RECENT FOOD CONSUMPTION PATTERN OF JAPANESE HOUSEHOLDS: DRIVING FORCES BEHIND WESTERNIZATION†

Selected Paper
2002 Annual Meeting of the American Agricultural Economics Association

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Abstract:
A complete demand system for 11 aggregated food categories with 24 demographic variables, is specified following QUAIDS and is estimated using Japanese household level data. The estimation results suggest that westernization is due to the income effect and the tendency is further enhanced by the demographic factors.

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1. Introduction

In this paper, recent trends in the food at home consumption of Japanese households are analyzed. A complete demand system for 11 aggregated food categories for Japan is estimated following the Quadratic Almost Ideal Demand System (QUAIDS) developed by Banks, Blundell and Robin (1997). This parametric specification is relatively new, and this study will be one of the few applications of QUAIDS. In the previous literature, most if not all research on Japanese households demand behavior were based on macro data. Food consumption is strongly influenced by the tastes, which are closely related to household characteristics such as age, life-style and region of the residence. These effects of demographic characteristics on food consumption are further enhanced by the current Japanese situation, where the income and price effects have been significantly decreased (Sawada, M. 1984; 1986, and 1991). Household survey data contains the rich source of the household characteristics. Therefore the utilization of the data is desirable. The data used is cross-sectional household level data obtained from the 1997 *Family Income and Expenditure Survey* (FIES)[5].

The rest of this paper is organized as follows. Next section briefly describes the characteristics of the Japanese food consumption pattern and summarizes the previous literature on Japanese household food demand. Section 3 explains the model and the estimation procedure. In section 4, the data used for estimation and sample selection criteria is mentioned. Section 5 shows the estimation results. The proposed model is statistically preferred to the commonly used model. The household characteristics clearly affect the consumption pattern of households. Section 6 is a discussion of the results. It also includes possibilities for further research.

2. Recent Trends

The expenditure share of the food consumption to total living expenditure is decreasing since 1960's, but it still consists of 23.3% of total living expenditure in 2000 This decrease in the expenditure share is mainly due to the decrease in the relative price of foods to the other expenditure categories, such

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[5] See the Appendix A for more detailed description of the data.

as housing and education expense. Although the food expenditure share has been decreasing, the daily calorie intake per person has been steadily increasing until recently. There are mainly two reasons for the increase in the daily calorie intake, 1) the increase in the amount consumed by consumers and 2) a major shift in nutrition intake from carbohydrate to protein and fat. These are common phenomena observed worldwide when an economy is developing. At the individual food categories level, the increase in consumption of meat, fresh fruits, and dairy products, and the decrease in consumption of cereal, vegetable and fish are observed. Unique characteristic of Japanese food consumption pattern compared to the other developing countries is that, during above period, the substitutions of the traditional Japanese foods by western foods are occurred.

Another major change in the food consumption pattern of Japanese household is that more and more foods are now provided in the form of prepared foods and the food away from home. The expenditure shares of both prepared foods and food away from home are doubled over the last 30 years. This trend is interpreted as *preference for convenience*.

As causes for above trends in the recent food consumption pattern of household, the existing research suggests that the taste change as well as income and price effects. However, most of the existing studies limit their analysis on the specific food category and not on the overall food consumption pattern. The examples are analysis of meat consumption by Sawada, M. (1989a and 1989b) and Ishibashi, (2000a), and analysis of vegetable consumption by Ishibashi (2000b). The analysis on the overall food consumption pattern is somewhat limited (e.g. Sawada 1984) and they use the long time-series data. Given the drastic change over the past three decades, using time-series data may cause the biased results in the estimation results. In this paper, the focus is on the analysis of overall trends in food consumption pattern using the cross sectional household level data.

3. Model

In the literature, the most frequently used specifications to estimate complete demand system were the Almost Ideal Demand System (AIDS) by Deaton and Muellbauer (1980) and transcendental logarithmic model (Translog) by Jorgenson, Lau and Stoker (1982). These models belong to the Price Independent Generalized Logarithmic group (PIGLOG), in which the expenditure share is linearly related to the log of income, while the price effects have more flexible effects on the share. One reason to specify the Engel curve as a PIGLOG shape is that it can be exactly aggregated. Recently, many researchers using household level data have reported that while the expenditure share of some good is linear in log income, the expenditure shares of other goods may not be linearly related to log income. For example, Blundell, Pashardes and Weber (1993) found that, under the price variation, the coefficient of the quadratic log income is significant in the restricted parametric specification. Blundell, Duncan and Pendakur (1998) found that the expenditure share is not linearly related to the log income using cross sectional data by a nonparametric estimation. Given these results, the Quadratic Almost Ideal Demand System (QUAIDS) is adopted in this study. The specification form of QUAIDS with demographic variables is written as follows,

