

AN ANALYSIS OF THE PERSONAL CONSUMPTION EXPENDITURES IN JAPAN, 1892-1967

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1. Introduction

The purpose of this paper is to present findings of a statistical analysis of the personal consumption expenditures in Japan during her experience of modern economic growth.¹ It covers approximately five decades, omitting the extraordinary experience of World War II and the reconstruction period immediately following the War (1939-1953). The study represents an attempt to make an extensive use of the newly estimated historical statistics of the Japanese economy, commonly referred to as the *LTES* series.² The personal consumption data are based on Professor M. Shinohara's estimates and the national income data, on Professor K. Ohkawa's.

Obviously, the scope of the present investigation is limited. It explores the rationale of the Japanese consumption behavior from a macro-economic point of view, while leaving untouched a detailed analysis of the pattern of consumption demand, either by commodity or by type of households (e.g., workers' vs. farmers').

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1. Kuznets' concept. See Kuznets (1966, ch.1).

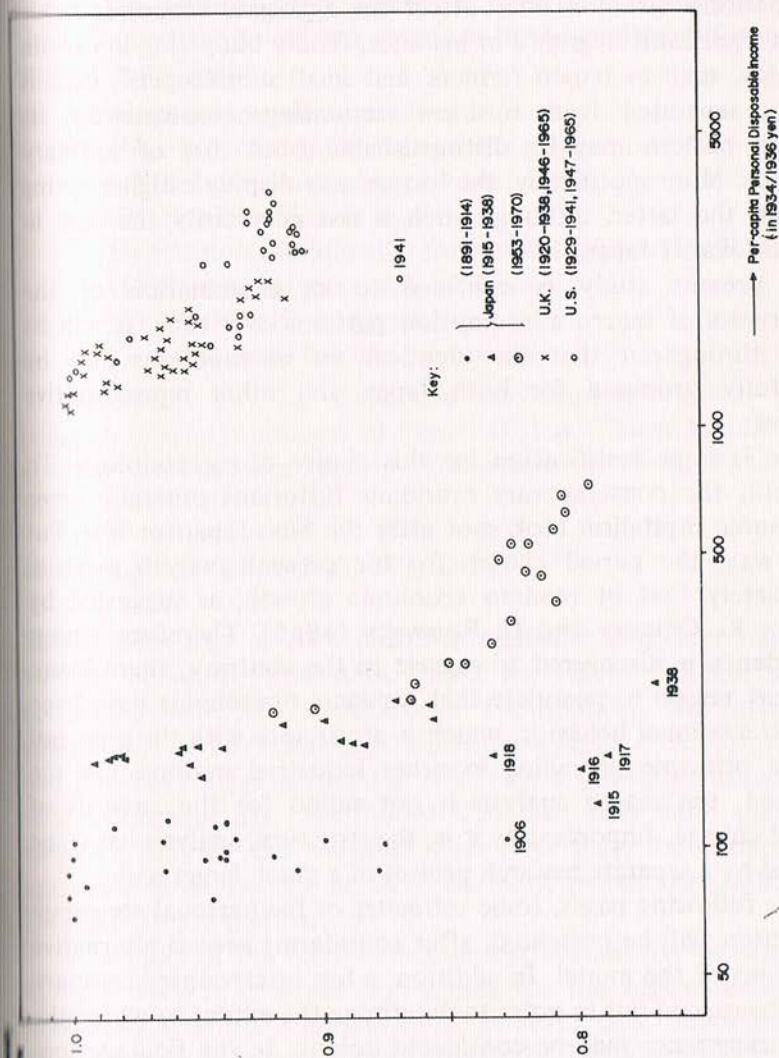
2. *LTES* stands for *Estimates of Long-Term Economic Statistics of Japan since 1868*, 14 volumes, edited by Kazushi Ohkawa, Miyohei Shinohara and Mataji Umemura (Tokyo: Tōyō Keizai Shimpō Sha, 1965-).

Nevertheless, it will prove to be of value in drawing some analytical observations; for one thing, there have been in the past only a handful of analyses of long-term consumption expenditures of the country, such as Gleason (1965), Ohkawa (1970) and Yoshihara (1977).

It has been pointed out frequently that the Japanese savings rate is exceptionally high compared with other major industrialized nations (e.g., Mizoguchi 1970, ch. 5). This is true not only from cross-sectional observation, but also from a comparison of historical records. The fact is born out easily by Figure 1, which relates annual real disposable incomes per capita in three representative countries to corresponding average propensities to consume (hereafter abbreviated as APC). A slight inverse association may be detected for all cases. In particular, note the wide range of the APC values for Japan in marked contrast to those for the other two countries. In the latter, APC has always been higher than 0.90 with only a single exception, the United States in 1941. By contrast, APC in postwar Japan (1954-1967) is as low as 0.84 on the average. While the figure is much higher for prewar Japan (0.92), it still belongs to the lower end of the range by the international standard. Moreover, it seems suggestive that the six prewar incidents where APC registered especially low values (less than 0.85) all correspond to the years of relatively high output growth in real terms.

