MEASUREMENTS OF STANDARDS OF LIVING OF THE WORKING CLASSES IN JAPAN[1]

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I

The purpose of this paper is first to measure the present degree of recovery in the standards of living of urban and farm working classes as compared to those prevailing before the war, and next to make comparisons interregionally between the urban and farm standards of living. It is also important for practical purposes to measure the rate of recovery of the standards of living from year to year in the post-war period, and I have no intention to neglect its importance by selecting the theme mentioned above.

The usual expression "standard of living" is very convenient, though its concept is not clear. It means sometimes the historical and moral standard itself, sometimes the level of living really enjoyed by people; moreover it often implies the non-economic side of life.[2] In order to measure it exactly, it must be properly defined, and I will take the consumption level as the object of my measurement which can be adequately defined, consisting as it does of the most important part in the level of living really enjoyed. The consumption level means aggregates of goods and services consumed by a definite unit (per person, or per family of the same size) in a given period of time, as compared with the aggregate of goods and services consumed during the base period. The variation of consumption level thus defined can be measured by the consumption-quantity or volume index. There is another concept called the "real income level," the index of which has been used to express variations of the level of living. But to measure the variation of the real level of income is theoretically a far more complex task than to measure the variation of consumption level, since the

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[2] *Cf.* Joseph S. Davis, "Standards and Content of Living," *American Economic Review*, March 1945.

former embodies the problem of how to measure the variation of real saving. Here I will deal with the consumption level alone, notwithstanding the practical importance of measuring the real income level.

The average of the three years 1934–36 was taken as the pre-war base period in that these years cover the last normal, adequate period before Japan commenced mobilization towards a war-time economy. The year 1949 was chosen as the latest post-war period for comparison with the pre-war, the yearly average data of which is available. I utilized the data from family budget surveys of urban and farm working classes in both periods. The ratio of average expenditure on consumables obtained from the data, was deflated by the cost of living index, the unit price and the weights of consumables being also mainly derived from the same family budget surveys.[3]

It is theoretically difficult and an unsolved problem, as to what index-number formula is the best to make consistent comparisons of price levels or consumption levels in different situations of want, tastes and consumption patterns. On the one hand, some practical and convenient formulae have been employed to obtain a single, unique index-number. For example, the Economic Stabilization Board has been using Fisher's ideal formula in its comparison of the consumer price level in the pre-war and post-war periods. Therefore, the consumption level and the real wage level, which were officially recognized by the Japanese Government after the war, are to be unterstood as calculated by the quantity index of Fisher's formula. On the other hand, from a purely theoretical point of view, it has been the custom to introduce the assumption of constant wants or a constant preference scale to give "economic meaning" to the consumption quantity index to be obtained in different situations. And it has been made clear that even on this assumption of constant wants, each Laspeyre's and Paasche's formula is not the upper and lower limit of a single, unique value at the same time.[4] Convenient methods such as Fisher's formula have of course no exact economic meaning. There is no stable bridge between theory and practice.

I think, therefore, that it may be reasonable to take the view that there must necessarily be a multiplicity of comparisons between different situations, and that the identity of a preference scale is not a necessary condition for making comparisons of consumption levels. When one takes such a view, the dissimilarity of consumption structures in different situations to be compared should necessarily be noticed. Hans Staehle has

[3] It should be noted that in Japan the aggregate amount of private expenditure for consumption, in accounting the national income, has been somewhat roughly estimated from the data of the urban and farm family budget studies above mentioned, and that the comparison of national consumption levels made by utilizing these aggregate data will suffer larger errors than those in the case of our procedure.

[4] *Cf.* J. R. Hicks, "The Valuation of the Social Income," *Economica*, May 1940 and R. G. D. Allen, "The Economic Theory of Index Numbers," *Economica*, August 1949.

recently proposed again a suggestive idea named the "Dissimilarity Method" for international comparisons of real incomes,[5] but I favour the opinion that the numerical values of his index of dissimilarity (D) have not always an exact correlation with real income levels. I think it may be preferable to measure the dissimilarity of consumption structures by a formula similar to Staehle's at the equivalent consumption levels estimated by the conventional method.

II

In the two different situations to be compared, two representative family households of the same size, the expenditure by each of which is equal to the average expenditure of all households in any situation, are assumed to be obtained. The expenditure is presumed to correspond exactly to the consumption in each situation, though this assumption is of course somewhat unreal especially with regard to durable goods.

Let q_0', q_0'', $\cdots$, q_0^n and q_1', q_1'', $\cdots$, q_1^n stand for the quantities of various goods and services purchased and consumed by the representative household above mentioned in the situation 0 and 1. Write p_0', p_0'', $\cdots$, p_0^n and p_1', p_1'', $\cdots$, p_1^n for the corresponding unit prices. Let the cash expended on consumption be represented by e_0 and e_1 respectively, and the expenditure ratio, $E\,(=e_1/e_0)$. Write L for Laspeyre's formula of the price index and P for the Paasche's. Then the well known two formulae of quantity index are given by the following relations:

$$Q_{01}(p_0)=\frac{\Sigma q_1 p_0}{\Sigma q_0 p_0} = \frac{\Sigma p_1 q_1}{\Sigma p_0 q_0}\cdot\frac{\Sigma p_0 q_1}{\Sigma p_1 q_1} = \frac{E}{P} \tag{1}$$

$$Q_{01}(p_1)=\frac{\Sigma q_1 p_1}{\Sigma q_0 p_1} = \frac{\Sigma p_1 q_1}{\Sigma p_0 q_0}\cdot\frac{\Sigma p_0 q_0}{\Sigma p_1 q_0} = \frac{E}{L} \tag{2}$$

