4 (October 1957), pp. 532-551.

of that level in the 1930's.[1] Upon examining these calculations Kuznets found three inter-related aspects of the trends in the food share: (1) the extremely high level of the share until World War I; (2) the striking decline from that level to the 1930's and even to the 1920's; and (3) the existence of "very sharp character of the break" in the decline of this share between the prewar and the postwar (WWI) periods. Besides raising serious questions regarding the data he had used, Kuznets urged further scrutiny and explanation of the trends and expressed hope for research being undertaken by Japanese scholars.

Miyohei Shinohara's data, recently made available to me, successfully dispel the points raised by Kuznets. According to this source, there is a slow and steady decline in the share of foods from 66 percent in 1878-1882 to around 50 percent in the 1930's. Table 2 presents the contrast of these two series and gives justification to my use of Shinohara's data in this part of the paper.[2]

---

[1]Simon Kuznets, "Notes on Consumption: Trends in Level and Structure," a paper presented at the international conference on economic growth--case study of Japan's experience (Tokyo, Japan, September 5-10, 1966), (Mimeographed).

[2]Shinohara has reservations as to his estimates of total food expenditure. Because of the inclusion of foods consumed by the military and also because of the use of retail prices prevailing in Tokyo for foods not consumed by the producers, he feels that the expenditure figures are likely to be overestimated.

Elsewhere in his paper (ibid.) Kuznets says that the food share in 1926-1927 is "perhaps between 43 and 47 percent." Shinohara's data show this share to be about 57 percent.

TABLE 2

The Share of Foods in Private Consumption Expenditures, Current Prices, Selected Periods, 1878-1938*

Ohkawa-Kuznets Estimates[a]		Shinohara Estimates	
Years	Share of Foods	Years	Share of Foods
1878-1882	76.6	1878-1882	66.4 percent
		1883-1887	63.7
1888-1892	72.5	1888-1892	63.4
		1893-1897	63.0
1898-1902	69.1	1898-1902	63.1
		1903-1907	63.8
1908-1912	65.0	1908-1912	63.0
		1913-1917	60.3
		1918-1922	59.7
1924-1928	45.2	1923-1927	57.7
		1928-1932	52.7
1933-1934	35.8	1933-1937	49.9
1934-1938	39.2		

sharp decline — why?

*[a]The hyphenated name for this set of estimates should not be taken to imply that both scholars necessarily endorse the figures. Kuznets' table from which the figures were taken is entitled, "An Attempt to Estimate the Share of Foods in Private Consumption Expenditures..." These were constructed, moreover, to show that there are some peculiarities in the original estimates by Ohkawa and his associates. Ohkawa himself was among the first to acknowledge the need to undertake research work for revising the estimates.

Sources:

(1) Simon Kuznets, "Notes on Consumption: Trends in Level and Structure," a paper presented at the international conference on economic growth--case study of Japan's experience, September 5-10, 1966, Tokyo, Japan (mimeographed), Table 6. Kuznets' estimates are based on data in K. Ohkawa, et. al., The Growth Rate of the Japanese Economy (Tokyo, 1957).

(2) Miyohei Shinohara, "Kojin Shohi Shishutsu no Koseihi," [Composition of Private Consumption Expenditures, 1874-1940], (Xeroxed manuscript).

Although it is impossible to tell the exact extent of overvaluation[1] involved in Shinohara's data, assume that the degree of such overestimation remained rather stable over the period of about thirty years between 1909 and 1940. It is then quite clear that the share of foods in private consumption expenditure declined gradually over these years. This is what one could have expected. Given the grwoth of expendable resources per capita, the rise in the level of living would be reflected in the decline of this proportion. Although the absolute amount of food expenditures rises (per capita), mainly because demand shifts from less preferred foods, alternative uses of consumers' budget for goods and services other than foods become relatively more important.

Far more interesting, and quite revealing, are the figures presented in Table 3. The picture presented by the table is unmistakable. The share of starchy staples in total food expenditure declines steadily from the level of around 56 percent to 44 percent during the course of the years. On the other hand, the relative importance of animal proteins and other foods (among which are such "protective" foods as fruits and vegetables) rises, the former rising more rapidly than the latter. The story is exactly the same when it is cast

---

[1] Shinohara's estimates are based on the "commodity-flow" approach of measuring consumption expenditure. He starts with output (in quantities) and arrives at net food supply after adjusting for changes in inventories, net exports, wastage, non-food uses, etc. The net food supply figures are used to estimate food expenditure by applying appropriate price data (prices on farm--where a part of the supply is consumed--and retail prices). The expenditure figures may contain elements of overestimation because Shinohara uses the retail prices prevailing in Tokyo (where the price levels might very well have been higher than in other localities) and does not subtract the use of foods by the military (which is in the public sector).

It is my understanding that Shinohara will make these adjustments in his forthcoming book, Kojin Shohi Shishutsu [Private Consumption Expenditures].

TABLE 3

Composition of Food Consumption, by Major Food Groups, 1911-1940*

Years	Starchy Staples[a]	Animal Proteins[b]	Other Foods	Total[c]
	-- Food Expenditure Per Capita (in 1934-1936 yen) --			
1911-1915	35.0 (56.0)	5.5 (8.8)	21.9 (35.1)	62.4 (100.0)
1916-1920	36.6 (53.5)	7.7 (11.2)	24.0 (35.2)	68.3 (100.0)
1921-1925	35.4 (48.1)	10.5 (14.3)	27.8 (37.6)	73.8 (100.0)
1926-1930	34.5 (45.8)	10.8 (14.3)	30.1 (39.9)	75.3 (100.0)
1931-1935	33.4 (43.8)	11.7 (15.4)	31.0 (40.8)	76.0 (100.0)
1936-1940	33.9 (43.7)	13.6 (17.5)	30.1 (38.8)	77.5 (100.0)
	-- Calories Per Capita Per Day --			
1911-1915	1765 (86.6)	40 (2.0)	232 (11.4)	2037 (100.0)
1921-1925	1807 (85.1)	47 (2.2)	269 (12.7)	2123 (100.0)
1931-1935	1711 (83.3)	72 (3.5)	272 (13.2)	2055 (100.0)

why the decline?

*[a]Starchy staples include: rice, barley, naked barley, other cereals, sweet potatoes, white potatoes, wheat flour, starch, and noodles.

[b]Animal proteins include: meat, milk, eggs, fish, shellfish, and other marine products.

[c]Expenditure total excludes beverages and tobacco. Calorie total excludes canned (and bottled) foods as well as beverages.

Computed from Miyohei Shinohara, "1919-1940 Nenkan ni okeru Shokuryo Shishutsu no Ichi-Suikei," [An Estimate of Food Expenditure for the Years 1909 through 1940], No. D-5, Mimeographed.

In parentheses are percentages of the total.

in terms of calories derived from these food groups. In terms of both food expenditure and calorie "intake" protein-rich animal foods increase their relative importance over the years.

