Economics Bulletin

Volume 37, Issue 1

Sweets or Alcohol? The Gender Battle within Japanese Families

Xiangdan Piao
Hitotsubashi university

Abstract

This paper provides a new perspective from which to understand intra-household food allocation by examining how gendered differences in food preferences and wives' share of household income—a proxy for wives' bargaining power—influence food allocation. In a two-stage estimation in this study, single households were used to identify whether men and women have different food preferences, and then, households consisting of couples were used to examine how wives' share of household income affects household food allocation. The estimation results show that an increase in wives' share of household income increases the share of expenditure on the sweet foods preferred by women and decreases the share of expenditure on the drinks and alcohol preferred by men. Regarding food eaten inside and outside the home, the share of total expenditure on eating out of households with full-time working wives is increased and the purchases of vegetables and seafood are decreased. These results indicate that a potential disadvantage of increasing the number of female married full-time workers is lower-quality household diets due to increased eating out and reduced spending on vegetables.

Financial support from the JSPS Grants-in Aid for Young Scientists (S) 21673001 is gratefully acknowledged. I would like to thank Naohito Abe, Daiji Kawaguchi, Emiko Usui, Xinxin Ma, Hirokazu Ishise, Shota Araki, Hiroshi Morita, and seminar and conferences participants for their useful discussion and comments. I would like to thank the two anonymous referees and the Stephane Mussard (editor). Finally, I am grateful to Scribendi and Philip MacLellan for English editing service.
Citation: Xiangdan Piao, (2017) "Sweets or Alcohol? The Gender Battle within Japanese Families", *Economics Bulletin*, Volume 37, Issue 1, pages 190-203
Contact: Xiangdan Piao - piaoxiangdan123@gmail.com.
Submitted: June 08, 2016. **Published:** January 17, 2017.

1. Introduction

Exploring the determinant of food allocation is important for diet quality, which influences nutrition intake and consequently public health. If men and women have different food allocations (or diet quality) due to different preferences, then exploring how different preferences and couples' bargaining influence the final decision on food allocation would provide policymakers with beneficial data to improve overall public health.

Previous research focused on working wives and their food allocation, with some researchers report that a positive correlation exists between working wives and eating more outside home and reductions in home cooking (Kohara and Kamiya 2016; Nayga 1996; Phipps and Burton 1998; Yen 1993). Other researchers have focused on diet quality. Beydoun *et al.* (2009) argued that the downside of eating outside home more often is the reduction in diet quality, and Jaworowska *et al.* (2013) showed that increasing consumption of fast food and take-out food negatively correlates with health.

This paper provides a new perspective from which to understand intra-household food allocation by focusing on how gender differences in food preferences and wives' income share—a proxy for wives' bargaining power—influence food allocation. Wives' income share can be used as a proxy for their bargaining power because researchers have shown that couples' relative income positively affects their relative expenditure (Browning *et al.* 1994; Cherchye *et al.* 2012) based on the collective model. Proposed by Chiappori (1992), this model allows researchers to explore the relation between household members' expenditures and preference heterogeneity. The collective model describes household-level decisions as made by maximizing the aggregate household utility, which is the weighted sum of a member's utility. These weights (i.e., bargaining power) are assumed to be determined by relative income, relative age, and other characteristics.

The present study followed the method applied by Hayashi (1995), who investigated differences in decision processes among generations and used data from the National Survey of Family Income and Expenditure (NSFIE), which collects Japanese households' daily account books. In the present study, I examined data for single households and investigated whether gender differences in food preferences exist. The resulting differences were then used to interpret the wives' income share in the second stage of the study, in which I examined whether the wives' income share affects the share of female-preferred food consumed by households using data on couples without other family members (e.g., children).

The results of the present study are as follows. First, an increase in the wives' income share results in increased purchases of female-preferred sweet foods that do not require time for preparation and decreased purchases of male-preferred drinks and alcohol. Second, women tend to consume less when they eat out and to purchase more vegetables and seafood than men. However, compare with households run by housewives, in households with full-time working wives the share of total expenditure on eating out is increased and purchases of vegetables and seafood are reduced. This result implies that the increasing number of full-time married female workers likely has caused a decrease in the quality of household diets and that women's dietary habits of eating out and vegetable consumption do not significantly influence couple households.