We calculated firstly L and P and next E and obtained these values of $Q_{01}(p_0)$ and $Q_{01}(p_1)$ by the above equations. $Q_{01}(p_0)$ is the quantity index evaluated at the prices of the situation 0, $Q_{01}(p_1)$ being evaluated at the prices of situation 1, both taking the situation 0 as the base. Each value has its own exact real meaning from the standpoint of non-subjective, say, mechanical evaluation. From the viewpoint of consumers preference theory also, we can say the same, though the meaning of course differ.

By the theory established on the assumption of the maximizing principle of total utility and of the constant preference scale between two situations, we are told that $Q_{01}(p_0)$ is the upper limit of the supposed true index at p_0 prices and $Q_{01}(p_1)$ is the lower limit of another supposed true index

[5] Hans Staehle, "International Comparison of Real National Incomes: A Note on Methods," *Studies in Income and Wealth, Volume Eleven*, National Bureau of Economic Research, ed. (New York, 1949).

at p_1 prices. It is to be noted that there is one limit regarding one index at p_0 prices and also a limit about another index at p_1 prices, and that these two supposed true indices generally never coincide with each other in value. Therefore, a plurality of quantity index is unavoidable even under the assumption of constant wants.

Dr. A. Bergson has recently made a very suggestive comment on H. Staehle's paper above cited.[6] He endeavours to give a precise economic meaning of the "conventional method," insisting that taste differences between two situations never lead to the impossibility of comparisons of real incomes and that two comparisons, one from the standpoint of taste in situation 0 and the other from the standpoint of taste in situation 1, can, or rather must be made, and that each index has its own concrete economic meaning under certain reasonings. My ideas were much clarified after reading his comment. We shall not lose so much if we abandon the assumption of a constant preference scale, since even under this assumption we can not escape from plurality of evaluation. It is true that we shall not be able to speak about the interrelations between $E \gtrless L$ and $E \gtrless P$ in judging the rise or fall of the consumption level, but we can say that $E>L$ or $Q_{01}(p_1)>1$ means the rise of consumption level from the standpoint of the preference scale at situation 1, and that $E>P$ or $Q_{01}(p_0)<1$ means the fall from the standpoint of the preference scale at situation 0. Even in the so-called inconsistent case of $L<E$ and $E<P$ we can not lose the economic meaning. In reality, a comparison of the consumption level or the real income level cannot be compatible with the assumption of constant wants, except at brief intervals. If we are confined within very restricted limits in constancy of wants, we shall never well be able to approach economic reality.

The assumption of a perfect complementarity is of couse bold, but it is, I think, useful to reflect that under this condition the numerical value of $Q_{01}(p_0)$ and $Q_{01}(p_1)$ has accurate meaning in each, as Dr. Bergson points out. The so-called functional relationship between price and quantity has been emphasized in Japan also, but so long as we cannot measure empirically the indifference curves, the gap between the value of the measured index and that of the so-called "true" index will remain unknown. Whether we call it the "true" value under the assumption of maximization behaviour or whether we call the really measurable value the "true" value under a perfect complementarity might be a problem of definition. The calculated price indices by the conventional method have of course a proper economic meaning, giving accurate measures of the variations of absolute price level.

It will be noted, however, that from such a standpoint, the measurement of the consumption level will have no full meaning without measure-

[6] Abram Bergson's Comment on H. Staehle's paper, *op. cit.*

ments of dissimilarity of structures of consumption. By consumption structure I mean the ratios of quantities of individual items or group items to the total quantities consumed, evaluated under a certain definite price system. This is numerically equal to the expenditure proportion or structure in each original price situation. But when we wish to compare consumption structures in different situations, the evaluation of the two collections must be done by the same, single price system. Between situations 0 and 1, there are necessarily two different indices of consumption structure, one evaluated at p_0 prices, the other at p_1 prices. This plurality just corresponds to that of the quantity index above mentioned. If we calculate the ratios for broad groups of items such as food, clothing, housing, fuel and light, etc., according to the customary classification, the two indices of dissimilarity of the consumption structure might be expressed as follows:

$$D(p_0) = \sum_{i=1}^{n} \left| \frac{\Sigma q_{i1} p_{i0}}{\Sigma q_1 p_0} - \frac{\Sigma q_{i0} p_{i0}}{\Sigma q_0 p_0} \right| \qquad (3)$$

$$D(p_1) = \sum_{i=1}^{n} \left| \frac{\Sigma q_{i0} p_{i1}}{\Sigma q_0 p_1} - \frac{\Sigma q_{i1} q_{i1}}{\Sigma q_1 p_1} \right|$$

where $i=1, 2, \cdots, n$ stands for the broad groups of goods and services. $D(p_0)$ and $D(p_1)$ are nothing but the indices of dissimilarity proposed by H. Staehle about food expenditure and developed to broad categories by Dorothy S. Brady and Eleanor M. Snyder.[7]