In an international comparison of dietary patterns, M. K. Bennett found a rather close inverse relationship between the fraction of total calories derived from the starchy staples and the level of per capita income.[1] This decline of the "starchy staple ratio" as incomes rise reflects the tendency of people to consume increasingly large quantities of meat, dairy products, and other relatively costly foods as enlarged purchasing power allows them to modify their dietary pattern. Among the starchy staple foods there is also a tendency for people to shift away from consumption of sweet potatoes, barley, naked barley, and other miscellaneous cereals, while consumption of rice increases its relative importance. This phenomenon can be seen clearly in the following tabulation.

The Share of Starchy Staple Foods in Total Calorie "Intake"[2]
Selected Periods, Japan, 1911-1935

Years	Rice	Barley	Naked Barley	Miscellaneous Cereals	Potatoes	Wheat Flour and Starch	Noodles
1911-1915	65.6	6.4	7.8	2.7	1.6	.5	2.1
1921-1925	68.1	4.6	5.6	1.8	1.3	.6	3.1
1931-1935	69.3	3.4	4.7	1.7	.9	.7	2.6

The decline in the consumption of these "inferior" starchy staples is a reflection of the shift of emphasis on the part of consumers from food calories per se

---

[1] M. K. Bennett, The World's Food (New York, 1954), pp. 214-222.

[2] Computed from net food supply data in Shinohara, "1900-1940 Nenkan si okeru Shokuryo Shohi Shishutsu no Ichi-Suikei," op. cit.

Calorie figures were taken from:
F.A.O. United Nations, Food Composition Tables for International Use (Rome, 1954), Table 1. "As Purchased."

total food expenditure. In other words, a drop of 4 percentage points in the share of starchy staples was taken up by the rise of the same amount in the share of animal proteins. It is evident that the substitution of the animal proteins group for starchy staples took place, as expected, even during the years in which the total calorie "intake" did not show a significant response to the income growth.

Figure 1 depicts the movements of the prices and aggregate real expenditures of these two food groups. It is clear from the figure that the real expenditures (per capita) on these food groups did not show much fluctuations around the respective trends. Apparent also in the figure is that the prices of the two major food groups moved almost in parallel, implying that the relative prices of the two groups were rather stable.[1]

On the basis of the data presented in Table 3, we observe that over the period between 1921-1925 and 1935-1940 per capita real expenditure on starchy staples declined at .2 percent, that on animal proteins increased at 1.7 percent, and per capita expenditure on other foods rose at .5 percent per annum. Given that the relative prices of these food groups were more or less stable, these growth rates immediately translate themselves into crude income elasticity estimates (since the annual growth rate of per capita real consumption expenditure was about one percent). The implied income elasticities are -.2, 1.7 and .5 for starchy staples, animal proteins and other foods, respectively. The indication is that as a food group starchy staples are "inferior" foods, whereas animal proteins are "preferred" items. Although we cannot tell with

---

[1]Price indices were constructed by dividing the current-price expenditures (aggregated over commodities in the group) by the constant-price expenditures (similarly aggregated) for each group.

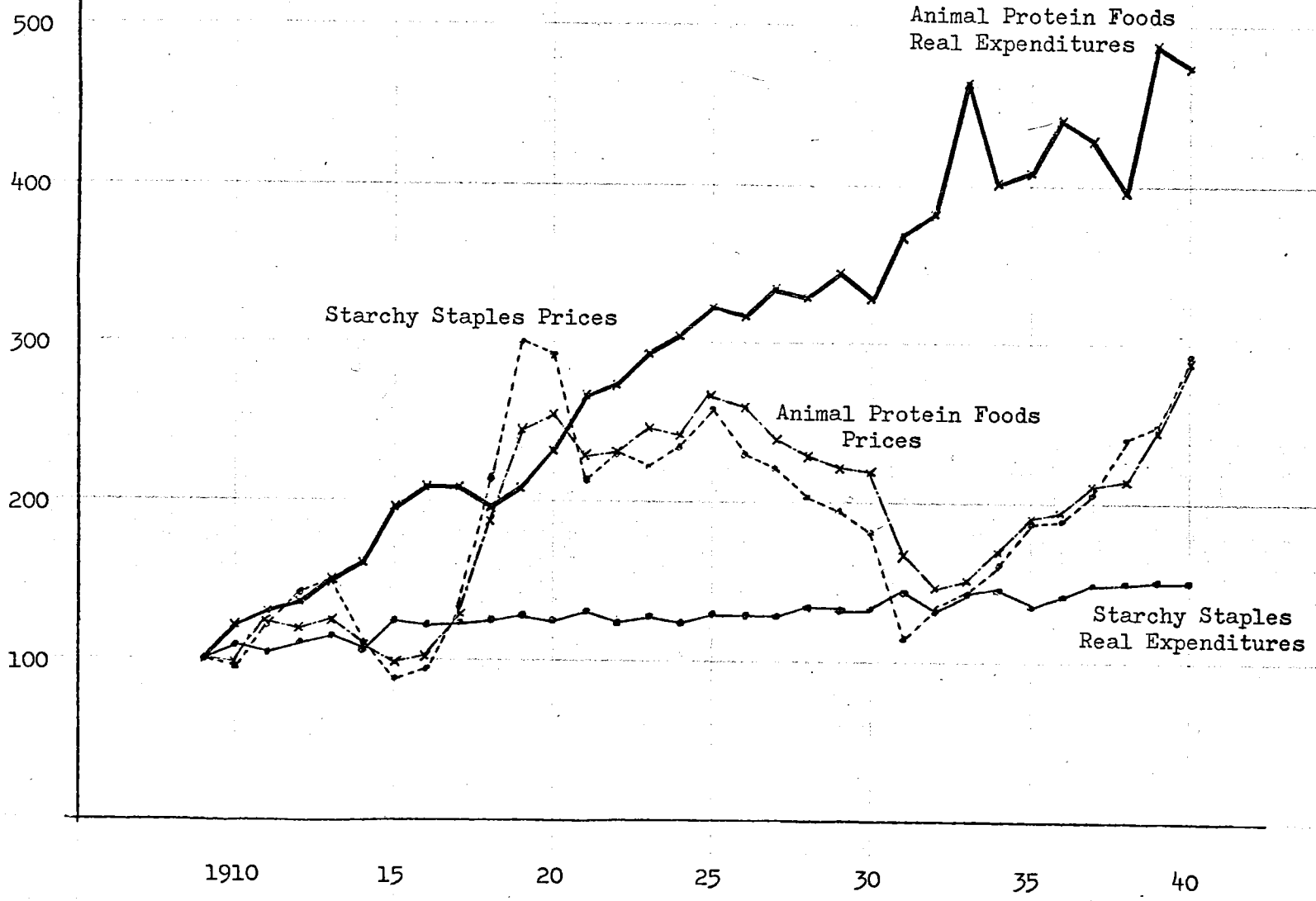
Figure 1

Index Numbers of Real Expenditure and Prices,

Starchy Staples and Animal Protein Foods, 1909-1940*

(Base: 1909 = 100)

--Per Capita--



* Based on M. Shinohara's estimates.

confidence how much change in per capita expenditure on starchy staples takes place in response to one percent increase in real income per capita, we can reasonably say that the change would not be in the upward direction. It is to be noted that these crude elasticity estimates compare well with those formerly derived by T. Noda and S. Nakayama for the interwar years.[1]

Among various household expenditure surveys carried out during the interwar years, only a few are easily available for general use today. Four household expenditure surveys were chosen here for the purpose of supplementing the elasticities estimated above. Although all the surveys chosen relate to incomes and expenditures of urban workers' households, differences are inevitable among these survey records in the concepts and procedures used in collecting and classifying the data. The lack of parallelism is not too serious, however, if we confine ourselves to analyses of large aggregates.[2]

---

[1] See the preceding section, p. 10. The estimates by the two scholars pertaining to the interwar period are given in parentheses.