The Japanese government encourages married women to work more to promote economic growth. Because increased dining out decreases the quality of one's diet (Beydoun *et al.* 2009), the policy implications include, for example, that married husbands should be encouraged to prepare more meals, as Baxter and Tai (2016) showed that married men perform less housework

than married women. In addition, food service industries, such as restaurants, should provide meals that have more vegetables.

This paper is structured as follows. Section 2 describes the data, while section 3 explains the econometric methodology. Section 4 reports the results. Finally, section 5 contains the conclusions and implications of this study.

2. Data

The data used in this research were obtained from the NSFIE, a survey conducted every five years using households' daily account books. The data contain detailed information on demographics and households' income, savings, and expenditures. This study used survey data from 2004.

Married couples without children or other household members were selected as couple households. Single households included only one member, either male or female. Observations with missing information on wealth, income, food expenditure, or important demographics were excluded. Table I shows the sample statistics with individuals younger than 65 years old, while sample statistics from all single households and all couple households are shown in Appendix A. The statistics on food expenditure and the food expenditure categories for the households younger than 65 years old and the total sample are the same.

On average, single women spend more on sweets, vegetables, dairy products, and seafood than single men do. Based on the statistics from single female households and single male households, I found that of the total food expenditure single women spend 10.1% on sweets, 15.8% on vegetables. 4.2% on dairy products, and 6.3% on seafood. In contrast, single men spend 4.5% on sweets, 4.9% on vegetables, 2.0% on dairy products, and 2.6% on seafood. However, single women spend less on eating out, drinks, and alcohol than their single male counterparts do. Of the total food expenditure, single female households spend 39.6% and 10.3% on eating out and drinks and alcohol. Single male households spend 62.7% and 15.4% on eating out and drinks and alcohol, respectively. Single female households spend less on food (JPY 36,481) than single male households do (JPY 49,334); see Table I.

For household demographics, single women and wives are more likely than single men and husbands to engage in part-time work, 14.4% and 22.3%, respectively. Only 2.1% and 3.8% of single men and husbands work part-time, respectively. Of married wives, only 24.7% are employed full-time, while 61.6% of single women work full-time. For annual income (or monthly real income), single female households and single male households, on average, gain JPY 2.9 million (monthly JPY 195,640) and JPY 4.2 million (monthly JPY 284,703), respectively. For couple households, the wife's income share accounts for only 25.5% of the total household income. Monthly receipt incomes include real and non-real incomes (e.g., cashed saving deposits; see Table I).

Table I: Sample Statistics of Individual's Age Younger Than 65 Years Old

	Single Woman		Single Man		Couple	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Sweets (%)	10.130	7.447	4.486	4.659	7.705	4.773
Drinks and alcohol (%)	10.266	8.064	15.370	11.075	11.387	7.693
Dairy products (%)	4.194	3.737	1.980	2.569	4.104	2.858

Table I.
(continued)

Eating out (%)	39.626	20.367	62.702	21.439	31.111	15.973
Vegetables (%)	15.758	11.472	4.875	7.364	18.366	8.588
Seafood (%)	6.322	6.352	2.582	4.257	9.948	6.015
Other (%)	13.703	8.755	8.004	7.911	17.380	8.426
Food expenditure (¥)	36481.790	19183.940	49334.260	25632.650	64997.710	26924.490
Woman (or wife) works full-time dummy	0.616	0.486			0.247	0.431
Woman (or wife) works part-time dummy	0.144	0.352			0.223	0.416
Man (or husband) works full-time dummy			0.899	0.302	0.757	0.429
Man (or husband) works part-time dummy			0.021	0.144	0.038	0.192
Man's (or husband) age			36.868	12.810	51.548	11.679
Woman's (or wife) age	45.169	15.260			49.380	11.537
Annual household income ≥JPY 6 million dummy	0.071	0.257	0.165	0.372		
Annual household income ≥ JPY 7 million dummy	0.037	0.190	0.115	0.319		
Annual household income ≥ JPY 10 million dummy					0.126	0.332
Annual household income ≥ JPY 15 million dummy					0.020	0.141
Three major metropolitan areas	0.391	0.488	0.542	0.498	0.402	0.490
Woman's (or wife's) occupation						
Blue-collar worker	0.249	0.433			0.194	0.396
White-collar worker in the private sector	0.302	0.459			0.167	0.373
White-collar worker in the public sector	0.144	0.352			0.074	0.262
Other	0.065	0.246			0.034	0.181
Unemployed	0.239	0.427			0.530	0.499
Man's (or husband's) occupation						
Blue-collar worker			0.256	0.436	0.283	0.451
White-collar worker in the private sector			0.396	0.489	0.347	0.476
White-collar worker in the public sector			0.207	0.405	0.158	0.365
Other			0.062	0.240	0.006	0.078
Unemployed			0.080	0.271	0.205	0.404
Wives' income share					0.255	0.254
Monthly receipt income (¥)	430451.400	308495.000	501763.700	300343.100	874058.000	656798.100
Monthly real income (¥)	195640.800	132474.200	284703.800	155827.500	424830.600	428572.900
Realized capital gain (¥)	130.137	4306.335	2108.348	70340.230	473.021	17937.840
Household year income (10,000 ¥)	291.149	179.197	420.095	206.231	634.180	324.070
Household net financial asset (10,000 ¥)	729.030	1246.103	339.644	864.550	1095.089	1897.369
Observation	1095		1138		5184	