In explaining the unique pattern of consumption (or of savings), one may conceive of two possible approaches: behavioral and structural. The former, which may in turn be subdivided into two groups, seeks an answer to the difference in human behavior. On the one hand, one may argue that the behavioral criterion, such as utility maximization, differs from one country to another. Alternatively, one may regard the difference as a matter of degree, so that it may be reduced to the difference in functional specification or in parametric values of the model, while postulating the applicability of a uniform maxim.

The second methodology emphasizes the importance of structural consideration in analyzing the economic behavior of a developing economy, since changing compositions of either consumption goods or of occupational structure are likely to influence the aggregate consumption expenditures. The components of consumer demand undergo constant transformations from one period to another, owing to changes in relative prices, shifts in personal tastes, and alternation



Note: The data for both the U. K. and the U. S. have been converted to yen by using the foreign exchange rates at New York City (average for 1934-36) as reported in *Statistical Abstract of the U.S.*, 1937, p. 272.

FIGURE 1

of old and new products. By contrast, the persistent demand for cheap, indigenous food and clothing in Japan has been highly instrumental in keeping the average consumption spending at a relatively low level (Rosovsky and Ohkawa 1961). Moreover, changes in occupational structure may affect the aggregate economic behavior to a significant degree. For instance, family budgeting in certain households, such as tenant farmers' and small shopkeepers', cannot be easily separated from business accounting; consequently, its behavioral pattern may be distinguishable from that of ordinary households. More specifically, the former may display a higher saving ratio than the latter, although such is not necessarily the case in post-World War II Japan.

The present study is confined to an examination of the characteristics of macro consumption patterns over time. It will be assumed throughout that the identical set of functions may be meaningfully proposed for both Japan and other representative economies.

There is some justification for this choice of methodology. To begin with, the contemporary economic historians generally agree that Japanese capitalism took root after the Sino-Japanese War. Put another way, the period chosen for the present analysis matches approximately that of modern economic growth, as suggested by Professors K. Ohkawa and H. Rosovsky (1965). Therefore, unless clear evidence is discovered to suggest to the contrary, there seems no *a priori* reason to postulate that Japanese households have been subject to irrational behavior, which is at variance with the universal economic principle prevailing in other industrial nations. On the other hand, the macro analysis is not suited for the analysis of structural change. Important as it is, the structural analysis has to be conducted by a separate research project of a much larger scale.

In the following pages, some estimates of the personal consumption function will be presented, after considering several alternative formulations of the model. In addition, a few intercountry comparisons will be carried out in order to determine the extent to which the Japanese experience may be considered unique. In the final section, some concluding remarks will be offered.

2. The Models

It is beyond the scope of this study to conduct comprehensive

tests on the relative strength of competing theories of consumption. The choice of the models has therefore been dictated not only by their theoretical appeal but also by their ease of handling and the availability of relevant data.

Of the representative economic models of consumer behavior, the following six have been chosen as likely candidates for use in the present investigation:

- A. Absolute income hypothesis
- B. Hypotheses allowing for variable preference field
 - (1) Relative income hypothesis
 - (2) Habit formation hypothesis
- C. Hypotheses not allowing for variable preference field
 - (1) Permanent income hypothesis
 - (2) Wealth effect hypothesis
- D. Liquidity-asset holding hypothesis.

According to the Keynesian consumption theory, personal consumption expenditures at year t (C_t) is a linear function of the absolute level of personal disposable income at the same year (Y_t) so that

$$(1) \quad C_t = \alpha + \beta Y_t \quad (\alpha > 0, 1 > \beta > 0).$$

This implies that as APC becomes smaller, the greater the level of income becomes. The data found in Figure 1 seem generally consistent with the expectation. Furthermore, an international comparison of historical experiences by Kuznets (1966, pp. 248-250 and 262-264) suggests that the APC's are by no means constant over time. Consequently, the above equation may still claim some validity, despite the classical discovery that the proportion of aggregate gross savings in GNP has been remarkably stable in the United States (Friedman 1957).

A version of the relative income hypothesis may be expressed as $C_t/Y_t = f(Y_t/Y_0)$, where Y_0 stands for the highest income level previously attained. Unfortunately, however, this functional form is not suitable for postwar Japan through the 1960s, for the level of her current income has constantly renewed its past record.

A habit formation hypothesis may be represented by a specification of the form

$$(2) \quad C_t = \alpha + \beta Y_t + \gamma C_{t-1} \quad (1 > \beta > 0, 1 > \gamma > 0).$$

This hypothesis has an intrinsic attraction, especially because of the relative importance of indigenous components in the Japanese consumption pattern. Moreover, it should be noted that the equation is essentially equivalent to an empirically tested version of the permanent income hypothesis, where permanent income is estimated as a weighted sum of past income streams.