[2] Each survey covers over 1200 urban workers' households. The sample households are classified into several income classes, whose monthly average incomes and expenditures are available for analysis. Some characteristics of the surveys are listed below:

Selected Surveys of Average Monthly Income and Expenditure, Urban Workers' Households, 1921-1936*

Survey Period	Sample Size	Number of Classes	Persons Per Household	Total Consumption Expenditure (current yen)
1921 (March)	1212	13	4.8	76.6
1926-1927	4785	9	4.2	102.2
1931-1932	1517	7	4.1	76.3
1935-1936	1673	7	4.1	80.1

*Weighted averages over the classes. From: Hyoe Ohuchi, Nihon Keizai Tokeishu, Meiji, Taisho, Showa [Collected Statistics of the Japanese Economy, for Meiji, Taisho, and Showa Periods] (Tokyo, 1958), pp. 302-307.

Using total household expenditure per capita instead of recorded income of the household, income elasticities were computed by the method of ordinary cross-section regression of food expenditure per capita on total consumption expenditure per capita (both in logarithms). Because of the nature of the data, observations entering into regression were duly weighted according to the number of households represented in each class average. The resulting measured elasticities are given in the second panel of Table 4 along with their respective standard errors in parentheses. Most regressions show an excellent fit, as expected: the coefficient of determination are all above .90. The starchy staples group (here only cereals are included) is atypical in this regard, except for the 1931-1932 survey whose coefficient of determination is a respectable .85.

It is quite remarkable that the cross-section estimates are so consistently close to the crude estimates from the time-series estimates. The measured income elasticity of demand for all foods falls in the range between .3 and .4. Interestingly enough, too, their values decline over the years. The same seems to be the case for measured elasticities of starchy staples, zero to -.1, and of animal proteins, which are around one to .8.

According to L. Juréen's calculation, income elasticities for some prominent food groups at varying income levels can be expected to be as follows:

Prewar Income Elasticities at Varying Income Levels, Juréen's Data[1]

Income per Capita in 1934-1938 U.S. Dollars	Animal Foods (excluding fish)	Cereals	Total Food in Constant Prices
35 dollars	.79	.03	.47
50	.73	-.10	.42
75	.64	-.23	.37

[1]The figures were taken from: L. Juréen, "Long-Term Trends in Food Consumption: A Multi-Country Study," Econometrica (January 1956), p. 9, Table V. The figures are taken only for lower income levels contained in Juréen's table.

TABLE 4

The Shares of Major Food Groups in Total Household Expenditure, and Measured Income Elasticities, Urban Workers' Households*

Period of Survey	Food Total	Starchy Staples[a]	Animal Proteins[b]	Other
	-- Share in Total Expenditure (Food Expenditure) --			
1921 (March)	38.0	17.6 (46.3)	7.6 (20.0)	12.8 (33.7)
1926-1927	30.2	14.2 (47.0)	5.2 (17.2)	10.8 (35.8)
1931-1932	26.9	10.2 (37.9)	5.0 (18.6)	11.7 (43.5)
1935-1936	31.1	14.2 (45.7)	4.9 (15.7)	12.0 (38.6)
	-- Measured Income Elasticities --			
1921 (March)	.494 (.052)	.216 (.075)	1.182 (.146)	.477 (.064)
1926-1927	.386 (.018)	-.021[c] (.027)	.943 (.024)	.657 (.019)
1931-1932	.347 (.027)	-.105 (.016)	.753 (.096)	.582 (.035)
1935-1936	.329 (.024)	-.016[c] (.024)	.824 (.052)	.545 (.059)

*[a]Include cereals only.

[b]Include meat, dairy products, eggs, and fish.

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

Sources:

"Average Monthly Income and Expenditure of Urban Workers' Households," 1921 (March), 1926 September-1927 August, 1931 September-1932 August, 1935 September-1936 August, in Hyoe Ohuchi, Nihon Keizai Tokeishu, Meiji, Taisho, Showa [Collected Statistics of the Japanese Economy, for Meiji, Taisho, and Showa Periods], (Tokyo, 1958), pp. 302-307.

The figures in the first panel, "Share in Total Expenditure," are the weighted averages of the classes represented.

The figures in parentheses in the second panel are standard errors of estimates.

note the problem of using deflated R when deflated sharply due to depression, bilateralism, etc.

Recent estimates by K. Ohkawa and his associates put per capita national income in 1934-1936 at about 210 yen. This is equivalent to about 61 dollars in 1934-1936 U.S. currency.[1] Some interesting observations emerge when the income elasticities calculated here are contrasted with those "predicted" empirically at similar income levels by Juréen.

Juréen's international data were limited to the observations of European countries. Necessarily, therefore, the exact content of his food groups, such as animal foods and cereals, is different from the ones relevant to the Japanese dietary patterns during the interwar period. Nevertheless, it may be observed that at the per capita income level of 61 dollars the elasticity value of between one and .8 for animal foods is rather higher than that expected from Jureen's calculation. Moreover, the present estimates of Japanese elasticity for cereals falling between zero and -.1 is also on the higher side. That is to say, in regard to each food group, the estimated Japanese income elasticities correspond to those "expected" for countries with much lower per capita income than Japan actually had in the interwar years. Since the relative weights of these food groups in the Japanese and the European diets are very much different (i.e., the relative share of cereals is much higher in the Japanese diets), it is not surprising to observe that the present estimate of income elasticity for all foods turns out lower than indicated from Juréen's table.

if Y higher) then elasticities even higher than expect

Again, Japanese income elasticity for all foods was much lower than most international data indicated. Put another way still, this means that Japanese food consumption patterns in the prewar period were such that changes in food

---

[1] See page 13 above.

but how did Japanese total caloric intake compare with Europeans? What you are really describing is the rice preference -

demand in response to income growth were very much like those in countries where per capita income were higher than Japan's. Japanese did not change their dietary habits as much as other peoples (Europeans) did when they became richer. The Japanese behaved as though they were richer at a per capita income level which was actually low. One implication of this behavior in regard to food consumption seems rather clear: it provided Japanese industries with the growing domestic markets for their products.

III. Food Consumption Patterns in the Postwar Years

The violent disruption in the general process of Japan's economic growth brought forth by World War II and its aftermath is quite evident in the economic statistics of the time. The indicators of food consumption patterns are no exception. The ratio of food expenditure in total consumption expenditures (the so-called Engel ratio) jumped up to a very high level once again, after having declined steadily since Japan's modernization. The starchy staple ratio was again at around 87 percent, a substantial portion of which being claimed by starchy roots and "inferior" cereals. The apparent intake of food calories and proteins declined as domestic production decreased and the quantity of emergency food supplies brought in by the occupation authorities were substantially below the prewar levels of food imports.