$$w_j = \alpha_j + z\delta_j + \sum_{l=1}^{J} \gamma_{jl} \ln p_l + \beta_j \ln\left(\frac{m}{a(P,z)}\right) + \frac{\lambda_j}{b(P)}\left\{\ln\left(\frac{m}{a(P,z)}\right)\right\}^2 ,$$

where

$$\ln a(P,z) = \alpha_0 + \sum_{l=1}^{J} (\alpha_l + z'\delta_l) \ln p_l + \frac{1}{2}\sum_{l=1}^{J}\sum_{j=1}^{J} \gamma_{lj} \ln p_l \ln p_j ,$$

$$\ln b(P) = \sum_{l=1}^{J} \beta_l \ln p_l .$$

The expenditure share of j th good, w_j, depends on log price of all goods in the system, $\ln p_l$, household total expenditure, m, and the vector of household demographic characteristics, z. Household characteristics are allowed to enter the equation only through α_l. This method follows Deaton and Muellbauer (1980). The restrictions to be satisfied are following,

Adding Up

$$\alpha_{J+1} = 1 - \sum_{j=1}^{J} \alpha_j \text{ , } \beta_{J+1} = -\sum_{j=1}^{J} \beta_j \text{ , } \lambda_{J+1} = -\sum_{j=1}^{J} \lambda_j \text{ ,}$$

$$\gamma_{J+1,i} = -\sum_{j=1}^{J} \gamma_{j+1,i} \text{ , } \delta_{k,J+1} = -\sum_{i=1}^{J} \delta_{k,i} \text{ .}$$

Symmetricity

$$\gamma_{ji} = \gamma_{ij} \text{ .}$$

Homogeneity

$$\gamma_{j,J+1} = -\sum_{i=1}^{J} \gamma_{j,i} \text{ .}$$

The above model nests AIDS when $\lambda_j = 0$, otherwise, the characteristics of goods can change according to the income level. In other words, it is possible for a good to be a luxury for lower income, but it becomes a necessity as household income increases or vice versa. It can also be observed that the expenditure term appears in the elasticity formula.

Expenditure Elasticity

$$e_i = \frac{\left\{ \beta_i + \frac{2\lambda_i}{b(P)} (\ln x - \ln a(P,z)) \right\}}{w_i} + 1$$

Uncompensated Price Elasticity

$$e_{ij}^u = \frac{\left\{ \gamma_{ij} - \mu_i \left(\frac{\partial \ln a(P,z)}{\partial \ln p_j} \right) - \frac{\lambda_i}{b(P)} \left(\frac{\partial \ln b(P)}{\partial \ln p_j} \right) (\ln x - \ln a(P,z))^2 \right\}}{w_i} - \delta_{ij}$$

where $\mu_i = \frac{\partial w_i}{\partial \ln m} = \beta_i + \frac{2\lambda_i}{b(P)} \left\{ \ln \left[\frac{m}{a(P,z)} \right] \right\}$,

and δ_{ij} is a kronecker delta.

Compensated Price Elasticity

$e_{ij}^{c} = e_{ij}^{u} + e_i w_j$.

Infrequent Purchase and the Endogeneity of Expenditure

The problem one encounters with micro data is the significant number of households with zero consumption entries. This is indeed the case in this data set: about 40 % of total households report zero consumption purchase for rice. Keen (1986) suggests zero consumption observed in the broadly aggregated categories is likely to be caused by infrequent purchase. Zero consumption for rice, in this case, very likely occurred for this reason. Keen showed that controlling the endogeneity of the expenditure is enough to obtain an unbiased estimator in a linear system. In a non-linear system such as this model, the method proposed by Holly and Sargan are employed. Total food expenditure is first regressed to the set of instrumental variables (other non-food expenditures for eight goods, household total annual income and explanatory variables in the demand system). Then the estimated errors are included in the demand system equation as additional explanatory variables. This procedure is suggested by Banks, Blundell and Robin (1997).