It is to be noted here that there is an inseparable connection between these indices of structure and those of level. When the consumption level is measured by the quantity index of $Q_{01}(p_0)$, we are necessarily assuming the consumption structures expressed by $D(p_0)$. When the consumption level is measured by $Q_{01}(p_1)$, we are necessarily assuming the consumption structure expressed by $D(p_1)$. $D(p_0)$ and $D(p_1)$ are in each independent index of the structure. Hence it may be said that the following formula, which expresses the dissimilarity of the expenditure structure, has no clear meaning in connection with the measurement of the consumption level.

$$D = \Sigma \left| \frac{q_1 p_1}{\Sigma q_1 p_1} - \frac{q_0 p_0}{\Sigma q_0 p_0} \right| \qquad (4)$$

It may be reasonable to assume that the numerical values of $D(p_0)$ and $D(p_1)$ have not always exact relations with the numerical values of $Q_{01}(p_0)$ and $Q_{01}(p_1)$ in comparing situations in different consumption patterns. The surprisingly small value of Engel's coefficient (35–40 per cent) of Japanese urban workers' family budget, in comparion with their low consumption level before the war, might be mentioned as a remarkable example of that fact. In comparisons between situations in similar patterns alone, there may be found exact relations in structure indices and level indices. In our

[7] Dorothy S. Brady and Eleanor M. Snyder's Comment on H. Staehle's paper, *op. cit.*

comparisons of the pre-war and post-war periods, consumption patterns differ considerably because of rationing, lack of goods, etc. In comparing urban and farm working classes, there is a dissimilarity of the consumption pattern because of the differences of living and working conditions, and therefore we must measure indices of structure as well as indices of level in order to approach the reality of living conditions.

I think that the indices of structure have their proper meaning when measured at the assumed equivalent level of consumption, which is defined by our formulae of level indices. If we can calculate the numerical values of expenditure (or income) elasticities of the commodity groups at situation 0, it may not be difficult to estimate the consumption structure at a consumption level nearly equal to that situation 1, by utilizing the index of $Q_{01}(p_0)$. The same may be possible at situation 1.

III

The price data in urban districts which can link the pre-war with the post-war periods are available for Tokyo alone. Pre-war data of the base period 1934–36 has recently been compiled by the Bureau of Statistics of the Prime Minister's Office, which can be linked with the expenditure data of the family budget surveys carried out during the same period by the Cabinet Bureau of Statistics. Post-war data on the Consumer Price Survey (C.P.S.), carried out by the Bureau of Statistics, is available, consisting of consumer prices (except some kinds of service rates) and so-called "effective prices," which are weighted averages of official prices and black-market prices by quantities purchased. Pre-war data, however, is a complex of consumer prices and retail prices. We have, moreover, no full guarantee for quality identities between individual goods and services selected in both periods. It is probable that pre-war quality was, generally, somewhat better than the post-war.

We calculated directly the linked price indices of broad group items in the year 1949 with the pre-war, by the usual formula taking expenditure ratios as the weights as follows:

$$\frac{\Sigma\left(\frac{p_1}{p_0}\right)p_0q_0}{\Sigma p_0q_0}=L, \quad \frac{\Sigma\left(\frac{p_0}{p_1}\right)p_1q_1}{\Sigma p_1q_1}=\frac{1}{P} \tag{5}$$

The numerical value of the indices is shown in Table 1.

Coverage of food, fuel and light is good, but those of other groups are not so good. The values of L and P computed by the formulae (5) are expected to suffer some errors. It is probable that the prices of uncovered goods and services might rise relatively more than those of the covered, because the former may consist rather of luxury items. If so, the bias may

Table 1. Consumer Price Indices of Group Items in 1949 in Tokyo (1934–36=1)

Groups*	L	P	Pre-war weights	Post-war weights	Pre-war† coverages %	Post-war coverages %	Commodity coverages
1 Cereals and bread	241.2	209.3	158.0	230.3	99.9	86.1	9
2 Fish	362.8	238.8	45.9	65.6	53.1	58.3	22
3 Meat and eggs	312.2	287.5	24.6	61.4	97.2	77.5	7
4 Vegetables and peas	445.8	391.1	26.4	55.3	56.9	60.6	11
5 Manufactured foods	286.7	257.6	24.7	59.0	93.6	54.7	17
6 Seasoning	166.2	160.1	35.9	32.3	88.1	64.1	7
All food	276.4	229.7	315.5	503.9	86.6	73.6	74
7 Drinks and tobacco	336.4	291.1	94.5	144.2	74.5	47.7	19
8 Clothing and footwear	434.5	243.8	135.0	101.0	86.2	33.0	38
9 Fuel and light	137.1	91.9	51.5	42.8	98.0	93.7	7
10 Rent	20.0	20.0	167.9	9.0	89.2	54.6	17
11 Housing, other than rent	389.7	274.2	31.5	37.7		20.7	
12 Miscellaneous	171.5	107.6	204.1	161.4	52.1	35.5	38
Total			1,000.0	1,000.0	79.4	58.2	193

* Group 1, includes potatoes and beans; 3, dairy products; 7, fruits, candies, cakes and beverages.