A variant of the equation (2) may be

$$(3) \quad C_t = \alpha + \beta_0 Y_t + \beta_1 Y_{t-1},$$

which can be derived by combining the absolute income hypothesis and an assumption that the coefficient β in the equation (1) is a linearly decreasing function of the growth rate of Y so that $\beta = \beta_0 + \beta_1 - \beta_1(\Delta Y_t/Y_t)$, where $\Delta Y_t = Y_t - Y_{t-1}$.³ This version of the hypothesis has an affinity to the view by Fujino (1972, p. 121) that the consumers' time preference is dependent on the rate of growth of real income.

A simple-minded wealth-effect hypothesis may be expressed by a formula $C_t = \alpha + \beta W_t + \gamma Y_t$, where W_t stands for the wealth owned by the household at time t . By definition, $W_t = W_{t-1} + Y_{t-1} - C_{t-1}$, so that the above equation may be rewritten to yield

$$(4) \quad C_t = \beta Y_{t-1} + (1 - \beta)C_{t-1} + \gamma \Delta Y_t.$$

Note that (4) has no intercept and that the coefficients of Y_{t-1} and C_{t-1} add up to unity. However, it is also possible to interpret its generalized form, having a non-zero constant and no constraint on the coefficients, as a version of the lagged-income hypothesis.

It is noteworthy that functions of types (2), (3) and (4) have a common property. Assuming, for instance, that Y grows at a constant rate (r) and that APC has reached a constant value (APC^*), one can easily find that equation (4) yields $APC^* = (\beta + \gamma r)/(\beta + r)$ and $dAPC^*/dr = (\gamma - 1)\beta/(r + \beta)^2 < 0$ (since $\gamma < 1$ and $\beta > 0$). In other words, they too are consistent with the observation (in Figure 1) that the growth rate of income is negatively associated with APC.

Finally, the last set of hypothesis asserts that an increase in asset holding will result, other things being equal, in a relatively high value of APC. By construction, this hypothesis seems more appropriate for structural analysis. In the present investigation, the liquid-asset

3. I owe this formulation to Brinner (1973, pp. 1-9).

holding hypothesis has not been subjected to empirical testing due primarily to the difficulty in procuring the necessary data.

The unit of measurement presents some problems in actual estimation procedure. The subsequent analysis is based on real per capita data, where both consumption and income are divided first, by the size of population and then by the consumer price index, which takes years 1934-1936 as the base.⁴ For a commentary on the nature of the basic data, the reader is referred to the Appendix to the present paper.

After a process of elimination, the following six functions have been selected for the analysis of the Japanese consumption behavior. Using small-case letters to stand for per capita real values and omitting the subscript t , the fitted regressions are:

$$(5) \quad c = \alpha_1 + \beta_1 y + \epsilon$$

$$(6) \quad c = \alpha_2 + \beta_2 y + \gamma_2 y_{-1} + \epsilon$$

$$(7) \quad c = \alpha_3 + \beta_3 y + \gamma_3 c_{-1} + \epsilon$$

$$(8) \quad c = \alpha_4 + \beta_4 y_{-1} + \gamma_4 c_{-1} + \delta_4 \Delta y + \epsilon$$

$$(9) \quad c = \beta_5 y_{-1} + \gamma_5 c_{-1} + \delta_5 \Delta y + \epsilon$$

$$(10) \quad c/y = \alpha_6 + \beta_6 (c_{-1}/y_{-1}) + \gamma_6 (\Delta y/y) + \epsilon$$

Among these, equations (9) and (10) may be interpreted as variations of the permanent (or expected) income hypothesis. As usual, ϵ represents the disturbance term.

3. Results of Estimation

The ordinary least squares method of estimation has been applied to the data, ignoring the possible repercussions of c on y . The results of the estimation are reported in Table 1. Clearly, equation (10) is inferior to others and consequently omitted from the subsequent discussion. Both equations (5) and (6) display not only the existence of significant serial correlations but also relatively poor performance in forecasting. From a purely technical point of view, therefore, the remaining three formulations (7), (8) and (9) seem preferable to others. In other words, it is definitely advisable to incorporate a

4. Ideally, one should construct time-series data of standardized consumer units rather than using population. The use of real quantities presumes, of course, the non-existence of money illusion in the long run.

Table 1 - Personal Consumption Function, Japan (1892-1938 and 1954-1967)

Equation Number	Dependent Variable	Constant	Independent Variables ^a				$\Delta y/y$	\bar{R}^2	d	S^b	Forecasting ^c Capability (%)		
			y	$y-1$	$c-1$	Δy					$(c/y)_{-1}$	1968	1969
5	c	18.42 (9.66)	0.7833 (93.57)				0.993	0.97	7.93	0.93	0.59	1.58	
6	c	15.33 (8.95)	0.4120 (5.62)	0.4059 (5.08)			0.995	1.08	6.65	0.30	0.70	1.75	
7	c	4.873 (2.86)	0.3814 (9.95)		0.5583 (10.58)		0.998	2.00	4.67	-0.29	0.00	1.22	
8	c	3.839 (2.03)		0.3176 (4.95)	0.6343 (7.85)	0.4239 (8.26)	0.998	2.05	4.65	-0.29	-0.11	1.05	
9	c	-		0.2246 (4.88)	0.7613 (14.49)	0.4079 (7.83)	0.998	2.06	4.78	-0.09	0.11	1.42	
10	$\frac{c}{y}$	0.857 (18.76)											
										0.0786 (1.57)	-0.6065 (-6.10)	0.05	0.72

^aValues of the coefficients have been rounded at the fifth place below the decimal point. Figures in parentheses show t -values.