As can be expected, along with the reconstruction of food collection and distribution systems and the gradual recovery of food production, the indicators showed steady improvement in the years following the disaster. The food rationing covering cereals and starchy roots was gradually relaxed: rationing of sweet potatoes was abolished in December 1949, and that of barley in June

1952.[1] The 1955 crop of rice greatly eased the supply shortage and the per capita ration of this last item in the rationing system was increased to the extent that rice control lost much of its significance.

Over the five year period between 1934 and 1938 per capita real national income (in 1934-1936 prices) ranged from about 200 yen to 230 yen. During the years between 1951 and 1964 per capita real income in the prewar prices rose from about 180 yen in 1951 to about 470 yen in 1964. The prewar level of real income was reached around 1954-1955 when the figures once again registered between 205 and 230 yen in 1934-1936 prices. It is not at all surprising, therefore, that we find the return of food consumption patterns to the prewar level around these years. As with other indicators of general economic activity, the middle of the 1950's witnessed the return of food consumption to the peak levels attained in the prewar period.

It is indeed interesting, however, to note that the Engel ratio remained still high, relative to the comparable prewar period, its value attaining the prewar level only recently in the mid-1960's.[2] It appears that this phenomenon cannot be explained easily without examining rather closely non-economic factors as well as income and price situations.

how about Y distrib. much more equal, which raise ? & spd.

Such an explanation must emphasize: (1) massive exposure of Japanese people to the influences of foreign consumption patterns; (2) the rapid acculturation of these influences through mass communication media; and (3)

---

[1] N. Kayo, ed., Nihon Nogyo Kiso Tokei, op. cit., p. 353.

[2] The Engel ratios for the selected years are as follows:

	1933-1937	1946-1950	1951-1955	1956-1960	1961-1964
Private Cons. Exp. Foods / P.C.E. Total	49.9%	84.5%	54.5%	53.6%	51.3%

M. Shinohara, op. cit., and Bank of Japan, Hundred-Yeear Statistics, op. cit.

the inauguration in 1947 of the school lunch program (with the emphasis on bread and milk). These factors, along with the rise in the purchasing power of the population, enabled Japanese to change their dietary pattern considerably. The increases in consumption of meat and dairy products, white potatoes, and wheat are cited as a clear indication of this trend. The increase in per capita consumption of oils and fats, too, is suggested as collaborating evidence reflecting the changes in cooking methods. Frying as an increasingly popular form of food preparation, as well as use of oil in salad dressing, mayonnaise, and other shortening, reflects the gradual shift from dependence on boiling and broiling with traditional condiments such as shoyu (soy sauce) and miso (bean paste). It may be suggested that the nature of demand for the starchy staples has undergone a radical change. Just as wheat in the form of bread has become increasingly familiar substitute for rice, whereas in the prewar period it was an inferior substitute as the major ingredient in noodles, white potatoes have come to be regarded as something decidedly different from sweet potatoes and going better with dishes of Western origin.[1]

---

[1]Changes in the calories (per capita per day) contributed by some of these commodities are as in the following:

Years	Rice	Wheat	Barley Naked Barley	Miscellaneous Cereals	Sweet Potatoes	White Potatoes	Oils Fats	Milk, Eggs Meat	Fish
1931-1935	1319	132	137	33	119	19	20	23	36
1951-1955	956	246	179	13	109	41	50	37	62
1961-1964	1074	245	42	8	39	35	140	130	73

Kagaku Gijutsu Cho, Nippon no Shigen, op. cit., and Ministry of Agriculture and Forestry, Norinsho Tokeihyo, op. cit.

be reasonably maintained. In the latter part of this section the possible shifts in "tastes" will be explicitly incorporated into analyzing the postwar data. In the meantime, let us trace some of the significant changes in the postwar food consumption patterns with familiar and more conventional methods of analysis.

Measured Income Elasticities of Food Demand, the Postwar Years

Table 5 presents net food supply in terms of calories contributed by major food groups (on the per capita per day basis) during the postwar years as contrasted to the prewar peak levels in 1934-1938. As can be seen clearly, judging from the starchy staple ratio, the prewar level of food consumption was recovered around 1951-1953. The recovery of total calorie "intake" from all sources, however, had to wait until about 1954-1956 to reach the prewar peak levels. Nonetheless, judging from protein consumption, it is evident that the prewar level was regained around the end of the 1940's. Together with the jump in the Engel ratio mentioned earlier, the divergence in these recovery dates is clear evidence of the change in food consumption patterns from the prewar to the postwar period. In view of the historical predominance of starchy staples in the Japanese diets, I shall choose 1951 as the starting point in the study of the postwar period.

For the annual observations on food expenditure and total expenditure covering 1951 through 1964 the following (two-stage least squares) regression model was adopted:

$$v_t = \alpha + \beta M_t + e ,$$

where, specifically, v is per capita food expenditure (including beverages and tobacco) in real terms, M is per capita real personal consumtpion expenditures,

Moreover, rapid urbanization of Japanese life, not only in the usual sense of the shift of population from rural to urban areas, but in the sense of all that modern urban life and technology connotate, has helped in shaping new food consumption patterns. Electric appliances, such as refrigerators, ovens, toasters and other kitchen implements (to say nothing of such gadgets as automatic rice cookers), technologically expand the range of feasible methods of food preparation and their variety. Rural and urban acceptance of these items, as well as the popular use of processed foods, attests to the continuing change. In recent years, furthermore, increasing affluence of the Japanese economy has permitted imports of exotic foods in increasing amounts along with imports of such essential food items as grains (for food and feed) and meat and dairy products.[1]

It goes without saying, therefore, that these socio-cultural and technological changes have had a profound impact on the postwar development in Japanese food consumption patterns. In contrast to the prewar period when food consumption patterns were changing rather slowly, the postwar period calls for a radically different approach and methods of analysis. The assumption of stable "tastes," which may have been tolerable in the prewar analyses, cannot

---

[1] Before 1960, the annual cost of imported foodstuffs ranged between $700 million and $800 million. Since 1960, however, the rise in the imports of food has been conspicuous. In 1963 total food imports was approximately $1.5 billion, an increase of 39 percent over the preceding year. Following are the commodities which contributed most to this rise in the value of food imports: sugar and molasses (accounting for 30 percent of the increase), wheat and soy beans (each 8-9 percent), sesame seeds, bananas, corn and meats (each 5-6 percent), and coffee and cocoa (each 3 percent). Imports of meat registered the largest increase as a single item in 1963, rising by 160 percent over the preceding year. Foods accounted for 23 percent of total imports in 1964.