† Pre-war coverages are somewhat over-estimated.

be downwards. The aggregate index obtained as the weighted average of these group indices is 236.7 by L, and 168.8 by P formula.[8] It may be questioned why the rent index is as low as 20 times, and its post-war weight so surprisingly small as less than 1 percent. This may be explained as follows. Firstly in the pre-war period all the families surveyed were restricted to those dwelling in rent houses or rooms; in the post-war period only about a half of all the families surveyed were dwelling in rent houses. Secondly, black-market prices were barely recorded by C. P. S., while the official rate of rents has been controlled at the lowest level. The real rent

[8] Three kinds of consumer price indices linking 1948 with 1934-36 were made by utilizing the same data above mentioned: the index of the Bureau of Statistics is 157.8 times, that of the Economic Stabilization Board 156.1 times and that of the Research and Planning Section of SCAP is 155.8 times. The former two are calculated by Fisher's formula, the last by the formula $\Sigma E_0 G / \Sigma \frac{E_0 G}{M}$, where $E_0 G$ designates expenditure of items in 1949, and M stands for linked index of each item.

The current monthly C. P. I. in the post-war period, conducted by the Bureau of Statistics, is calculated according to Laspeyre's formula taking the expenditure ratios at 1948 as the weights, this year also being taken as the base. Therefore we can obtain a somewhat rough index at any post-war time by multiplying the post-war current index by one of the linked indices above mentioned. However, this is not enough for our analytical purposes.

index, therefore might perhaps be far higher than the value recorded, although exact data is not available. This under-estimation of the rent index is one of the main reasons why the consumer price index linked with the pre-war is substantially low compared with other price indices, such as the wholesale and retail price indices.[9] I think it may be better to calculate the aggregate index, excluding the rent index. The calculated value is 280.5 by L and 181.1 by P in this case, the former being 18 percent and the latter 7 percent higher than that above mentioned.

The average expenditure of the working classes (workers and salaried workers) in the pre-war period is ¥88.76 on a three years average; in the post-war it is ¥14,087. The post-war survey covers not only workers but all classes. According to the special quarterly analysis compiled by the Bureau of Statistics, the grand averages of expenditures of all classes are nearly equal to the average expenditures of the working classes during this period. We, therefore, assume ¥14,087 as the representative average expenditure to be compared with the pre-war period. However, the expenditure ratios of the working classes may probably be somewhat different from those of other classes, though no exact data is available, which causes a slight bias in the post-war weights in Table 1.

The size of the family differs remarkably in both periods, the average family members is 3.90 pre-war, and 4.65 post-war, both being unconverted into adult units. This large deviation is attributed mainly to the difference in survey methods, although there is in general a tendency for the size of a family to increase in the post-war period, so as to economize in dwelling costs. C.P.S. was carried out on stratified random sampling, but the pre-war budget survey was conducted with the volunteer families selected under pre-determined conditions. The characteristics of the averages differ. It might be reasonable to suppose that the average of the volunteer families is apt to have an upper bias and the average of C.P.S. a down bias, since the omitted families in this case may be supposed to be of the higher classes, and those in that case to be of the lower classes.

On the converting formula of a family size into a common unit, there are, as is well known, many works and discussions. Expenditure variations due to family size may be analysed into two factors, one, the factor originating in the difference of each member's age, sex, and working hours, etc. It has long been attempted to convert these "extraneous" differences into various "consuming units" or "adult male units," but such units are more or less of an arbitrary nature. The other is the factor of economic nature, meaning that large-sized families have an advantage in a kind of

[9] The wholesale price index compiled by the Bank of Japan is 242 times, and the retail price index compiled by the Bank of Japan 242 times, between the same periods, though the comparison's between these and that of the consumer price never have an exact meaning because of the difference in the calculating formula.

large-scale economy over a small-sized family, though this degree of economy differs item by item. To measure jointly the effects of both factors we must assume functional relations between expenditure and the number of family members. We selected a logarithmic linear equation as follows:

$$\log y = b + a \log x \qquad (6)$$

where x stands for the number of family members and y for the expenditure per head. The average values obtained are, $a=-0.49167$, $b=2.35284$, utilizing the data in the special quarterly analysis carried out by the Bureau of Statistics in November 1948, March, June and September 1949. There is no data available for this computation during the pre-war period. By applying the above equation, the post-war expenditure of the average family of the same size as in the pre-war period (3.90 persons) is estimated at ¥12,890. Hence the ratio of money expenditure (E) is 145.2. $P>E$ and $L>E$. The post-war consumption level is definitely lower than the pre-war from the pre-war standpoints of view. The quantity index evaluated at p_0 prices $[Q_{01}(p_0)]$ is 85.4, and that evaluated at p_1 prices $[Q_{01}(p_1)]$ 61.3. These values are calculated according to the price indices not excluding the rent index, because the post-war expenditure is also correspondingly underestimated as to rent. But if the accurate value of weight regarding post-war rent were known, we should find the value of $Q_{01}(p_0)$ somewhat lower than the above value.