Notes: Monthly receipt income includes monthly real income and non-real income. Non-real income includes cashed saving deposits, sale property, debt, and insurance proceeds. The categories are divided as follows: "sweets" include Japanese cakes, candies, Western cakes, and similar items; "eating out" includes cooked food and general meals eaten outside the home; "vegetables" include vegetables and fruits; "drinks and alcohol" include alcoholic and non-alcoholic beverages; "dairy products" include eggs and dairy products; "seafood" includes fish and shellfish; and "other" includes meat and cereals.

3. Econometric Methodology

Following Hayashi's (1995) approach, I observed single households to investigate whether gender differences in food preferences exist. I then used observations of couple households to explore the relation between women's food preferences and wives' income share. The reason for this two-stage procedure was that the data set used (i.e., the NSFIE) contains only household-level records of expenditures for each detailed food category (e.g., cost of total fish bought) rather than individual-level observations (e.g., cost of fish consumed per family member).

Unfortunately, the data do not include information about time use. If the data had included this information, I could have included households' labor supply more directly. The lack of these data forced me to omit the labor supply time and to adopt Hayashi's (1995) method of using full-time and part-time work dummy variables as proxies for labor supply. Japanese wives who are housewives receive a tax benefit when their annual income is less than JPY 1.3 million. The part-time working dummy variable helps to remedy this problem because part-time working wives attempt to keep their income under JPY 1.3 million.

Individuals with higher education are likely to be more conscious of health; however, the NSFIE does not investigate education. Therefore, an individual's educational attainment cannot be controlled directly. Because Kohara and Kamiya (2016) shows that high-income households tend to eat healthier food, the high-income dummy was selected as the proxy variable for education. The estimation results using different high-income levels and the results are reported in the estimation results.

The Engel curve for single households is as follows. The functional form of Hayashi's (1995) Engel curve, which was derived from Christensen *et al.* (1975) and Deaton and Muellbauer (1980), is designated as:

$$c_{ij} = \boldsymbol{z}'_i \alpha_j + \beta_j \log(x_i) + u_{ij} \quad (1)$$

in which c_{ij} is the percentage of the jth food category for household i. The food categories are as follows: sweets, seafood, eating out, vegetables, dairy products, drinks and alcohol, and other. In this formula, x is the food expenditure, u is the error term, and $\boldsymbol{z}$ is the dummy for full-time work. It also serves as the dummies for part-time work, occupation, three major metropolitan areas, and an annual income greater than JPY 7 million (the proxy for education), as well as age, the female dummy, and a constant. The female dummy was used to capture the preference differences between men and women. I estimated the food Engel curve demand system using the generalized method of moments (GMM; see Hayashi 2000).

Due to the omission of price information, food expenditure (x) is an endogenous variable. For example, if an individual has a meal in a luxurious restaurant, then the expenditure share for eating out will be larger than normal. The same will be true for other food expenditures. As a result, restaurant prices are likely to be correlated with food expenditure and the expenditure share of eating out.

In principle, income is an instrumental variable (Browning *et al.* 2013; Hayashi 1995). Furthermore, two instrumental variables—monthly income[1] and realized capital gain—were selected for the endogenous variable food expenditure.

[1] Monthly receipt income or monthly real income.