^bStandard error of regression.

^c $(\text{Forecast})/(\text{Actual} - 1) \times 100$.

long-run perspective in explaining the Japanese consumption behavior.

It is well-known that the existence of the lagged variable in the equation (7) permits at least two possible interpretations: it represents either authentic lagged behavior of consumers or merely a combination of the absolute income hypothesis (equation (5)) and the autoregressive error term. It is easy to decide on this question by following a test proposed by Professor Z. Griliches (1967, pp. 33-34), which entails estimating a supplementary equation $c = \alpha_7 + \beta_7 y + \gamma_7 y_{-1} + \delta_7 c_{-1} + \epsilon$ and checking to see (i) if γ_7 is negative and significantly different from zero, and (ii) whether or not $\beta_7 \gamma_7 = -\gamma_7$ holds.⁵ The computation shows that the value of $-\gamma_7$ (significant) is approximately half of the value of $\beta_7 \gamma_7$. Hence the autoregressive error model is not acceptable as an appropriate interpretation of the result.

Regarding equation (9), it can be noted that the sum of the coefficients of y_{-1} and of c_{-1} does not differ significantly from unity.⁶ In terms of predictive capability, however, it seems slightly inferior to other two equations, (7) and (8).

A natural question comes to one's mind: is it justifiable to take the entire fifty-one year period as a unit of observation, as has been done in Table 1? Is it not highly conceivable that the socio-political renovations after World War II have caused fundamental transformations in the pattern of consumption expenditures? To name a few examples, the rapid "Americanization" of lifestyle has been quite manifest after the War (but particularly after the mid-1960s), as testified by the increasing importance of dairy and wheat products in food consumption. The intensified rate of urbanization, together with the spreading of higher education and of the mass media must have made the general public more susceptible to demonstration effect than they had been previously. The high rate of technological progress in machinery and electric appliance industries has resulted in the decline in the relative prices of their products, which in turn has stimulated the purchase of consumer durables such as automobiles, color television sets, vacuum cleaners and washing machines. In a

5. If one adds to the equation (5) the assumption that $\epsilon_t = \rho \epsilon_{t-1} + \xi_t$, the supplementary equation is easily obtained. Note this equation may be reduced to the identical form as our equation (8).

6. Standard error of $(\beta_5 + \gamma_5)$ is 0.0078.

word, the age of the mass consumption has finally arrived. Furthermore, various social innovations such as land reform, the liberalization of labor movement, the introduction of the new social security system, etc., seem highly relevant in transforming consumer behavior after the War.

There is some empirical evidence of a change in the pattern of consumption. Professor T. Mizoguchi (1968) had once computed, on the basis of both time-series and cross-section data, itemwise expenditure elasticities of consumption for the prewar and postwar decades.⁷ He had discovered, among other things, that:

- 1) The elasticity of food consumption rose during the period of 1878-1908, after which it declined until 1938. This suggests that the per capita volume of food consumption reached a saturation point by the turn of the century despite the low level of income that prevailed then.⁸ Presumably this phenomenon reflects the rice-dominant diet of the day. The elasticity value jumped up after World War II before it started to go down again; in the early 1960s, however, it maintained a comparatively high level (greater than 0.5) in view of the improved standard of living. This reflects, as argued by the author, the increasing "Westernization" of the postwar pattern of food expenditures; and

- 2) The income elasticity of cloth consumption was higher in the prewar period compared with that in the postwar days. Moreover, it has shown a downward trend in the postwar period, suggesting a decline in the relative price of textile products: another result of the technological progress in the postwar period.

In view of the importance of the question raised above, a statistical test was performed in order to determine whether or not a structural change had in fact taken place after World War II. For this purpose, the method proposed by Professor G. Chow (1960) was adopted. The results are significant at the one percent level for all the

7. In calculating the elasticities, Mizoguchi used total consumption expenditures in place of personal disposable income. The time-series elasticities have been computed for successive ten-year periods for the prewar years (1878-1938), and three-year periods for the postwar years (1952-1964).

8. Mizoguchi (1968) warns, however, that the period prior to 1908 requires extra care in handling the consumption data, as elasticities of certain expenditure items for the period (1878-1908) are not only erratic but take highly unrealistic values.

equations tested ((7), (8), and (9)).⁹ It may be concluded therefore that the parametric values of these regression equations have undergone significant changes after the War and that the consumption functions should be estimated separately for prewar and postwar decades. The results of separate estimation of equations (7) through (9) appear in Table 2. On the basis of this computation, Figure 2 depicts the predictive ability of the equation (8). Excepting the periods of wide fluctuations (such as 1906 and 1921-22), the performance of the equation is generally satisfactory. Similar conclusion may be reached for two other regressions.¹⁰

It may be observed here that the regression coefficients differ significantly between the two periods and that the relative weight of the constant terms is much lower for the prewar period. Furthermore, the coefficients of y_{-1} and c_{-1} in the equation (9) fail to add up to unity.¹¹ Consequently, there is difficulty in applying the wealth-effect hypothesis for prewar Japan.