If we take these numerical results quite mechanically, apart from the ordinal utility theory of index-numbers, we can infer that the consumption level of the urban working classes in 1949 was about 60 percent compared with that in the 1934–36 base period, if evaluated at post-war prices, and about 85 percent if evaluated at pre-war prices, and that both values might be recognized as having upper biases in consideration of the various conditions mentioned above, except the under-estimating character of $Q_{01}(p_1)$ itself, not depending on data. Each index has its own independent meaning from this point of view.[10]

These general consumption quantity indices must of course be equal to the weighted averages of those group items, the numerical values of which are shown in Table 2. Each expenditure in group items in this table is estimated by multiplying each expenditure weight shown in Table 1 with the total expenditure amount, already converted into the same family size by a general converting multiple. These estimated amounts, therefore, are not so exact because the best converting multiple itself is different from group to group, and here I intend to show roughly the existence of a wide variance in the recovering degree between these groups. Food, fuel and

[10] We compared the consumption levels of working classes of those of representative average families, which procedure is of course convenient, and may have an exact meaning only on the assumption of a constant distribution of expenditure through both periods. I cannot here develop this aggregation problem in a general sense.

light consumption levels are already near or almost equal to the pre-war level; on the other hand clothing and housing are yet at substantially lower levels. The forced existence of such an unproportional situation is worthy of notice.

Table 2. Consumption Quantity Indices of Group Items in 1949
(Working Classes, Tokyo, 1934–36=100)

	Estimated expenditure			Quantity indices	
	Pre-war	Post-war	Ratio		
Groups	(e_0)	(e_1)	$(E=e_1/e_0)$	E/L	E/P
	¥	¥			
Food	27.99	6,495	232.0	83.9	101.0
Drinks and tabacco*	8.40	1,859	221.3	65.8	76.0
Clothing and footwear	11.98	1,302	108.6	25.0	44.5
Fuel and light	4.57	552	120.8	88.1	131.5
Rent	14.90	116	7.8	38.9	38.9
Housing other than rent	2.80	486	173.6	44.5	63.3
Miscellaneous	18.12	2,080	114.8	66.9	106.7
Total	88.76	12,890	145.2	61.3	85.4

* includes fruit, cakes, candies and beverages.

This leads naturally to the problem of the consumption structures above inferred. In Table 3 a comparison between the values of $\Sigma q_{i0}p_{i0}/\Sigma q_0p_0$ in (A) and those of $\Sigma q_{i1}p_{i1}/\Sigma q_1p_1$ in (B) gives the ordinary dissimilarity of money expenditure ratios.[11] The degree is very great, for instance, the relative expenditure rise on food is 64.8 post-war from 31.6 pre-war, though a comparison of consumption structures at p_0 prices at (A) and at p_1 prices at (B) shows a somewhat different aspect. $|d(p_0)|$ and $|d(p_1)|$ denote the ratio-difference, the total of which is $D(p_0)$ and $D(p_1)$ in each already mentioned. The assumed consumption level at (A) is calculated by the values of $Q_{01}(p_0)$. The effect of the total expenditure variance upon structure is estimated by the expenditure elasticity η_1, which are calculated from C.P.S. monthly data of November 1949 under the assumption of linearity. Similarly the assumed consumption level at (B) is calculated by the value of $Q_{01}(p_1)$. The

[11] The numrical value of $\frac{p_0q_1}{\Sigma p_0q_1}$ is obtained from the relation $\frac{p_0q_1}{\Sigma p_1q_1}\cdot\frac{\Sigma p_1q_1}{\Sigma p_0q_1}=\frac{p_0q_1}{\Sigma p_0q_1}$. $\frac{p_0q_1}{\Sigma p_1q_1}$ is nothing but the weighted index of group items in P formula, and therefore obtained in the calculating process of P. Similarly the relation $\frac{p_1q_0}{\Sigma p_1q_0}=\frac{p_1q_0}{\Sigma p_0q_0}\cdot\frac{\Sigma p_0q_0}{\Sigma p_1q_0}$ is utilized to get $\frac{p_1q_0}{\Sigma p_1q_0}$.

effect of the total expenditure variance upon structure is estimated by η_0, which is calculated from the family budget studies in the base period under the asumption of linearity also. The dissimilarities shown at (A) and (B) are not negligible. The previously obtained quantity indices naturally imply these structure dissimilarities, $Q_{01}(p_0)$ being connected with (A), and $Q_{01}(p_1)$ with (B).

Table 3. Comparison of pre-war Consumption Structures of the Working Classes

(A) Structure valued at pre-war prices, the consumption level being taken as equal to pre-war

Groups	$\frac{\Sigma q_{10}p_{10}}{\Sigma q_0 p_0}$	$\frac{\Sigma q_{11}p_{10}}{\Sigma q_1 p_0}$	$\lvert d(p_0)\rvert$	η_1
All food	31.6	34.6	3.0	.798
Cereals and bread*	15.8	17.0	1.2	.429
Food other than cereals and bread*	15.8	17.6	1.8	.874
Drinks and tabacco*	10.4	8.7	1.7	1.251
Clothing and footwear	13.5	7.5	6.0	1.511
Fuel and light	5.1	12.3	7.2	.671
Housing	19.9	10.2	9.7	1.179
Miscellaneous	19.5	26.7	7.2	1.353
Total	100.0	100.0	34.8	

(B) Structure valued at post-war prices, the consumption level being taken as equal to post-war

Groups	$\frac{\Sigma q_{10}p_{11}}{\Sigma q_0 p_1}$	$\frac{\Sigma q_{11}p_{11}}{\Sigma q_1 p_1}$	$\lvert d(p_1)\rvert$	η_0
All food	55.2	64.8	9.6	.490
Cereals and bread*	18.4	23.0	4.6	.000
Food other than cereals and bread* Drinks and tabacco*	36.8	41.8	5.0	.776
Clothing and footwear	22.4	10.1	12.3	1.692
Fuel and light	3.2	4.3	1.1	.686
Housing	6.6	4.7	1.9	.803
Miscellaneous	12.6	16.1	3.5	1.782
Total	100.0	100.0	28.4	

* *Cf.* remarks in Table 1.