Estimation Procedure

Estimating the original demand system directly by Full Information Maximum Likelihood estimation (FIML) is a fairly complicated procedure, making it difficult to obtain convergence, and moreover it is computationally inefficient. Blundell and Robin (1999) proposed estimators, which are consistent and computationally more affordable, although not as efficient as FIML estimators when the system can be written as *conditionally linear*. In this study, Banks and Robin method is first employed to obtain the consistent estimators for the system. Then in the second stage, FIML estimation is carried using the estimators in the first stage as initial values. Next, the estimation procedure employed by Banks and Robin is described.

The estimation equation is rewritten as follows,

$$w_j = \alpha_j + z\delta_j + \sum_{l=1}^{J} \gamma_{jl} \ln p_l + \beta_j \ln\left(\frac{m}{a(P,z)}\right) + \frac{\lambda_j}{b(P)}\left\{\ln\left(\frac{m}{a(P,z)}\right)\right\}^2 + \varepsilon_i$$

$$= \begin{pmatrix} 1 \\ \ln p \\ \ln m - \ln a(P,z) \\ \dfrac{(\ln m - \ln a(P,z))^2}{b(P)} \\ z \end{pmatrix}' \begin{pmatrix} \alpha_j \\ \gamma \\ \beta_j \\ \lambda_j \\ \delta_j \end{pmatrix} + \varepsilon_i .$$

Given, $a(P,z)$ and $b(P)$, the demand system is linear (Conditional Linear). First, choose initial value for $a(P,z)$ and $b(P)$, and estimate the whole linear system to obtain the estimate of parameters $(\alpha_j \quad \gamma \quad \beta_j \quad \lambda_j \quad \delta_j)'$. Then $\hat{a}(P,z)$ and $\hat{b}(P)$ can be obtained using these estimates. Re-estimate the parameters given $\hat{a}(P,z)$ and $\hat{b}(P)$. Iterate above procedures until the difference between the previous estimator and newly obtained estimator is smaller than the specific criteria.

Two types of specification tests are carried out. First, the test for AIDS vs. QUAIDS is conducted. Since AIDS is nested, the ordinary Wald type test is employed for this specification test. The other test is for symmetricity, $\gamma_{ij} = \gamma_{ji}$. The model with symmetry restrictions imposed is estimated by the optimum minimum distance estimator proposed by Blundell (1988).

4. Data

The data is taken from 1997 *Family Income and Expenditure Survey* (FIES) compiled by Statistics Bureau of Ministry of Management, Home Affairs, and Posts and Telecommunications, Japan. The data is limited to households surveyed during July with positive total food expenditure. The number of observation is 7,740 out of 98,225. Eleven food categories included in the system, are glutinous rice, bread, noodle, fish, meat, milk, eggs, fresh vegetables, bean products, fresh fruits and prepared foods[6]. Price data is obtained by dividing the expenditure of the good by the quantity purchased of the good. For

[6] Food away from home expenditure is excluded, since it is found to have quite different characteristics as compared to other food expenditures. FAFH has a much larger income elasticity compared to other food expenditures, it is consumed as an entertainment or luxury good not as a necessity like other foods as found by Tokoyama (2000).

household who do not consume the good, the price data is not available. For those households, the average prices of the purchased households are used as proxies. The average prices are created by taking average by months, region and the size of the city, which the households reside. The income variable is household total food expenditure. Household demographic variables included are the age of household head, dummies for household size, for dummies for household types, and three dummies for the size of the city, which the household resides. Detailed explanations of those variables and the descriptive statistics of all variables used in the estimation are shown in tables 1 and 2.

5. Estimation Results

For limited space, the full sets of the estimation results are not reported in this paper. To summarize the results, most of the variables including demographic variables and the square of log income terms are significant. In table 3, Wald statistics shows that the joint significance of the log income square terms is not rejected, therefore AIDS model is rejected.

Tables 4 and.5 show the estimated expenditure and compensated price elasticities for the base households. The definition of the base households are those households with head whose age between 35-45 years old, non-worker wife and no household members more than 65 years old, and the household size is 4 or more. All other variables are evaluated at group means. In section 2, the consumption pattern and trends affecting those patterns analyzed in the previous literature are surveyed. In the following, those patterns and trends are examined based on the estimation results.