The last two columns of Table 2 report estimated values of long run marginal propensities to consume (LMPC) and average lengths of adjustment lags, respectively. The former was calculated on the assumption that y grew at a constant rate of r^* , which is the observed trend value of y for the respective period (see Table 4). Obviously r^* does not represent the steady-state rate of growth. However, it seems meaningless to calculate the value of LMPC for a stationary state where income ceases to grow ($r = 0$), as sometimes done. The average lengths of lag stand for mathematical expectations

9. F-statistics are found to be 6.43, 4.32, and 5.08 for equations (7), (8) and (9), respectively. Exactly the same procedure has been applied to two sub-periods in prewar Japan (1892 vs. 1905-1938), yielding totally negative results.

In addition, a test for the autoregressive model has been performed; the results were again negative for both pre- and postwar years.

10. From a theoretical point of view, it would be definitely better to choose a specification that has the ability to explain the entire span of observation period without taking a recourse to the concept of a structural change. In fact, the use of log-linear versions of the consumption functions has given a negative result to the test of a structural change. Even in this case, however, some of the parametric values are so far apart between the pre- and postwar periods. Consequently, confidence intervals of some coefficients (such as β_3 and γ_3 in the equation (7) and δ_4 in the equation (8)) are completely disjoint between the two periods.

11. Standard error of $(\beta_5 + \gamma_5)$ is 0.0088 (prewar) and 0.0175 (postwar).

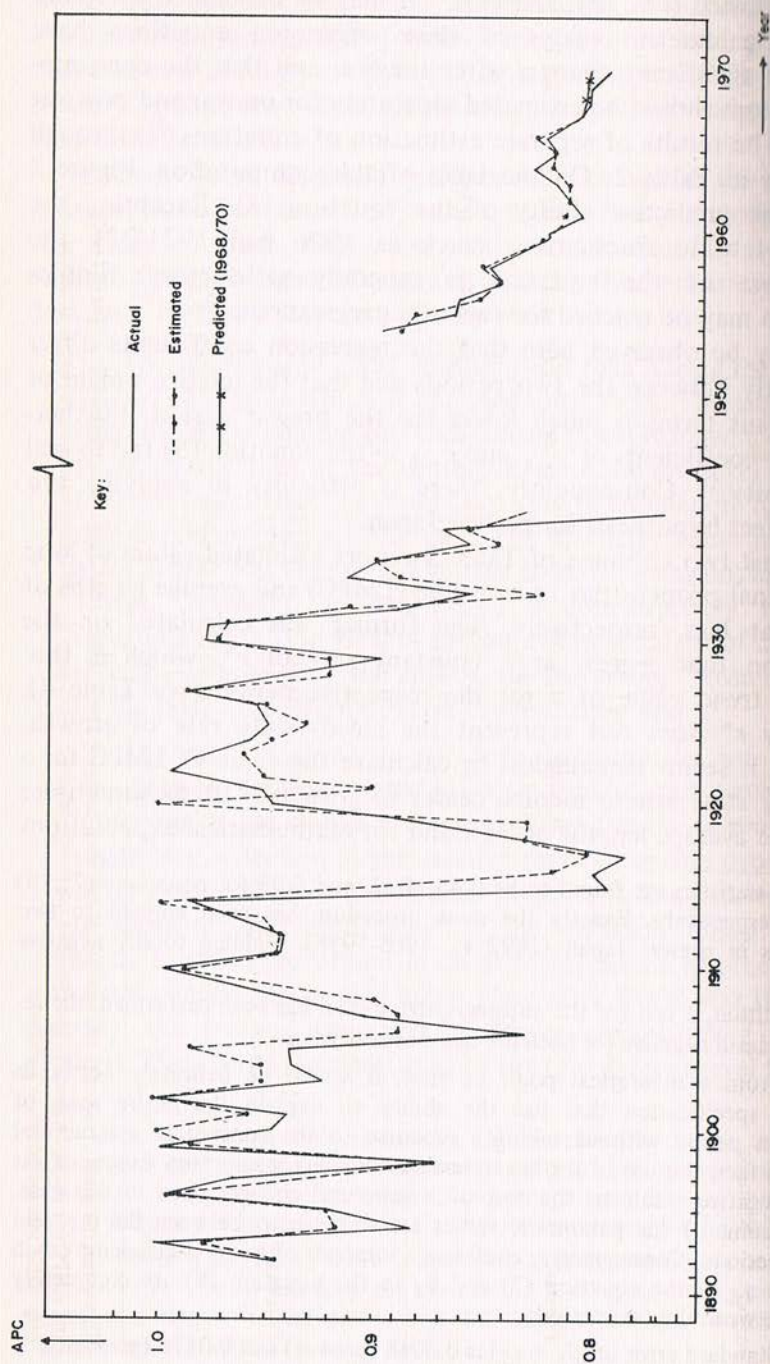


FIGURE 2

AVERAGE PROPENSITY TO CONSUME IN JAPAN
ACTUAL AND ESTIMATED VALUES

Table 2 — Personal Consumption Function in Japan: Prewar (1892-1938) and Postwar (1954-67)