IV

In turning to farm life, price data in rural districts has never been so fully compiled as in the case of urban districts up to now. Of late, the Department of Agriculture and Forestry has compiled pre-war and post-war price data of goods and services purchased for consumption by farm households, from the original materials in the "Farmers' Houseboulds Economy Survey." This survey also includes farmers family budget data for both periods. The pre-war survey, however, covers only some 300 out of 5,500,000 housebols a year all over the country, and the sampling method is not exactly defined. We are obliged to utilize this unsatisfactory data, because there is no better available. The post-war survey has been substantially improved, and covers some 4,000 households, the procedure of stratified random sampling being introduced. We were fortunately given an opportunity to make use of this unpublished data on prices and expenditure from the surveys.

Table 4 shows the calculated price indices of group items of goods consumed by farm households. The procedure is similar to that of urban districts. The weights of pre-war individual items are, however, not available in this case. For the food items the weights are substituted by those calculated from the 1936 data in the same survey by the writer for other purposes; for the non-food items they are substituted by those of 1949, the year to be compared.[12] This method certainly lessons the accuracy of the obtained values, to which the somewhat small differences seen between the values of L and P are partly attributable. ($P>L$ in drinks and tobacco may be explained as a result of this procedure.) The post-war coverages shown in Table 4 are estimated relatives assuming those of cereals and bread to be 90 percent, as no accurate data is available. Pre-war coverages are quite unknown, but it may be noted that coverage of housing, medical and allied expenses and especially miscellaneous expenses is so small that we can only guess roughly the indices of these groups.

The aggregate index calculated is 247.0 by L and 223.5 by P formula. The relatively small difference between the two values will, of course, be understood as being due to the relatively stable situation in rural life, except the cause above mentioned. The advancing rate of prices in rural areas may be recognized as not differing so much from that in urban areas, if we take the urban index excluding rent. On the one hand, post-war official prices of consumer goods have kept almost at the same level all over the country without any differentials due to districts. On the other

[12] The parity price index prepared by the Price Bureau to determine the official prices of basic agricultural products was also calculated on a similar assumption, that pre-war expenditure weights of almost all individual items purchased by farm households could be substituted by those in the year to be compared. We can not, therefore, utilize this parity price data here.

Table 4. Price Indices of Group Consumption Commodities by Farm Households in 1949 (1934–36=1)

Groups	Price Indices		Expenditure weight		Post-war cover-age	Com-modity cover-age
	L	*P*	Pre-war	Post-war		
					%	
1 Cereals and bread*	168.7	166.4	358.1	288.0	90.0	7
2 Fish	314.5	287.4	22.5	51.5	46.2	11
3 Meat and eggs*	452.1	418.4	7.3	15.2	90.8	5
4 Vegetables and peas	327.4	295.9	45.0	67.4	50.6	12
5 Manufactured foods	271.4	268.1	11.5	8.6	50.0	4
6 Seasoning	239.4	222.0	34.5	46.5	92.1	8
All food	202.3	199.2	478.2	477.2	79.3	47
7 Drinks and tobacco*	315.4	316.5	43.9	75.1	53.2	6
8 Clothing	400.0	378.8	72.9	107.8	55.2	16
9 Footwear, etc.	340.8	218.3	28.4			12
10 Fuel and light	200.5	181.5	52.6	68.9	77.5	6
11 Housing	390.4	359.7	68.1	69.3	17.0	11
12 Medical and allied expenses	269.9	242.7	54.2	41.9	11.5	5
13 Miscellaneous	147.3	109.4	201.0	159.8	7.4	7
Total			1,000.0	1,000.0	55.8	109

* See remarks in Table 1.

hand, black-market prices of main purchases, such as food and fuel, have been much lower in rural than in urban districts. These two factors might almost cancel one another out in the index of effective prices. A few words should be added here regarding the evaluation of home consumption goods produced on farms. We priced them on producer prices (official producer prices in case of rationed goods) similar to the method adopted in evaluating farm income and expenditure in the survey. It is theoretically not easy to decide whether to price them according to producer prices or consumer prices, and I hesitate to go into the question here. If we take the consumer prices, the index will turn out a little higher.