Expenditure Elasticites

All the expenditure elasticities are significant and positive; therefore 11 goods are all normal goods. Milk, eggs, bean products, prepared foods and glutinous rice are necessities. Bread, noodles, fish, meat, fresh vegetables, fresh fruits are luxuries. Low expenditure elasticities for rice and dairy products and high elasticities for meat and fish are also observed in other literature on food consumption and intuitive.

Westernization

Among the 11 categories, glutinous rice and bean products are considered as traditional Japanese goods and meat and bread are western foods. Elasticities for rice and bean products are smaller than 1, while the meat and bread are more than 1. This means as the income increases, the food consumption will be westernized. In section 2, we observed that the lipid consumption in Japan is still lower compared to consumption in other developed countries in the same income level. The expenditure elasticities for meat and fish is higher than rice elasticity, therefore it shows that as income increases, the expenditure share of the two goods increase, which consequently means the nutrition intake will be more inclined to lipid than carbon hydrate.

Preference for convenience

Prepared foods category will be most suitable to analyze the trend for convenience. The relatively low expenditure elasticity for prepared foods is observed. Although, the prepared foods demand is increasing recently, most of the prepared foods included in this survey are the prepared foods, which are traditionally cooked outside home. Other prepared foods, which market share and sales are dramatically increasing in recent, such as frozen Pizza, lunch boxes and side dishes sold at convenience stores, are not explicitly included in the survey. The effect of former is dominating the effect of latter. The preference for convenience can be analyzed also by comparing the bread and noodle. In general, bread is relatively easier to cook; therefore, it is more convenient compared to rice. Higher bread elasticity is compared to rice elasticity might be caused by this preference.

Preference for healthy foods

Two categories, which have significantly higher elasticities compared to other goods, are fresh vegetables and fruits. These are two categories, which are expected to increase most in future as income increases is expected. In general, vegetables and fruits contain fewer calories compared to other food groups. These high elasticities might be the reason for the saturation in calorie intake of Japanese.

Own Price Elasticities

In table 5, the estimated compensated price elasticities are shown. All own price elasticities are significant and negative, thus the system satisfies the negativity condition. Own price elasticities are much greater than cross price elasticities, which is intuitive.

Current food consumption pattern

Traditional Japanese food consists of Rice, main dish made of fish, and side dishes made of vegetables. This is a reason why rice and fish are complements.
Although, rice and meat dish are very common in the recent Japanese diet, it is still very uncommon to eat bread and fish together. This is why bread and fish are substitutes.

Westernization

Meat substitutes for fish and bean products, which were the main sources of protein for the traditional Japanese diet. Rice is substituted by all other food groups, especially bread and noodles. The substitution effect of rice and meat is very small as compared to the substitution effect of rice and other grains. This is because of physical characteristics of rice.

Preference for convenience

Price elasticities for prepared foods are significantly higher than those of other 10 food groups and prepared foods are substitutes for all those food groups. Among 10 food groups, the prepared foods are a main substitute for bread, meat and fish. This is consistent with the observation that most of the prepared foods currently consumed in Japan are side dish type and not main dish type.

Demographic Variation in Elasticity

Household Head's Age

Table 6 shows the effects of household head age on the expenditure and own price elasticities. Seven out of 11 food groups have smaller expenditure elasticities for elderly households as compared to younger households. It means that as food expenditure increases, the elderly households do not change the consumption pattern as much as younger households do. Especially the expenditure elasticities for prepared food are low. Preference for convenience is low for elderly households. Elderly households have higher elasticities for fish and bean products (traditional foods) which reflects the conservative taste of elderly households.

Household size

Table 7 shows the effect of household size on the expenditure and own price elasticities. The difference in the magnitude of elasticities among different household sizes is small, but in general, as household size increases, the elasticity becomes more inelastic. One reason might be as household size becomes larger, the preference of the household members diversifies and it is more difficult to introduce the different consumption pattern. The elasticity for prepared foods is small, which reflects the lower opportunity cost for cooking or higher opportunity cost for eating out.

Household type

Table 8 shows the effect of household types on the expenditure and own price elasticities. Compared to the base households, both households with working wife and single parent households has higher elasticity for prepared foods, which reflects the high opportunity cost for cooking.