TABLE 5

Net Food Supply, Calories Per Capita Per Day, Selected Years*

Other	Total Food	Starchy Staples[a]	Animal Proteins[b]	Other
1934-1938[c]	2050 cal.	1605 cal.	54 cal.	391 cal.
1948-1950	1910	1660	71	179
1951-1953	1930	1500	93	337
1954-1956	2070	1548	107	415
1957-1959	2170	1572	136	462
1960-1962	2230	1524	175	531
1963-1964	2298	1500	221	577
		-- Percent of Total Calories --		
1934-1938	100.0	78.3	2.6	19.1
1948-1950	100.0	87.9	3.7	9.4
1951-1953	100.0	77.7	4.8	17.4
1954-1956	100.0	74.8	5.2	20.0
1957-1959	100.0	72.4	6.3	21.3
1960-1962	100.0	68.3	7.8	23.8
1963-1964	100.0	65.3	9.6	25.1

*[a] Include cereals and potatoes.

[b] Include meat, eggs, milk, and fish.

[c] I cannot reconcile a substantial difference between this set of figures for 1934-1938 and those of Table 3 (the second panel) pertaining to 1931-1935.

Sources:

United Nations, F.A.O., Food Supply, Time Series (Rome, 1960).

Japan, Ministry of Agriculture and Forestry, Norinsho Tokeihyo [The Statistical Tables of the Ministry of Agriculture and Forestry], various annual editions.

Note:

Total Food does not include calories derived from beverages.

total, and where per capita real national income is used as the instrumental variable.[1] The instrumental estimates with and without logarithmic transformation of observations yield the following:

$$v_t = \underset{(2.011)}{6.239} + \underset{(.027)}{.380}\, M_t , \qquad R^2 = .947 \text{ and } D\text{-}W = .524$$

$$\log v_t = \underset{(.042)}{.096} + \underset{(.011)}{.808} \log M_t , \qquad R^2 = .998 \text{ and } D\text{-}W = 1.567.$$

Judging from the magnitude of R^2 and the Durbin-Watson statistic, it is obvious that the second equation is superior to the first. Nonetheless, evaluating the elasticity at the point of the mean in the first equation, we obtain .809 as the income elasticity for expenditure on food. This value compares very well with the estimate from the second equation, where the value is .808.

Because it is not possible to separate expenditure on food from those on beverages and tobacco in the data source as given, it is essential to adjust for this factor in order to arrive at the income elasticity of demand for food items only. On the basis of the data on expenditures on food, beverages, and tobacco provided separately for the seven year period between 1958 and 1964, the income elasticity of demand for beverages and tobacco can be estimated. It is not surprising that the estimated value of this elasticity is quite high

[1] For the rationale of using the instrumental variable, see:

Nissan Liviatan, "Errors in Variables and Engel Curve Analysis," Econometrica, 29, 3 (July 1961), pp. 336-362.

The sources of the data used are as follows:

Expenditures: Japan, Economic Planning Agency, Annual Report on National Income Statistics, 1966. It is not possible to separate food expenditure from expenditures on beverages and tobacco.

Population: Bank of Japan, Hundred-Year Statistics of the Japanese Economy, op. cit.

Not taken into account weighting for other component (food) answer is .695

at about 1.56. Since in 1958 the expenditures on these "nonfood" items occupied 13 percent of the total of the food, beverage, and tobacco expenditures, we multiply 1.56 by .13 and subtract this product from the income elasticity estimated by the use of the equation above. The resultant income elasticity estimate is .61 for expenditures on food per se.

Given that the service (processing and marketing) components of food expenditure is higher in the postwar years, and that these components grow more rapidly in response to income rises than demand for foods valued at the farm level, it is noteworthy that the elasticity estimated for the period is significantly higher than those computed for the prewar periods. Along with the evidence that the Engel ratio jumped higher in the postwar period, the higher income elasticity of food demand should be interpreted as indicating that the Japanese are not content to eat the same kind of foods as they used to before World War II. Their food consumption patterns are changing together with the rapid income growth. However, because the aggregate income elasticity is a product of many influences working on the aggregate economy besides the variables formally accounted for in the regression equation, further scrutiny of the changes in the aggregate economy is necessary in order to interprete its meaning correctly. It is, of course, impossible to do justice to the full range of factors that determine the aggregate income elasticity. Some of these have already been mentioned earlier in this section. In addition, the patterns of income distribution, occupational composition of the population, and the geographic distribution of the population are all relevant factors. Here we shall focus on only one of these factors.

Granted that Japan's agricultural sector employed only 26 percent of the total labor force in 1964 and, hence, that urban workers are more important

in influencing aggregate food demand today, a study of Japanese food consumption patterns cannot be complete without examining also the rural patterns of food consumption. The sizable movement of people from rural to urban areas has been in progress since the beginning of the modernization process, bringing forth a decline in the agricultural labor force relative to the urban counterpart. However, as is well known, only after the end of World War II and during the 1950's did an absolute decline in the agricultural labor force begin. Recently it has been decreasing at about 4 percent per annum. In the first place, such a rapid change in the geographic distribution of the population has a large impact on the pattern of aggregate demand, if in fact there are differences in urban and rural consumption patterns. Secondly, significant changes in the patterns of income distribution (as a result of the movements of people from rural areas to improve their income positions) influence the aggregate consumption patterns. Because, for one thing, if an average income rise in a given economy were mainly the result of an improvement in the level of the lower income groups, food demand would be expected to increase more rapidly than otherwise. Thirdly, movements of rural people to urban areas would be further expected to increase the aggregate elasticity of food demand as new arrivals in cities improve their income positions and begin to emulate urban consumption patterns. Although it is difficult to measure satisfactorily, there is no denying that some or all of these factors contributed to the rise in the aggregate Engel ratio and the aggregate income elasticity. On the basis of these observations I shall focus my attention on urban workers' households and farm households during the period from 1952 through 1962.

Table 6 identifies the variables and their definitions used in the remainder of this section. The sources of the data are given also in the table.

TABLE 6

List of Variables and Their Definitions

Variables	Name	Definition
N_t	Persons per household	Not adjusted for sex, age, or other attributes
Y_t	Real total expenditure	For Farm Households: Total of household living expenditures, kakei-hi, including value of barter transactions, imputed value of home consumption of products, depreciation as well as cash transactions. Deflated by the rural cost of living index (1957 = 100). For Urban Households: Total of household living expenditures, defined as shohi-shishutsu in the source, including cash expenditures only. 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 scripts refer to the i-th component of the rural or urban cost of living index at year t, respectively. i = 1 -- Total Food Expenditure 2 -- Expenditures on starchy staples, including cereals and starchy roots for farm households, but including cereals only for urban workers' households. 3 -- Expenditures on meat, milk, eggs, and fish. 4.-- Expenditures on other food items.

*Sources:

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).

For farm households, the expenditures are for family members only and exclude those attributable to hired hands. For each of the five scales of operation, classified according to the farm's operating acreage, district averages are the cross-section observations over ten years from 1952 through 1961. Data were drawn from ten agricultural districts out of eleven in Japan, excluding northernmost Hokkaido. For urban households, the data refer only to workers' households (blue-collar and white-collar, public as well as private employees). The sample households are classified into quintile groups according to money income. For this set of data, the cross-section observations are quintile-group averages over the ten year period between 1953 and 1962.