The average consumption expenditure in a farmer's family budget is ¥56.63 on the average for 1934–36, with family members numbering 6.50, the post-war corresponding figures being ¥12,691 and 6.63 persons. It is generally recognized that the sampling has a somewhat upper bias, observed from the acreage cultivated by a family, the average area cultivated by a family being 1.28 chō (1 chō=2.5 acre) in the pre-war survey, while that of the grand average of all families all over the country is 1.08 chō. The corresponding post-war figures are 0.99 chō and 0.79 chō, the latter being taken from the Farm Land Census conducted on March 1, 1949. According

to our analysis of the original data of this farm-household survey in March 1949, it was found that the following two relations are fitted to the data:

$$\left.\begin{aligned} y &= 8828 + 382\,x \\ \log z &= 0.58986 + 0.23835 \log x \end{aligned}\right\} \quad (7)$$

where x, y and z stand respectively for cultivated acreage, expenditure for consumption, and number of family members. By utilizing those two empirical relations, a household cultivating an average area 0.79 chō is estimated to have 6.37 family members and to be spending ¥11,861 for consumption. No similar data is available in the pre-war analysis, consequently we applied the above relations to the pre-war data. A representative family cultivating an average acreage of 1.08 chō is estimated to have 6.25 family members and to be spending ¥53.32 for consumption.

Again from the original data above mentioned we effected a direct relation between y and z to be $\log y = 3.39003 + 0.85609 \log z$. This was applied to the above obtained two representative households, and E, the ratio of expenditure in families of equal size is estimated to be 222.2.[13] The consumption quantity indices $Q_{01}(p_0)$ and $Q_{01}(p_1)$ are computed to have numerical values of 98.5 and 89.1. From the mechanical standpoint, in spite of unsatisfactory data, we can say that the consumption level of a post-war farmer's family is estimated to be about 90 percent of its pre-war level if evaluated at post-war prices, and to be nearly equal to the pre-war level if evaluated at pre-war prices. From the viewpoint of preference theory, the evaluation from the pre-war standard must be taken as valid. We are unable to make a consumption structure analysis in this case because of lack of data.

V

From the above analysis it has been clarified that the real expenditure of a post-war farm household is at a level a little lower than, or nearly equal to, that of the pre-war, while urban working classes are obliged to be content with a substantially lower consumption than the pre-war level. This does not, however, necessarily mean that post-war rural people enjoy a higher level of living than urban people, because in Japan it has generally been supposed that the farmer's level of living was considerably lower than that of urban people at the time we selected as the base. If a cross-section comparison of real expenditure between urban and rural working classes is successfully carried out, we can clarify this problem statistically, and there-

[13] We get $E=224.1$ which is quite near the value above obtained directly from the non-converted average expenditures. So in this case our converting procedure is not so effective as to results, but these converting relations are necessary in principle, and, moreover, have to be utilized for the comparisons with urban expenditures later.

fore we endeavored to make cross-section studies by utilizing the same data above used. The degree of dissimilarity in the consumption pattern between urban and rural life is great, but from our theoretical standpoint the comparisons have their own concrete meanings even in this case. The price system on which quantities are to be evaluated is plural in this case also, one for urban life, the other for farm life.

The computed price indices of group items in urban (Tokyo) and farm districts in 1949 are shown in Table 5, the same calculating procedure being adopted as before, though the commodity coverage (and therefore expenditure coverage) in this case has to be considerably lower than in the intertemporal case above treated, since it is more difficult to identify commodities. The aggregate index of prices paid by farm households calculated from these group indices is 75.4 (urban price 100), weighted according to urban values, that of urban consumer prices being 170.6 (farm price 100), weighted by farm values. The reciprocal is 58.6 (urban price 100).

Table 5. Comparison of Price Indices of Group Items in Urban and Rural Districts in 1949 (base, 100)

Groups*	Rural index, weighted by urban values	Urban index, weighted by rural values		Commodity coverage
			(reciprocal)	
1 Cereals and bread	52.7	201.2	(49.7)	8
2 Fish	103.7	112.1	(89.2)	8
3 Meat and eggs	86.6	121.0	(82.6)	5
4 Vegetables	42.2	235.1	(42.5)	7
5 Manufactured foods	79.8	122.9	(81.4)	6
6 Seasoning	90.8	106.9	(93.5)	6
All food	68.0	183.2	(54.6)	40
7 Drinks and tobacco	83.2	133.1	(75.1)	5
8 Clothing	65.6	168.3	(59.5)	9
9 Footwear, etc.	81.2	127.9	(78.2)	6
10 Fuel and light†	68.6	285.0	(35.1)	6
11 Housing	84.0	127.1	(78.7)	4
12 Medical and allied expenses	63.0	208.6	(47.9)	3
13 Miscellaneous	100.1	103.1	(97.0)	5
Total				78

* *Cf.* Remark 1 in Table 1.

† Gas consumed in urban districts is converted to charcoal in rural districts by equivalent calorie content.

As already mentioned, the representative expenditure of urban working classes is estimated to be ¥14,087 for 4.65 family members, and that of

farmers ¥11,861 for 6.37 family members. If we convert the latter into a 4.65 persons' expenditure by utilizing the relation above obtained, it is estimated to be ¥9,150. The ratio of farm expenditure to urban (E_0) is 65.0 percent (the reciprocal is 153.8). If we convert the former into 6.37 persons' expenditure by utilizing the relation above obtained in urban family budget data the expenditure is estimated to be ¥16,538. The index of urban expenditure to rural (E_1) is 139.5 (the reciprocal is 71.7) in this case. Here, too, we have to face two E values, namely E_0 and E_1 whose numerical values differ not slightly. In the former two cases we did not consider this plurality, not because of a theoretical reason but because of lack of data. These two E values must be combined with the two values of price indices in order to obtain a quantity index. Computed results are as follows: (i) Take the urban level as 100, the rural level is 95.1, and taking the rural level as 100, the urban is 90.2, (ii) taking the urban level as 100, the rural level is 86.2, and taking the rural level as 100, the urban level is 81.8. From these figures it might be permitted to assume that the urban consumption level of the working classes is somewhat lower than that of farm classes when viewed from a rural standpoint, and that, on the contrary, the latter may be somewhat lower than the former when viewed from the urban standpoint, a supposition not inconsistent but real from our theoretical point of view. And this supposition is also valid even from the standpoint of preference theory apart from the magnitude of inequalities.