6. Discussion

In this paper, the food demand system of 11 food categories is estimated following QUAISA. The results show that the food consumption patterns significantly vary among the demographic groups and the recent trends of westernization, preference for healthy foods, and preference for convenience are also observed. In the future, the diversifying demographic structure – decreasing household size, the increase in number of working wives, and the increase in the number of single parent households – will enhance the diversification of food consumption patterns. On the other hand, the change in the demographic structure, namely the aging society, will have the opposite effect on the food consumption patterns, since the elderly has more conservative taste than younger households in general. Which effects will dominate the future aggregate food consumption trend cannot be easily determined from this study. That will be the future study area. Two possibilities for further researches are the analysis of the seasonal and regional differences in the food consumption pattern. It is observed that there exist distinct seasonal and regional differences in the food consumption pattern. The data used in this study is limited to the July data. It is interesting to analyze using other months and investigate the effect of regional dummies.

Appendix A: DATA DESCRIPTION

The Family Income and Expenditure Survey (FIES, "*Kakei Chosa*"), conducted by the Statistics Bureau of Japanese Ministry of Public Management, Home Affairs and Posts and Telecommunications, is one of the two comprehensive consumer expenditure surveys in Japan[7]. The purpose of the survey is to create the price indices and to collect information on income and expenditure of households for various kinds of policy planning.

The survey covers households designated as *appropriate households* by the Statistics Bureau. The appropriate households include all households except those engaged in agriculture, forestry and fishery, and one-person households. In the 1990 population census, there are about 29 million *appropriate households* (71.3% of total 40.67 million households). From these 29 million households, sample households are chosen using a stratified three-stage sampling method. Every month about 8,000 households are surveyed. Each household participates for 6 consecutive months. One sixth of the households are then replaced by new households each month. Unlike the Consumer Expenditure Survey (CES) in the U.S., the Statistics Bureau does not release household identification numbers; therefore, it is not possible to keep track of the same household through survey periods. At the beginning of the survey period, data on household characteristics - such as household composition, total annual household income and housing tenure - is collected. Then in the following sixth months, households are asked to report twice a month, both the amount of commodities purchased and the expenditure involved in purchasing each commodity. Two biweekly expenditure data sets reported for each individual household, are then combined to obtain the monthly expenditure of the individual households.

Although the original survey covers all of the individual commodities purchased by each household, the data, which is available here, is limited to the data on detailed food categories and nine aggregated categories - housing, utility, furniture, clothing, health expenses, transportation, education, leisure, and

[7] The other survey is called National Survey of Family Income and Expenditure (NSFIE, "*Zenkoku Shohi Jittai Chosa*"), collected by the same agency every five years. The sample size is 60,000 taken from all households, including one-person households. It covers ten aggregate expenditure categories but not detailed food categories.

other expenditure - and certain other household characteristics. Data on detailed food categories except Food Away From Home includes expenditures, amount purchased and frequency of purchase. For Food Away From Home and the nine aggregated categories, amount purchased is not available.

Household characteristics in the FIES seem to reflect the rapidly aging population in Japan. Compared to U.S. households, the age of the reference person is older (51.6 years old for Japan and 47.7 for U.S.), the percentage of children under 18 in the household is lower (0.78 and 0.69), while the percentage of members over 65 years old in the household is higher (0.47, 0.31). The household size in Japan (3.34) is larger than the household size in the U.S. (2.54). Number of wage earners in the household in Japan is 1.54 and in the U.S., 1.41. Households with housing tenure are 72.4 % of total households in Japan and 61.4 % in the U.S. Average disposable income in Japan is 497,036 yen per month, and in the U.S., $37,920. Saving rate is 28% for Japan, and 6.9% for the U.S.

One drawback of the survey is that it does not include one-person households in the sample. The number of one-person households in Japan is increasing by 19.7% from 1990 to 1995. These households account for 11.24 million, 25.6% of all households in the 1995 Census. Therefore, when applying the results obtained using this survey to the whole population, researchers need to be aware this sample selection problem. Below is a brief comparison of one-person households and the sample in the FIES.

The increase in one-person households is caused by both increases in households of a young, single population, who used to stay at home with their parents until marriage, and households of older population, who used to be included in their children’s households as extended family. Thus, the distribution of one-person households is V shaped. Responding to this increase, the Statistics Bureau, Management and Coordination Agency started to conduct a survey called “The Income and Expenditure Survey for one-person households (IES)” every month since January 1995. Several characteristics of one-person household can be noted from the survey. The following numbers are taken from 1998 wave of IES. The average age of the reference person is younger (48.6 year old) in IES than the average age of the reference person in FIES. About half of the sample is female, 50 % of who are more than 60 years old.