Period	Equation Number	Independent Variables				R ²	d	s	LMPC ^a	Average Length of Lag (years)
		Constant	y	y ₋₁	c ₋₁					
Prewar	7	4.265 (1.87)	0.2433 (4.58)		0.7153 (11.26)	0.987	2.08	4.42	0.809	2.51
	8	4.236 (1.81)		0.2386 (3.09)	0.7206 (8.10)	0.987	2.08	4.47	0.808	2.54
	9	—		0.2133 (2.74)	0.7793 (9.16)	0.986	2.06	4.59	0.899	—

Postwar	7	13.63 (5.08)	0.5854 (14.45)		0.2682 (4.80)	0.999	2.07	2.65	0.779	0.37
	8	10.28 (2.43)		0.4748 (4.14)	0.4095 (2.77)	0.999	2.19	2.64	0.781	0.40
	9	—		0.2515 (3.03)	0.7078 (7.11)	0.999	2.66	3.17	0.814	—

^a Long-run marginal propensity to consume. It has been computed as follows: LMPC for the equation (7): $\hat{\beta}(1+r)/(1+r-\hat{\gamma})$ and LMPC for the equations (8) and (9): $(\hat{\beta}+\hat{\gamma}r)/(1+r-\hat{\gamma})$. Where r is the growth rate (trend value) of per capita personal disposable income (given in Table 4).

derived from the actual lag distributions, in conformity to the procedure suggested by Professor Griliches (1967). The average lag has not been computed for the equation (9), for the latter does not assume the lagged income hypothesis.

It is clear from Table 2 that while the short-run marginal propensity (SMPC) in the equation (7) increased in the postwar period, the value of LMPC moved to the opposite direction. In addition, note that the average length of lag has been substantially shortened after the War. This, of course, is not surprising. The relatively cheap, indigenous components must have dominated the consumption demand in the prewar decades.

4. Intercountry Comparisons

In order to identify the uniqueness, if any, of the Japanese experience, an inter-country comparison of personal consumption expenditures has been attempted. For this purpose, three economies have been chosen (United Kingdom, United States, and Canada) and exactly the same models as described above (equations (5) through (9)) have been estimated.¹² The selection of these countries has been purely accidental, as it has been dictated by the ease of access to the data. The period of observation covers the years between the 1920s and the 1960s, excluding the World War II days.

Table 3 reports the results of the computation. Just like the Japanese case, the estimated equations (5) and (6) indicate significant autocorrelations. However, the predictive ability of equation (5) for the United Kingdom is surprisingly high. In the case of the United States, it is noticeable that equation (9) excels all the others in terms of forecasting capacity. The SMPCs obtained from equation (7) are much greater than that for prewar Japan, although they are roughly equivalent to the postwar Japanese values. The sums of the coefficients of y_{-1} and of c_{-1} in the equation (9) add up to unity for all the countries reported in Table 3.¹³ The magnitude of the β_5 coefficient in the same equation, representing presumably the wealth effect on consumption, is greatest for Canada, followed by Japan (prewar), the United States, and the United Kingdom in this order.

12. In addition, the equation (10) has been estimated with no satisfactory results.

13. Standard errors of $(\beta_5 + \gamma_5)$ are 0.0036 for the U.K., 0.0095 for the U.S. and 0.0064 for Canada.

Table 3 - Personal Consumption Function, U.K., U.S. and Canada

Country	Equation Number	Constant	Independent Variables			\bar{R}^2	d	s	Forecasting Capability (%)			Period Covered	
			y	y - 1	c - 1				Δy	1	2		3
U.K.	5	6.149 (6.35)	0.8519 (49.74)			0.988	0.65	0.89	0.29	0.29	0.29	0.58	1921-38 & 1948-62 (1913 prices)
	6	5.865 (5.76)	0.7520 (6.83)	0.1069 (0.92)		0.988	0.59	0.89	0.21	0.31	0.31	0.80	
	7	2.863 (2.68)	0.5399 (7.52)	0.3911 (4.43)		0.993	1.17	0.70	-0.36	0.16	0.16	1.09	
	8	1.008 (1.10)		0.2003 (2.17)	0.7744 (7.19)	0.7156 (10.62)	0.996	2.03	0.54	-0.58	-0.04	0.51	
	9	-		0.1343 (1.90)	0.7039 (10.52)	0.996	2.12	0.54	-0.47	0.15	0.15	0.75	
	5	67.47 (4.90)	0.8695 (75.95)			0.996	1.51	18.58	-1.72	-1.14	-1.14	-1.42	
	6	63.09 (4.90)	0.7384 (12.70)	0.1372 (2.29)		0.997	1.37	17.17	-1.80	-1.47	-1.47	-1.81	1929-41 &
U.S.	7	46.88 (3.46)	0.6927 (12.07)	0.2127 (3.13)		0.997	1.40	15.98	-1.50	-1.28	-1.28	-1.75	1948-42 (1947/49 prices)
	8	12.46 (0.62)		0.2630 (1.29)	0.7070 (12.78)	0.998	1.66	14.85	-1.07	-0.57	-0.57	-1.33	
	9	-		0.1611 (1.36)	0.6745 (13.28)	0.997	1.73	14.64	-0.89	-0.33	-0.33	-1.16	