Table 6 shows the consumption quantity indices of group commodities between the two classes, selecting (i) case from the above-mentioned two cases. It will be observed that the dissimilarity between rural consumption and urban is pronounced by the two contrary facts: (i) very higher levels of carbohydrate foods, vegetables and fuel and (ii) very lower levels of fish, meat and eggs, manufactured foods, etc. If judged from the viewpoint of normal urban expenditure patterns alone it might be said that these facts suggest that rural life is positively lower than urban, though we do not favour this supposition.[14] The index of dissimilarity of the consumption structure is not exactly clear because of lack of data on the rural side, but if we are allowed to assume roughly that the consumption level difference between the two classes is almost negligible, we obtain the value of D as 46.0, evaluated at urban prices, and 46.4, evaluated at rural prices, respectively, as regards group commodities. These values are rather large.

From the results obtained by the three ways of comparison, one may be led to suppose that at the pre-war period the consumption level of farm households would be substantially lower than that of urban workers. The

[14] Nathan Koffsky, "Farm and Urban Purchasing Power," *Studies in Income and Wealth, Volume Eleven*, National Bureau of Economic Research, ed. (New York, 1949) deals with the same problem in U. S. A. This paper, together with the comments by Margaret G. Reid, D. Gale Johnson and E.W. Grove was helpful to us.

Table 6. Comparison of Consumption Quantity Indices of Group Items in Urban and Rural working Classes in 1949 (urban level, 100)

Groups*	Ratios of money expenditure (E) %	Quantity indices† %	
		$Q(r)$	$Q(u)$
1 Cereals and bread	81.2	154.1	163.4
2 Fish	51.0	48.8	57.2
3 Meat and eggs	16.1	18.6	19.5
4 Vegetables and peas	79.2	187.6	186.4
5 Manufactured foods	9.5	11.9	11.7
6 Seasoning	93.4	102.9	100.0
All food	61.5	90.4	112.6
7 Drinks and tobacco	33.8	40.6	45.0
8 Clothing and footwear	69.2	95.1	116.5
9 Fuel and light	104.5	152.3	297.7
10 Housing	96.4	114.8	122.5
11 Miscellaneous	81.3	88.0	113.9

* *Cf.* Remark 1, in Table 1.

† $Q(r)$ and $Q(u)$, indices evaluated at rural and urban prices respectively.

computed results also prove this supposition, the consumption quantity index of farmers being 47.9 and 40.6 percent of the urban workers' level evaluated at rural prices, and the index of urban workers being 135.3 and 159.5 (the reciprocal 73.9 and 62.7) percent of the farmers' level, evaluated at urban prices. These two values in each case are obtained from the two family-size converting relations above obtained. E is 40.3 and 47.5 respectively, taking urban expenditure at 100. The rural aggregate price index (urban 100) calculated is 99.2 weighted by urban values, and 64.3 weighted by rural values, from the group indices shown in Table 7. It is to be noted in this case that the data utilized and the coverage are mostly unsatisfactory, especially so in case of the "miscellaneous" group, the price index of which, by urban weights, may probably be over-estimated. The above mentioned indices of quantity evaluated at rural prices, therefore, are possibly under-estimated. But even if adequate allowances are made on this point, it will be clear that the farmers' consumption level might be considerably lower than the urban, and I would say that it might be at least 30 percent lower from the mechanical point of view.

The period 1934–36 was officially taken as the base year for making the agricultural parity price index by the Goverment. The parity level of living in the base period is hardly defensible from our calculated results, but it should be noted that under the official prices of main agricultural

Table 7. Price Indices of Group Items in Urban and Farm Districts in 1934–36

Groups	Indices weighted by urban expenditure values	Indices weighted by rural expenditure values		Commodity Coverage
			(reciprocal)	
1 Cereals and bread	81.4	124.7	(80.2)	4
2 Fish	91.6	102.3	(97.8)	7
3 Meat and eggs	65.1	147.3	(67.9)	5
4 Vegetables and peas*	52.2	190.0	(52.6)	14
5 Seasoning	73.6	150.0	(66.7)	6
All food	75.8	132.1	(75.7)	36
6 Fuel and light	64.0	262.9	(38.0)	6
7 Miscellaneous	113.7	167.6	(59.7)	20†
Total				62

* Potatoes are included in 4.

† Commodity coverages are 4 (drinks and tobacco), 8 (clothing and footwear), 2 (housing, excluding rent), 6 (other than those above mentioned).

products directly determined by the parity index, the farmers' level of consumption is roughly at parity with the urban level in 1949. As long as this post-war condition is due mainly to the substantial fall of the living level in urban districts, the farmers' situation hereafter will turn disadvantageous because of the tendency to increase real wages on the urban side.