It is quite clear from Table 7 that the high growth rates of per capita real incomes in both urban and rural sectors are amply reflected in the substantial (and rapid) reduction in the respective Engel ratios over the years. Moreover, on the average, the Engel ratio for urban workers' households is lower than that for farm households in any selected year. This is in part a reflection of higher per capita monthly incomes enjoyed by the urban workers' households. Because the rural expenditures on starchy staples include starchy roots, while the urban counterpart does not, it may not be immediately obvious that the share of starchy staples in total expenditure is lower in the urban sample. However, this becomes rather evident when the shares from the two samples are closely examined. In regard to the share of animal protein foods, the picture is essentially the same. The urban levels of food consumption are unquestionably higher than those in rural areas.

For the cross-section data for selected years the logarithmic regression equation used in the time-series analysis was adopted. The logic of this method is comparable with the instrumental estimation because money income,

TABLE 7

Percentages of Total Household Expenditure Devoted to Food Groups, Urban Workers' Households and Farm Households, Selected Years*

Year	Food	Starchy Staples[a]	Animal Proteins[b]	Other
		-- Urban Workers' Households --		
1953	44.2%	16.0%	8.6%	19.6%
1957	41.5	14.1	8.8	18.5
1961	37.2	10.3	8.8	18.0
		-- Farm Households --		
1953	48.8	25.8	1.9	21.1
1957	48.1	24.6	2.3	21.2
1961	41.5	19.4	2.6	19.5
		Percent of Total Food Expenditure		
		-- Urban Workers' Households --		
1953	100.0	36.2	19.5	44.3
1957	100.0	34.0	21.2	44.8
1961	100.0	27.6	23.7	48.4
		-- Farm Households --		
1953	100.0	52.9	3.9	43.2
1957	100.0	51.1	4.8	44.1
1961	100.0	46.7	6.3	47.0

*[a]Including cereals and starchy roots for farm households, but including cereals only for urban workers' households.

[b]Including meat, dairy products, eggs, and fish.

Sources:
Same as in Table 6.

Note:
Figures are weighted averages of the cross-sectional groups.

or its proxy, is used as the instrumental variable in grouping the sample. The resulting estimates of income elasticities are given in Table 8.

As in the case of the share of food expenditure in the total, here also we observe that the measured elasticities for all food, starchy staples, and animal proteins are smaller for the urban sample than for the farm sample. The indications are that in response to income rises the farm households would expand expenditures on food groups relatively more than the urban households, although, strictly speaking, the differences do not appear to be statistically significant in most cases.

Looking at the results for the urban households and comparing them with the measured income elasticities for urban samples in the prewar years (Table 4), we observe close similarities of the elasticities in both prewar and postwar years. In fact, the differences between the urban and the rural households in the postwar years are more pronounced than those of the urban households between the prewar and the postwar years.[1] Because of the increase in the relative shares of animal proteins and other food groups the postwar elasticity for total food tends to be higher than the prewar one. However, if each food group is taken separately, there seems to be hardly any difference at all. The geographic shifts of the population, changes in the technological and institutional framework of food consumption and the unprecedented rapidity and dynamism of the economic growth, which brought forth these changes, are

---

[1] Two factors should be noted here. There is a problem of the upward bias in the samples of urban workers' households in the prewar family budget surveys. It is suspected that this is particularly serious for those prior to the 1926 survey. Furthermore, strictly speaking, the price effects in the postwar years cannot be ignored. The relative prices of foods in the postwar years show a clear upward trend. Especially pertinent to the discussion here is that the relative prices of animal proteins and of the other food group show distinct increase among foods.

TABLE 8

Measured Income Elasticities Based on Household Budget Surveys Urban Workers' Households and Farm Households, Selected Years*

(in parentheses are the standard errors of estimate)

Year	Food	Starchy Staples[a]	Animal Proteins[b]	Other
		-- Urban Workers' Households --		
1953	.481 (.015)	.196 (.032)	.750 (.012)	.590 (.017)
1957	.456 (.011)	.062 (.012)	.773 (.032)	.602 (.018)
1961	.472 (.004)	.075 (.012)	.700 (.008)	.585 (.012)
		-- Farm Households --		
1953	.529 (.036)	.466 (.080)	1.117 (.220)	.412 (.084)
1957	.531 (.044)	.363 (.089)	1.156 (.181)	.507 (.069)
1961	.529 (.040)	.159[c] (.091)	1.087 (.136)	.720 (.072)

*[a]For workers' households including cereals only.

[b]Include meat, dairy products, eggs, and fish.

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

Source:
Same as in Table 7.

Note:
Estimates were derived by weighted logarithmic regressions: observations were weighted according to the number of households represented in each group.

more important in determining the aggregate consumption patterns in the postwar years. The comparison of the cross-sectional elasticities between the two periods tends to reinforce this contention.

Urban/Rural Contrast of Food Consumption Patterns and Changes in Preferences

As mentioned earlier, Japan in the postwar period experienced rapid changes in consumers' expendable resources, the socio-cultural determinants of consumers' "tastes," and the institutional arrangements as to procurement and distribution of foods. The assumption of constant "tastes" may have approximated reality so far as the prewar periods of relatively slow growth were concerned. It does not appear to be tolerable, however, when these rapid changes in the postwar period are explicitly recognized. When the economy sustains the average annual growth rate in real terms of some ten percent for a decade or more, furthermore, the changes in such factors may be consecutive rather than once-and-for-all.

The above contention means that in the relationship characterizing the growth of demand for food introduced in the first section of this paper,

$$\frac{\dot{D}}{D} = \frac{\dot{A}}{A} + \varepsilon \frac{\dot{N}}{N} + \eta \frac{\dot{Y}}{Y} ,$$

an explicit account should be taken of the term $\dot{A}/A$, autonomous changes in "tastes" as defined.[1] If we think of consumption behavior observable ex post to reflect the compounded influences of both the structure of food demand and the changes in the structure, the term $\dot{A}/A$ is taken to reflect the latter and the parameters in the equation, ε and η, to measure the former.

---

[1] See footnote 1 on page 7.

In this part of the paper, moreover, I shall relax the assumption of homogeneity (of degree one) for the demand function, i.e., ε is not henceforth necessarily equal to $1 - \eta$. I now propose to measure from the data the partial elasticity of food demand with respect to number of persons as well as that with respect to income.

Under certain assumptions the statistical procedure adopted here provide simultaneous measures of the structure and the changes in the structure of food demand. I have used this statistical procedure, with some variations, elsewhere. Readers interested in its logic and assumptions are advised to make reference to my earlier papers.[1]

---

[1]Hiromitsu Kaneda, "Substitution of Labor and Non-Labor Inputs and Technical Change in Japanese Agriculture," Review of Economics and Statistics, 47, 2 (May 1965), pp. 163-171.

———————, "Regional Patterns of Technical Change in U.S. Agriculture, 1950-1963," Journal of Farm Economics, 49, 1 (February 1967), pp. 199-212.

———————, "Urban/Rural Contrast of Consumption Patterns and Consumer Preferences in Japan," Center Discussion Paper No. 15, Economic Growth Center, Yale University, mimeo. (December 1966).