Following Hayashi's (1995) lead, in the couple households' Engel curves, food expenditures are summations of wives and husbands' expenditures, calculated as follows:

$$c_{ij} = \alpha_j^h + \beta_j \log(x_i) + \left(\alpha_j^w - \alpha_j^h\right)\lambda_i + \lambda_i \log(\lambda_i) + (1-\lambda_i)\log(1-\lambda_i) + u_{ij} \quad (2)$$

in which $u_{ij} = \lambda_i u_{ij}^w + (1-\lambda_i)u_{ij}^h$, $\lambda_i = x_i^w / x_i$ is the wives' real share of the food expenditure (i.e., wives' bargaining power), which cannot be observed. In this formula, w and h denote wives and husbands, respectively. Furthermore, $x_i = x_i^w + x_i^h$ is the total food expenditure for household i, while j is the jth food category, and c_{ij} is the percentage of the jth food of household i. As previously, the food categories are sweets, seafood, eating out, vegetables, dairy products, drinks and alcohol, and other.

The term $(\alpha^w{}_j - \alpha^h{}_j)$ represents the gender differences in food preferences. I used the wives' income share instead of their unknown real share of the food expenditure and compared the coefficients of the female dummy—used to capture gender differences in food preferences—and the coefficients of the wives' income share. Using the wife's income share as a proxy for the wives' true expenditure share of food is deemed valid because food is a normal good.

Both $\lambda_i \log(\lambda_i)$ and $(1-\lambda_i)\log(1-\lambda_i)$ are unobservable. These two terms can be defined with the function $\psi(\lambda_i) = \lambda_i \log(\lambda_i) + (1-\lambda_i)\log(1-\lambda_i)$. If the coefficients of the wives' income share are close to the female dummy from (1), then the results support the argument that the wives' income share is positively correlated with female-preferred food expenditure.

In this study, I examined whether the wives' income share positively affects their preferred food expenditure. However, $\psi(\lambda_i)$ and λ_i are unobservable from the data. As a result, (2) could not be estimated directly. To address this problem, I conducted two estimations. First, based on Hayashi's (1995) method, I added wives' income share ($\hat{\lambda}_i$) as an approximation indicator of the wives' true food expenditure share (λ_i) to the base model $c_{ij} = \boldsymbol{z}'_i \alpha_j + b_j \log(x_i) + u_{ij}$. Second, I estimated (4) as the bias correction. If the wives' income share positively, or negatively, is correlated with λ_i and simultaneously, $\psi(\lambda_i)$ is omitted in u_{ij} (i.e., (3)), then $\hat{\lambda}_i$ creates endogeneity due to the correlation between λ_i and $\psi(\lambda_i)$. As a bias correction, c_{ij} was replaced by $w_{ij} = c_{ij} - \psi\left(\hat{\lambda}_i\right)$ in (3) to estimate (4) as follows[2]:

$$c_{ij} = \boldsymbol{z}'_i a_j + b_j \log(x_i) + k_j \hat{\lambda}_i + u_{ij} \quad (3)$$

$$w_{ij} = \boldsymbol{z}'_i \tilde{a}_j + \tilde{b}_j \log(x_i) + \tilde{k}_j \hat{\lambda}_i + u_{ij} \quad (4)$$

Thus, c_{ij} is the percentage of the jth food of household i, while $\boldsymbol{z}$ includes the dummy for wives' full-time work status, the dummy for wives' part-time work status, the dummy for husbands' full-time work status, and the dummy for husbands' part-time work status. In addition, $\boldsymbol{z}$ contains variables for wives' occupations, husbands' occupations[3], three major metropolitan areas, wives' age, husbands' age, a constant, and an annual household income greater than JPY 10 million. Furthermore, x_i is the household food expenditure. I estimated the system food Engel curves using the GMM. The food expenditure is, again, an endogenous variable, and the instrumental variables are monthly income and realized capital gain.

4. Estimation Results

[2] I changed $\hat{\lambda}_i$ and (1- $\hat{\lambda}_i$), which reports zero into 0.000001, in order to calculate $\psi\left(\hat{\lambda}_i\right)$.

[3] The robustness results are obtained either from controlling for the head of the household or the husband's occupation or the wife's occupation.