Table 3 (Continued)

Country	Equation Number	Constant	Independent Variables			\bar{R}^2	d	s	Forecasting Capability (%) ^a			Period Covered
			y	y-1	c-1				Δy	1	2	
	5	59.86 (3.12)	0.9005 (58.05)			0.990	0.87	36.70	-0.22	0.39	2.24	
	6	47.01 (2.69)	0.5513 (5.03)	0.3677 (3.21)		0.992	0.55	32.52	-0.14	1.23	1.26	1927-41 & 1948-68 (1944/49 prices)
Canada	7	14.58 (1.07)	0.4423 (6.89)	0.5330 (7.22)		0.996	1.44	23.19	-0.10	1.53	0.67	
	8	12.36 (0.89)		0.3749 (3.91)	0.6049 (5.72)	0.996	1.69	23.23	-0.11	1.43	0.76	
	9	-		0.3460 (3.85)	0.6460 (6.81)	0.996	1.73	23.16	0.16	1.75	0.99	

^aExtrapolated to three-year period succeeding to the observation period.

The statistical test on equation (7) for the validity of the autoregressive error model indicates that the values of $\beta_7 \delta_7$ for both the United States and the United Kingdom are different from those of $-\gamma_7$ by not more than ten percent. This indicates that there is room for doubt on the validity of the interpretation that equation (7) represents the lagged-income hypothesis.¹⁴ On the other hand, the interpretation seems acceptable for Canada, which has yielded the average lag of about 1.1 to 1.2 years.

In order to make a comparable observation on the effect of growth rate on consumption, it is necessary to standardize for the value of r . Accordingly, several hypothetical consumption propensities have been computed in Table 4. Obviously, Japan ranks at the top in the actual annual rate of growth (trend value) of per capita personal disposable income, while Canada is at the bottom. The comparison is somewhat misleading, because the Great Depression appeared to have been more damaging to the Canadian income level than for other countries; on the other hand, Canada's growth rate after the recovery was very rapid indeed. Note that the rate of growth of prewar Japan is roughly level with those for the United States and the United Kingdom. In short, the effect of growth rate on personal consumption must have been most manifest for postwar Japan.

Given the estimated equations (8) and (9), columns three through eight in Table 4 measure the extent to which a change in r affects the consumption propensities. It is clear that in all cases, an increase in the growth rate results in a decline in consumption propensities, as anticipated. It is also clear, however, that for the same rate of growth of income, Japan indicates consistently lower propensity values compared with other countries. On the other hand, the other three show highly comparable figures with each other when r is normalized.

What would be an appropriate interpretation of these results? First of all, the high savings ratio in Japan is *not* solely ascribable to the high rate of growth. In the case of prewar period, the relative strength of the demand for traditional commodities should perhaps

14. If one assumes that the lag-adjustment theory is also applicable to both the United States and the United Kingdom, average lags are 0.6 and 0.3 years, respectively. (A similar observation has been made by Yoshihara (1972) on the postwar U.S. economy).

Table 4 — Effects of Income Growth on Consumption Propensities

Country	Actual rate of Growth (r) ^a	LMPC, Derived from Eqtn. (8)			APC*, ^b Derived from Eqtn. (9)		
		$r=$	$r=$	$r=$	$r=$	$r=$	$r=$
		actual	0.02	0.08	actual	0.02	0.08
Japan (prewar)	0.0229	0.81	0.82	0.72	0.93	0.93	0.79
Japan (postwar)	0.0791	0.77	0.79	0.77	0.81	0.85	0.81
U.K.	0.0216	0.86	0.86	0.83	0.96	0.96	0.89
U.S.	0.0233	0.88	0.88	0.85	0.96	0.96	0.89
Canada	0.0146	0.91	0.90	0.85	0.98	0.97	0.90

^aTrend values, as estimated for respective periods by fitting $\ln y = \alpha + \beta t$. In this computation, the β values for pre- and post-W.W. II years were estimated separately and then transformed to weighted averages.