The statistical procedure can be summarized as follows:

Specify the demand function as

$$(1) \quad D = G(t)AN^{\alpha}Y^{\beta},$$

where G(t) is an unspecified function of time reflecting the autonomous changes influencing demand. Let lower case letters denote logarithms of the variables and introduce a stochastic term in the above equation. We obtain a regression equation

$$(2) \quad d = a + \alpha n + \beta y + g(t) + u.$$

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.

Let the observations from cross-section and time-series be combined. Then, equation (2) assumes the form

(footnote follows on next page)

(footnote continued)

$$(3) \quad d_{rt} = a_r + \alpha n_{rt} + \beta y_{rt} + g(t) + u_{rt} ,$$

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 there are T. Assume that the stochastic term is distributed normally with

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

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. 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

$$(4) \quad d_{.t} = a_{.} + \alpha n_{.t} + \beta y_{.t} + g(t).$$

Now subtract (4) from (3), we obtain a regression equation involving only the variables measured from their respective (logarithmic) means of period t,

$$(5) \quad d'_{rt} = a'_r + \alpha n'_{rt} + \beta y'_{rt} + u_{rt} ,$$

where the prime indicates the variable measured from the cross-sectional means.

Equation (5) contains only those parameters that can be estimated by the use of ordinary least squares method. The variable g(t) can be estimated from equation (4), after the parameters are ascertained, according to the assumption to be made about the nature of a_r. Assume here that $a_r = a$, that is, the "influences of time" are the only unspecified factor at work in the demand situation. This means that at the same values of n_{rt} and y_{rt}, the values of d_{rt} are the same for all observations covering the cross-sections. Then, g(t) can be computed numerically from equation (4).

There are two important assumptions involved in the procedure as adopted here. The first is that the structure of "tastes," to be measured by the partial elasticities, remains the same over the years for all the cross-sectional observations. The second crucial assumption is that the "influences of time" (including consumers' "tastes") are the same for all cross-sectional observations at any moment of time. That is to say, in the context of this study, all the farm households, regardless of their geographic locations or income positions, are assumed to share the same "preference" patterns in any given year. The state of "preferences" is also assumed to be the same among workers' households regardless of their income positions. When a change occurs in the "influences of time" its effects are assumed to prevail over all cross-sections equally.

On the basis of these assumptions the parameters ε and η are first estimated and then numerical values of the time function $\dot{A}/A$ are obtained as residuals. This means that numerical values of the time function of any pair of years would differ depending on the values of the independent variables and real expenditure for a given food group, since the parameters are assumed to be the same for all years. In other words, it means that for any food expenditure group, if all three variables are the same at two points in time, the resulting value of the time function would also be the same. If we observe differences over time in real expenditure for a given food group, therefore, a part of the difference would be attributed to changes in the size of family and in the level of real income and the rest to the residual measure of the change in consumers' "tastes" and other influences of time.

Table 9 presents the estimated elasticities with respect to family size and income. As could be expected, the fit of the regression equation is ex-

TABLE 9

Estimated Elasticities with Respect to Family Size and Total Expenditure, Postwar Years*

(in parentheses are standard errors of estimate)

Category of Expenditure	Size Elasticity	"Income" Elasticity
	-- Urban Workers' Households --	
Food	.405 (.083)	.462 (.024)
Cereals	.461 (.168)	.216 (.050)
Animal Proteins	.327 (.130)	.722 (.038)
Other Foods	.394 (.097)	.591 (.029)
	-- Farm Households --	
Food	.455 (.022)	.555 (.016)
Starchy Staples	.921 (.036)	.343 (.026)
Animal Proteins	-1.125 (.089)	1.299 (.065)
Other Foods	.274 (.037)	.579 (.027)

*The estimates are derived from the regression equation of the form

$$\log X'_{rst} = \alpha \log N'_{rst} + \beta \log Y'_{rst},$$

where the prime denotes the variables measured from their respective (logarithmic) means of period t. This equation, in turn, is based on

$$X_{rst} = G(t)AN^{\alpha}_{rst}Y^{\beta}_{rst},$$

where G(t) is an unspecified function of time reflecting the autonomous changes influencing demand for X. The subscripts r and s refer to cross-sectional observations (r to districts and s to scales of operation) and t denotes the year of observation.

For farm households the observations entered numbers 500 over the years 1952-1961, the agricultural districts (10, except Hokkaido), and the scales (5).

For urban workers' households the cross-sectional observations are quintile group averages over the years 1953-1962; and the entire set of data numbers 50.

Farm household regressions are weighted according to the number of households represented in each group average.

cellent. Although the R-squares are not formally given in the table, the coefficients of determination are all above .80, except for the regression of animal proteins group for the farm households.

With regard to the magnitudes of the estimated partial elasticities several points of interest can emerge from the table. It is interesting to note that the difference is quite small between the urban and the rural size elasticities of total food expenditure (excluding alcoholic beverages and meals away from home). On the other hand, the estimated partial elasticities of food demand with respect to income indicate significant difference between the rural households and the urban households. This means that the difference between the urban and the rural households in their consumption behaviors (as observed earlier in reference to Table 8) is attributable not so much to differing family sizes as to income levels. Furthermore, in terms of partial income elasticities, food groups can be ranked, in the decending order of magnitude, as follows: animal proteins, other foods, total food, and starchy staples. In terms of partial size elasticities, however, the ranking order tends to be reversed. The first ranking indicates, of course, the position of each food group in the structure of consumers' preferences. Animal proteins are preferred to starchy staples. In response to income growth, consumers' demand for the former increases proportionally more than tha that for the latter. The second ranking reflects the effects of family size on food consumption. Adopting H. S. Houthakker's classification of the two effects of family size,[1] we may state that the specific effect is stronger than

[1] H. S. Houthakker classifies the influences of family size on consumption into two effects: (1) the specific effect, resulting from the increase in the

(footnote follows on next page)

the income effect for most food groups, except for animal proteins group for the farm households. The basic "need" for food energy (calories) is reflected impressively in the high size elasticities for starchy staples. And the very low size elasticity for animal proteins indicates the strong income effect. As can be seen clearly for the farm households, when faimily size increases consumption of animal proteins is reduced substantially. It is not surprising, therefore, that the second ranking reverses the order of the first ranking.

The estimated elasticities for farm households reveal quite clearly the relative position of major food groups in the overall structure of consumer preferences. The responsiveness of starchy staple consumption to the rise in income is rather negligible, whereas the size of family is very much responsible in determining the magnitude of such a consumption. On the other hand, animal proteins are luxury foods, and their size elasticity indicates the strength of the income effect over the specific effect. Although a rise in income tends to increase the expenditure for this food group more than proportionally, an increase in the size of family tends to decrease it significantly.

The index numbers computed from the numerical values of the time function are tabulated in Table 10. They reflect the movement of $\dot{A}/A$ over the

---

(footnote continued)

"need" for various commodities when family size increases; and (2) the <u>income effect</u>, 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.

H. S. Houthakker, "An International Comparison of Household Expenditure Patterns, Commemorating the Centenary of Engel's Law," <u>Econometrica</u>, <u>25</u>, 4 (October 1957), p. 544.