The male sample is biased towards the younger generation. About 60 % of the households are worker households. Only the average income for worker households is obtained, and this is reported to be 283,443 yen per month. The saving rate is slightly higher (29.2%) than in the FIES. The only expenditure in which the one-person households exceed appropriate households in the nominal level is housing expense. It is reported that quite different consumption structures are observed for different sex and age group of one-person households. In particular, the impact of one-person households on Food Away from Home and prepared food demand is large, since these households are the major consumers of these goods.

Table 1. Description of Variables: Expenditure Shares, Expenditure and Prices

		Mean	S.D.	Minimum	Maximum
Expenditure Share					
w 1	Expenditure share of Bread	0.060	0.048	0.000	0.495
w 2	Expenditure share of Noodle	0.054	0.063	0.000	0.711
w 3	Expenditure share of Fresh Fish and Shell Fish	0.124	0.086	0.000	0.740
w 4	Expenditure share of Fresh Meat	0.129	0.081	0.000	0.853
w 5	Expenditure share of Milk	0.055	0.051	0.000	0.595
w 6	Expenditure share of Eggs	0.018	0.015	0.000	0.201
w 7	Expenditure share of Fresh Vegetables	0.153	0.078	0.000	0.755
w 8	Expenditure share of Bean Products	0.020	0.015	0.000	0.177
w 9	Expenditure share of Fresh Fruits	0.091	0.089	0.000	0.807
w 10	Expenditure share of Prepared Foods	0.209	0.129	0.000	0.969
w 11	Expenditure share of Glutinous Rice	0.087	0.093	0.000	0.578
Expenditure					
lnx	Log of household total food expenditure	-0.991	0.493	-4.546	1.072
Price					
lnp 1	Log price of Bread	-1.154	0.788	-3.564	2.235
lnp 2	Log price of Noodle	0.279	0.430	-1.656	2.558
lnp 3	Log price of Fresh Fish and Shell Fish	-1.079	0.482	-3.484	2.181
lnp 4	Log price of Fresh Meat	-1.064	0.394	-2.733	1.574
lnp 5	Log price of Milk	-0.843	0.290	-1.950	0.629
lnp 6	Log price of Eggs	-0.693	0.467	-5.763	2.086
lnp 7	Log price of Fresh Vegetables	-0.121	0.345	-1.754	2.277
lnp 8	Log price of Bean Products	-1.608	0.322	-3.684	-0.230
lnp 9	Log price of Fresh Fruits	-0.015	0.539	-2.343	2.338
lnp 10	Log price of Prepared Foods	-0.052	0.471	-2.012	2.301

All Prices are normalized by the price of glutinous rice

Table 2. Description of Variables: Household Demographics - Continued

		Mean	S.D.	Min.	Max.
Hage1	Dummy for households whose head's age younger than 35 years old	0.125	0.330	0	1
Hage2	Dummy for households whose head's age between 35-45 years old	0.207	0.405	0	1
Hage3	Dummy for households whose head's age between 45-55 years old	0.249	0.432	0	1
Hage4	Dummy for households whose head's age older than 55 years old	0.420	0.494	0	1
HS2	Dummy for couple households	0.349	0.477	0	1
HS3	Dummy for households with 3 family members	0.242	0.428	0	1
HS4	Dummy for households with 4 or more family members	0.409	0.492	0	1
dold	Dummy for households with at least one household member 65+	0.318	0.466	0	1
dsingl	Dummy for single parent households	0.052	0.223	0	1
child3	Dummy for households with children yonger than 6 years old	0.177	0.382	0	1
child18	Dummy for households with children between 6-12 years old	0.191	0.393	0	1
wwife	Dummy for households with working wife	0.217	0.412	0	1
citys	Dummy for households living in small size cities	0.160	0.367	0	1
citym	Dummy for households living in medium size cities	0.519	0.500	0	1
cityl	Dummy for households living in large size cities	0.191	0.393	0	1
cityv	Dummy for household living in villages	0.130	0.336	0	1
reg1	Dummy for Kanto region	0.255	0.436	0	1
reg2	Dummy for Hokuriku region	0.066	0.248	0	1
reg3	Dummy for Tokai region	0.093	0.290	0	1
reg4	Dummy for Kinki region	0.136	0.343	0	1
reg5	Dummy for Chugoku region	0.083	0.276	0	1
reg6	Dummy for Shikoku region	0.060	0.238	0	1
reg7	Dummy for Kyushu, Okinawa region	0.167	0.373	0	1
reg8	Dummy for Hokkaido, Tohoku region	0.140	0.347	0	1