The GMM estimation results for (1) are displayed in Table II, using data for single households with single adults younger than 65 years old from the NSFIE. The female dummy coefficients for sweets, seafood, vegetables, and dairy products are positive, while those for eating out and drinks and alcohol are negative. All coefficients are statistically significant. That is, on average, women consume higher percentages than men do of sweets, seafood, vegetables, and dairy products and lower percentages than men do of food eaten outside the home and drinks and alcohol. Single women's and single men's full-time and part-time work dummies capture the effects of work status. Single women's full-time work status suggests that workers eat out more and consume more drinks and alcohol. The age coefficients for sweets, eating out, and drinks and alcohol are negative, while those for seafood, vegetables, and dairy products are positive.

Table III reports the GMM estimation results for (4) using couple households in which the husband and the wife were younger than 65 years old. The coefficients for the wives' income share for sweets, dairy products, and drinks and alcohol have the same signs as those for the female dummy shown in Table II. However, opposite signs appear for the categories seafood, eating out, and vegetables. Wives' full-time work status influences couple households' share of eating out in the total household food expenditure.

I performed two kinds of robustness checks. First, I changed the sample: Table IV shows the results from (1) using the total single households,[4] and Table V shows the GMM estimation results for the bias correction for (4) using the total couple households.[5] Table VI shows the results when the husband and the wife are younger than 60 years old.

Second, I performed a robustness check by changing the control variables and the instrumental variables. The control variables are wives' age, husbands' age, the dummy for wives' full-time work status, wives' part-time work status, the dummy for husbands' full-time work status, the dummy for husbands' part-time work status, and annual household income greater than JPY 15 million (the proxy for education).[6] Table VII shows the GMM estimates of the food Engel curves for the couple households with the correct estimation in (4) and the same instrumental variables as Hayashi (1995). The instrumental variables for food expenditure are annual household income, realized capital gain, and net financial assets. Table VIII displays the results from estimating the bias correction in (4) using the changed control variables. Table IX shows the results from estimating the non-correct estimation equation in (3) using the changed control variables.

The estimation results show that the wives' income share increases purchases of female-preferred sweets and decreases purchases of drinks and alcohol preferred by men. Regarding food eaten inside and outside the home, the wives' full-time work dummy and the wives' income share increase the share of eating out in the total household food expenditure and decrease the share of vegetable purchases compared to households with housewives.

5. Conclusions and Implications

[4] I tried other high-income dummies in an upper rank (10% or 25% or JPY 6 million), and the robustness results were obtained.

[5] To check whether the results are due to the outlier of food expenditure, the observations from the couple households' consumption of the upper 1% and lower 1% of food expenditure are deleted. Once I had done this, I could declare the results were robust.

[6] I tried other high-income dummies in an upper rank (10% or 25%), and the robustness results were obtained.

This paper provides a new perspective from which to understand intra-household food allocation by focusing on how gender differences in food preferences and wives' bargaining power (i.e., wives' income shares) influence food allocation. The method applied followed Hayashi's (1995) two-stage procedure for estimation and used NSFIE data, which are collected from Japanese households' daily account books.

The empirical results indicate that the wives' income share is positively correlated with female-preferred sweets and negatively correlated with male-preferred drinks and alcohol. This result is consistent with the collective model proposed by Chiappori (1992), which takes into consideration households with multiple members who have different preferences. Although the estimation results for married couples' food at home (e.g., seafood and vegetables) and food eaten outside the home fail to support the collective model's predictions, this result does not necessarily imply that the collective model is inconsistent with the data. One possible reason behind these seemingly inconsistent results is the existence of a gender bias in unpaid work. Japanese women might be socially expected to engage in more unpaid work, such as housework, than Japanese men are.

These empirical results show that women tend to spend less on the total household food expenditure on eating out and to purchase more vegetables and seafood than men. However, the wives' full-time work dummy and the wives' income share increase the share of eating out in the total household food expenditure and decrease the share of food in home purchases compared to households with housewives. In summary, compared to households run by housewives, households with full-time working wives have higher shares of eating out in the total expenditure and lower purchases of vegetables and seafood and that women's dietary habits of eating out and vegetable purchases do not statistically significantly influence couple households.

The results of this study imply that the increasing number of female married full-time workers likely has caused a decrease in the quality of household diets because increased dining out decreases the quality of one's diet (Beydoun *et al.* 2009). To promote economic growth, the Japanese government has encouraged more married women to work. The policy implications include, for example, that married husbands should be encouraged to prepare more meals, considering Baxter and Tai (2016) showed that married husbands do less housework than married women. In addition, the food service industry, such as restaurants, should provide meals that have more vegetables.