^bComputed as $(\hat{\beta} + \hat{\delta}r) / (\hat{\beta} + r)$, except for the value for postwar Japan, where the formula $(\hat{\beta} + \hat{\delta}r) / (1 + r - \hat{y})$ has been used in consideration of the fact that the coefficients of y_{-1} and c_{-1} do not add up to unity in this case.

be taken into consideration. In the postwar scene, on the other hand, not only has the adjustment lag decreased in length, but the SMPC moved upward in comparison with the prewar experience. The low LMPC value in postwar Japan may perhaps be explained in reference to the extremely low wealth-income ratio in the Japanese households after the War. Special reference may be made to the condition of residential housing. I have estimated elsewhere (1971, p. 128) that the quality of Japanese residential houses in 1963 was approximately two-fifths of that of the United States (as of 1960) in terms of space and facilities. Furthermore, the ratio of household tangible assets to annual personal disposable income in Japan was 0.83 for the fiscal year 1970, which is about half of a similar figure for the United States in 1935 (1.64).¹⁵ The maladjustment between the flow and the stock quantities may also be responsible for the failure of the simple-minded wealth-effect hypothesis in postwar Japan.

15. See *Japan Statistical Yearbook*, 1972, p. 501 for the Japanese data, and Goldsmith (1956, p. 14) for the U.S. data.

5. Summary

The major findings of the present paper may be summarized as follows:

1) The intertemporal movements in consumption expenditures in Japan during her modern economic growth may be best explained by the lag-adjustment hypothesis, rather than the absolute income hypothesis. Alternatively, one might interpret this as the relevance of a version of the permanent income hypothesis.

2) It seems that a structural change in the consumption pattern took place in Japan after World War II.

3) A comparison of consumption functions between prewar and postwar periods suggests that the former is characterized by an extremely low adjustment speed while the latter by a decline in the long-term marginal propensity to consume.

4) Japanese propensities to consume, having been normalized for difference in growth rates, rank low compared with those of the three countries examined (the United Kingdom, the United States, and Canada). To this extent, Japanese consumers have behaved differently from those in the other nations.

5) The Japanese economy experienced a serious setback in the early 1970s, notably by the Nixon shock and the two oil shocks. The average growth rate of real national product per capita (net of depreciation) significantly declined in the 1970s from 5.1 percent for 1970-1974 to about 1.8 percent in 1975-1979; even negative rates were registered in the calendar years 1974 and 1975 (-3.8 and -2.0 percent, respectively). Correspondingly, the average rate of growth in real personal disposable income per capita (y) decreased from 6.7 percent for 1971-1974 to 2.3 percent in 1975-1979.

Surprisingly, however, APC kept its relatively low position throughout this period of transformation despite the slowing down of the economy; not only did it average to approximately 76.7 percent for the 1970-1979 period, but it actually went down from 77.8 percent for the first half of the 1970s (1970-1974) to 75.6 percent for the second half (1975-1979). This fact alone seems sufficient to cast serious doubt on the validity of the habit formation hypothesis as applied to Japan in the 1970s, although it may be still too early to give the final verdict on this matter.

In any event, further work is urgently needed in order to explore the behavior of the Japanese consumers, and to determine if in fact

they behave differently from their Western counterparts. Especially pertinent in this regard is the study of the role of an asset variable factor virtually neglected in the present paper.¹⁶

Appendix

Note on the Data Sources

The following data sources have been consulted in carrying out the present investigation.

Japan

- C: Miyoei Shinohara, *Kojin shōhi* (Personal Consumption), LTES, Vol. 6 (Tokyo, 1967) for the prewar period and Economic Planning Agency, *Yearbook of National Income Statistics* for the postwar years.
- Y: Work sheets of Messrs. Kazushi Ohkawa and Nobukiyo Takamatsu for the prewar decades and Economic Planning Agency, *Yearbook of National Income Statistics* for the postwar years.
- C.P.I.: Noda estimates for the prewar years (Kazushi Ohkawa et al., *Bukka* (Prices), LTES, vol. 8 (Tokyo, 1967)), and the Bureau of Statistics index (Prime Minister's Office) for the postwar decades. The pre- and postwar indices have been linked by the adjustment factor suggested by Tsutomu Noda in *Bukka*.
- Population: Estimates by Professor Mataji Umemura for the prewar period, and those of Bureau of Statistics for the postwar years.

United Kingdom

All the data have been taken from C.H. Feinstein, *National Income, Expenditure and Output of the United Kingdom 1855-1965* (Cambridge, Cambridge University Press, 1972).

United States

C and Y: U.S. Department of Commerce, Office of Business Economics, *The National Income and Product Accounts of*

16. A study by Sato (1980, p. 197) is suggestive in this regard.

the United States, 1929-1965: Statistical Tables. A supplement to the Survey of Current Business (Washington, D.C., 1966).

C.P.I.: B.L.S. index has been adopted from U.S. Department of Commerce, *Historical Statistics of the United States, Colonial Times to 1957* (Washington, D.C. 1961) and U.S. Department of Commerce, *Statistical Abstract of the United States* (Washington, D.C., 1971).

Population: U.S. Department of Commerce, *Statistical Abstract of the United States*, (Washington, D.C., 1971). Inclusive of military personnel abroad.

Canada

All the data come from Statistics Canada, *National Income and Expenditure Accounts, Historical Revision 1926-1971* (Ottawa, October 31, 1972). The implicit consumption deflator has been used instead of the consumer price index (C.P.I.).

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