Table 3. Specification Test QUAIDS vs. AIDS

Wald test statistics for the hypothesis that the given set of parametres is jointly zero

	statistics	P-value
Chi squared (d.f.=10)	338.1	[.000]

	Parameter Estimate	Standard Error	t-statistic	P-value
Lambda 1	-0.0023	0.00103	-2.2	[.025]
Lambda 2	-0.0030	0.00151	-2.0	[.049]
Lambda 3	0.0015	0.00185	0.8	[.412]
Lambda 4	0.0004	0.00181	0.2	[.815]
Lambda 5	-0.0021	0.00125	-1.7	[.097]
Lambda 6	0.0000	0.00036	0.0	[.973]
Lambda 7	-0.0036	0.00177	-2.0	[.045]
Lambda 8	0.0004	0.00038	1.1	[.251]
Lambda 9	0.0262	0.00151	17.4	[.000]
Lambda 10	-0.0102	0.00253	-4.0	[.000]
Lambda 11	-0.0074	0.00236	-3.2	[.002]

Lambda # is the coefficient of the income quadratic terms.

Table 4. Estimated Expenditure Elasticities: Base Households, July

	Elasticity Estimate	t-stat.	P-value
Bread	1.0321	35.4	[.000]
Noodle	1.0402	19.5	[.000]
Fish	1.0057	22.7	[.000]
Meat	1.0078	36.9	[.000]
Milk	0.9907	25.1	[.000]
Egg	0.9586	25.6	[.000]
Fresh Vegetables	1.2215	41.9	[.000]
Bean Products	0.7445	14.9	[.000]
Fresth Fruits	1.5304	26.9	[.000]
Prepared Fods	0.7828	27.7	[.000]
Glutinous Rice	0.7089	10.0	[.000]

* All elasticities are evaluated at group means.

Table 5. Estimated Compensated Price Elasticities: Base Households, July

	Bread	Noodle	Fish	Meat	Milk	Egg	Fresh Vegetables	Bean Products	Fresh Fruits	Prepared Foods	Rice
Bread	-0.7199	0.0475	0.1162	0.0926	0.0293	0.0121	0.1002	0.0143	0.0440	0.1669	0.0968
	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]
Noodle		-0.2153	0.0033	0.0237	0.0016	-0.0085	0.0760	-0.0207	-0.0131	0.0507	0.0408
		[.000]	[.871]	[.283]	[.934]	[.149]	[.001]	[.001]	[.483]	[.021]	[.223]
Fish			-0.4781	0.1341	0.0552	0.0099	0.0342	-0.0026	0.0349	0.1837	-0.0688
			[.000]	[.000]	[.000]	[.006]	[.029]	[.502]	[.013]	[.000]	[.002]
Meat				-0.4487	-0.0123	0.0002	0.0635	0.0018	0.0733	0.1431	0.0304
				[.000]	[.191]	[.948]	[.000]	[.566]	[.000]	[.000]	[.068]
Milk					-0.3752	0.0096	0.0902	-0.0183	-0.0465	0.1325	0.1235
					[.000]	[.192]	[.000]	[.027]	[.001]	[.000]	[.000]
Egg						-0.4934	0.1326	0.0395	-0.0038	0.1023	0.1254
						[.000]	[.000]	[.005]	[.786]	[.000]	[.001]
Fresh Vegetables							-0.4707	0.0190	-0.0022	0.1115	0.0887
							[.000]	[.000]	[.826]	[.000]	[.000]
Bean Products								-0.3075	-0.0733	-0.0112	0.2754
								[.000]	[.000]	[.598]	[.000]
Fresh Fruits									-0.2806	0.1345	-0.0125
									[.000]	[.000]	[.631]
Prepared Foods										-0.4203	0.0014
										[.000]	[.889]
Rice											-0.4632
											[.000]

* All elasticities are evaluated at group means.