TABLE 10

Changes in Tastes and Other Influences of Time, Food Groups, Postwar Years*

(index numbers: base year = 1.000)

Year	Food	Starchy Staples[a]	Animal Proteins[b]	Other Foods
		-- Urban Workers' Households --		
1953	1.000	1.000	1.000	1.000
1954	.935	.979	1.028	.988
1955	1.008	.989	1.062	1.000
1956	1.063	.995	1.082	1.019
1957	1.006	.982	1.089	1.007
1958	1.034	.951	1.152	1.052
1959	1.041	.926	1.167	1.048
1960	1.042	.918	1.155	1.081
1961	.974	.865	1.169	1.089
1962	.915	.835	1.202	1.089
		-- Farm Households --		
1952	1.000	1.000	1.000	1.000
1953	.983	.924	1.039	1.077
1954	.977	.946	1.054	1.032
1955	1.028	1.019	1.150	1.062
1956	1.074	1.083	1.159	1.117
1957	1.050	.994	1.183	1.151
1958	1.055	.982	1.277	1.177
1959	1.042	.977	1.234	1.164
1960	1.011	.953	1.157	1.140
1961	1.000	.921	1.209	1.153

a and b Same as in preceding tables.

*The indices are based on residual measures of the influences of time from the equation of the form:

$$\log X_{..t} = \alpha \log N_{..t} + \beta \log Y_{..t} + \log G(t),$$

where the dot denotes the average value of the variable over the subscript it replaces, and where G(t) is assumed to be the same over the cross sectional observations.

years.[1] Assuming that the influences of time other than consumers' preferences were similar in the initial year and the terminal year for each of the samples, we may attribute the differences we observe in the indices to the presumed shift in consumers' preferences. Several observations emerge from the table.

The position of total food in the structure of consumer's preferences changed little in the rural households over the decade, while it declined appreciably in regard to the urban households. Rises were registered by animal proteins and other food groups for both samples. The position of starchy staples declined considerably more in the preference scale of the urban households than in that of the farm households. This is particularly interesting since the urban data include only cereals whereas the rural data include potatoes in addition. The urban consumers' shift against starchy staples is all the more pronounced here. Of interest is that the extent of the changes in the preferences for animal proteins is almost the same between the two samples, although the income elasticities estimated for this food group differ significantly. With regard to the other foods group, the change in favor of it is more rapid in the rural households than in the urban counterparts. This is a reflection of the increasing acceptance of processed foods,

---

[1] It is impossible to isolate rigorously the influences of consumers' preferences from other influences of time 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 of the absence of the relative prices of food groups in question, there is no doubt that the influences of time would include those of changes in relative food prices. In part, therefore, the changes in the indices would reflect changes in relative prices (or, in the case of the farm households, relative availabilities) during the period. I am inclined to think, however, that the omission of the price factor is not serious enough to change the present conclusions drastically.

oils and fats and other condiments in the rural households. It attests to the increasing variety of food preparation and to the rural emulation of the urban patterns.

IV. Conclusions

The present study indicates that the income elasticity of demand for food remained rather low in Japan until after the end of World War II. Bearing in mind the uncertainties associated with the data used for the earlier periods, we may offer some of the implications of this study in conclusion.

The income elasticities estimated of .3 or .4 for food during the years between 1878 and 1922 and also during the years between 1922 to 1940 mean that the drastic change in the Japanese patterns of food consumption alleged to have happened around World War I may be an illusion. Because of the progress in industrialization after World War I, the patterns of food consumption in the urban areas underwent some considerable changes.[1] The aggregate patterns, however, remained rather stable, and the changes that took place were moderate and gradual.

The relatively low elasticities estimated for the periods prior to World War II imply that the Japanese did not change greatly their food consumption

---

[1] Kazushi Ohkawa estimates that the income elasticities for demand for rice in the 1931-1939 period were -.2 to -.4 for salaried workers and zero to -.2 for wage workers, indicating that cereals became "inferior" goods during these years. With regard to rural consumption, Ohkawa estimates income elasticities for rice to be .3 for the owner-cultivators and .6 or .7 for the tenant farmers in 1936.

K. Ohkawa, Shokuryo Keizai no Riron to Keisoku [Theory and Measurement of Food Economy] (Tokyo, 1945), Chapters 2 through 4.

patterns as they became richer. The Japanese behaved as though they were richer at a per capita income level which was actually low. Consequently, Japanese food consumption patterns on the aggregate level were very much like those of countries where income levels were higher: changes in food demand in response to income growth were relatively small.

In my judgment here is a remarkable aspect of the story of Japan's economic development. As agricultural production grew slowly, in any case less rapidly than previously believed,[1] people's food consumption habits changed also slowly along with it. There was no pressing and persistent demand for large quantities of imported foods, except for rice and sugar. Nor were there sudden, pressing demands (and the market justification) for a radical transformation of agriculture in order to cultivate and raise "preferred" foods (for example, wheat, meat and dairy products) in which Japan lacked natural advantage. Indeed, the terms of trade between agricultural products and other products seem to have remained more or less stable during the early period. The process of the slow change in food consumption patterns, moreover, materially "contributed" to economic development by freeing foreign exchange earnings from the necessity of massive food imports and making it possible to finance imports of other essential goods and services. Just as it can be said that a

---

[1] According to the two well-known estimates by B. F. Johnston and by K. Ohkawa, agricultural production grew at the annual rate of 1.9 and 2.4 percent in the Meiji period. J. Nakamura's estimates reduce it to 1.0 percent.

J. Nakamura, op. cit., pp. 138-139.

S. Yamada's estimates used in this paper indicate the annual growth rate of 1.8 percent for the period between 1878-1882 and 1918-1922.

It is to be noted, however, that the growth rate of 1.8 percent is relatively high in comparison with the experiences of economically advanced countries in their early phases of development.

rapid devleopment of agricultural production "contributes" to the development of an entire economy, it can be stated that small import contents and slow changes in food consumption patterns "contribute" to the same cause by compensating for even slow development in agricultural production. In this regard also it is to be noted that the slow changes in food consumption patterns "contributed" to high rates of savings and "enabled" the Japanese to purchase (and become important sources of demand for) products of the domestic industrial sector.

The structural transformation of the Japanese economy in the 1950's was reflected in the beginning of the absolute decline in the agricultural labor force and in the emergence of highly sophisticated industrial complexes in Japan. This transformation coincides with the radical changes in food consumption patterns of Japanese people. As the level of income grew rapidly, the institutional and technological framework of Japanese life in general changed also rapidly. Under these circumstances, a drastic transformation took place in methods of food preparation and the patterns of food consumption. Not only the Engel ratio jumped higher than the prewar levels but also the income elasticity of demand for food increased to about .5 or .6. These indicators of food consumption remained in the high level long after the peak prewar levels of income had been recovered.

This study indicates that the geographic shifts of the population and the changes in the technological and institutional framework of food consumption played vital roles in determining Japanese food consumption patterns in the postwar years. The rural emulation of the urban consumption patterns is expected to continue for some time, as in most other aspects of life. At the same time the urban consumption habits seem to move more rapidly toward the Western patterns than in any other period in Japan's economic history.