Table 6. Estimated Expenditure Elasticities by Household Head's Age

	Household Head's Age							
	35<		35-45		45-55		55<	
	Elasticity Estimate	t-stat.	Elasticity Estimate	t-stat.	Elasticity Estimate	t-stat.	Elasticity Estimate	t-stat.
Bread	1.0696	33.2	1.0624	33.1	1.0554	25.0	1.0701	20.9
Noodle	1.1070	17.9	1.0934	17.9	1.0526	18.9	1.0672	15.8
Fish	0.9830	17.5	0.9919	24.1	1.0017	33.4	1.0010	35.6
Meat	1.0039	34.9	1.0055	33.0	1.0084	31.8	1.0107	24.4
Milk	1.0324	20.6	1.0257	17.3	0.9937	13.1	0.9977	18.1
Egg	0.9614	25.4	0.9609	26.3	0.9417	18.0	0.9465	19.7
Fresh Vegetables	1.1821	51.4	1.2061	47.2	1.1710	53.6	1.1826	51.0
Bean Products	0.7432	15.1	0.7704	17.9	0.7811	18.7	0.7894	19.8
Fresth Fruits	1.1029	14.0	1.1594	25.0	1.3443	31.6	1.2429	39.7
Prepared Fods	0.8329	26.2	0.8186	27.1	0.7688	24.5	0.7359	20.3
Glutinous Rice	0.8138	9.5	0.7654	8.9	0.7062	9.2	0.7896	14.1

* All elasticities are evaluated at group means.

Table 7. Estimated Expenditure Elasticities by Household Size

	Household Size								
	2			3			4 or more		
	Elasticity Estimate	t-stat.	P-value	Elasticity Estimate	t-stat.	P-value	Elasticity Estimate	t-stat.	P-value
Bread	1.0581	33.7	[.000]	1.0492	33.2	[.000]	1.0322	35.1	[.000]
Noodle	1.0918	17.1	[.000]	1.0684	18.3	[.000]	1.0384	20.3	[.000]
Fish	0.9939	25.2	[.000]	0.9984	22.4	[.000]	1.0056	23.2	[.000]
Meat	1.0062	31.6	[.000]	1.0067	35.6	[.000]	1.0079	36.6	[.000]
Milk	1.0194	18.4	[.000]	1.0050	21.6	[.000]	0.9901	24.0	[.000]
Egg	0.9542	22.6	[.000]	0.9565	24.4	[.000]	0.9591	25.9	[.000]
Fresh Vegetables	1.1959	49.3	[.000]	1.2064	46.8	[.000]	1.2324	40.3	[.000]
Bean Products	0.7502	16.1	[.000]	0.7663	17.5	[.000]	0.7250	13.5	[.000]
Fresth Fruits	1.2219	23.5	[.000]	1.3363	25.9	[.000]	1.5478	26.4	[.000]
Prepared Fods	0.8219	28.9	[.000]	0.8093	29.5	[.000]	0.7868	28.4	[.000]
Glutinous Rice	0.7654	9.6	[.000]	0.7412	9.9	[.000]	0.7270	10.9	[.000]

* All elasticities are evaluated at group means.

Table 8. Estimated Expenditure Elasticities by Household Types

	Base Households		Household Type: Households with Working Wife		Household Type: Single Parent Households		Elderly Households	
	Elasticity Estimate	t-stat.	Elasticity Estimate	t-stat.	Elasticity Estimate	t-stat.	Elasticity Estimate	t-stat.
Bread	1.0321	35.4	1.0317	33.6	1.0509	27.2	1.0236	28.1
Noodle	1.0402	19.5	1.0337	21.3	1.0700	14.6	1.0206	17.5
Fish	1.0057	22.7	1.0067	22.4	1.0021	25.8	1.0100	27.3
Meat	1.0078	36.9	1.0079	37.0	1.0067	39.4	1.0104	30.9
Milk	0.9907	25.1	0.9874	22.1	0.9959	18.6	0.9774	23.2
Egg	0.9586	25.6	0.9562	24.0	0.9483	20.4	0.9559	23.0
Fresh Vegetables	1.2215	41.9	1.2557	36.9	1.1973	47.5	1.2111	39.9
Bean Products	0.7445	14.9	0.7005	11.9	0.7339	14.5	0.7690	15.8
Fresth Fruits	1.5304	26.9	1.6256	25.2	1.4924	24.4	1.6535	29.4
Prepared Fods	0.7828	27.7	0.8079	32.7	0.7858	27.0	0.7682	27.0
Glutinous Rice	0.7089	10.0	0.7204	10.8	0.8069	16.0	0.6940	10.3

* All elasticities are evaluated at group means.

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