This study has several limitations. The first is due to the omitted time and education information. The omitted variables are released by controlling the proxy variables, according to previous literature. However, the proxy variables probably cannot resolve all problems; the endogeneity problem still exists. Second, I selected married households without children because children's food preferences cannot be identified. Because children's diet quality is also important, further work is necessary to explore the diet quality of couples with children.

Table II: GMM Estimates of Food Engel Curves for Single Households Younger Than 65 Years Old (2,233)

	Sweets		Drinks and Alcohol		Dairy Products		Eating Out		Vegetables		Seafood	
Female dummy	5.708***	(0.645)	–5.453***	(1.315)	1.418***	(0.469)	–9.956***	(1.907)	7.034***	(1.276)	1.392**	(0.629)
Woman works full-time dummy	–1.104	(0.711)	2.565**	(1.095)	–0.859**	(0.413)	7.473***	(1.856)	–4.673***	(1.047)	–2.056***	(0.603)
Woman works part-time dummy	–0.318	(0.998)	0.432	(1.441)	–0.310	(0.519)	5.204**	(2.422)	–2.077	(1.299)	–1.622**	(0.793)
Man works full-time dummy	–1.570**	(0.728)	1.929	(1.679)	–0.487	(0.488)	7.081***	(2.524)	–2.633*	(1.383)	–1.562**	(0.720)
Man works part-time dummy	–1.955**	(0.942)	1.435	(3.064)	–0.590	(0.748)	8.011*	(4.838)	–2.316	(1.839)	0.238	(1.368)
Age	–0.079***	(0.016)	–0.019	(0.025)	0.037***	(0.009)	-0.678***	(0.042)	0.352***	(0.019)	0.194***	(0.012)
Year income ≥ JPY 7 million dummy	0.193	(0.429)	0.225	(0.876)	0.093	(0.225)	1.769	(1.544)	–1.754***	(0.597)	-0.267	(0.463)
Occupation												
Blue-collar worker	0.243	(0.613)	0.863	(1.228)	–0.052	(0.360)	–3.771**	(1.833)	–0.650	(0.874)	1.103**	(0.497)
White-collar worker in the private sector	–0.183	(0.691)	–1.243	(1.273)	0.361	(0.412)	0.041	(1.954)	–0.529	(0.973)	0.667	(0.542)
White-collar worker in the public sector	0.094	(0.750)	–2.497*	(1.342)	0.296	(0.423)	0.661	(2.082)	-0.211	(0.999)	0.817	(0.560)
Three major metropolitan areas	–0.324	(0.329)	–1.508***	(0.492)	0.109	(0.167)	1.341	(0.821)	0.175	(0.392)	–0.466**	(0.238)
Log(food expenditure)	1.334	(2.803)	–1.022	(3.809)	–5.275***	(1.445)	45.220***	(6.380)	–11.433***	(3.168)	–6.571***	(2.082)
Constant	2.796	(11.994)	20.634	(16.183)	25.282***	(6.177)	–128.683***	(26.871)	47.862***	(13.507)	26.881***	(8.822)
Hansen's J $\chi^2(6) = 1.36718$ ($p = 0.9678$)												

Note: Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The instrument variables are monthly real income and realized capital gain.

Table III: GMM Estimates of Food Engel Curves for Couple Households Younger Than 65 Years Old with the Correct Estimation Equation (5,184)

	Sweets		Drinks and Alcohol		Dairy Products		Eating Out		Vegetables		Seafood	
Wife's income share	2.148***	(0.795)	–3.399***	(1.031)	0.799**	(0.385)	5.884***	(1.980)	–0.689	(1.107)	–1.094	(0.700)
Wife works full-time dummy	–0.803**	(0.401)	–0.510	(0.563)	–0.034	(0.242)	2.138*	(1.206)	–0.431	(0.693)	–1.267***	(0.420)
Wife works part-time dummy	0.335	(0.504)	–0.957	(0.666)	0.141	(0.270)	0.315	(1.373)	0.633	(0.785)	–1.547***	(0.488)
Husband works full-time dummy	0.865	(1.224)	0.767	(1.810)	0.132	(0.640)	1.152	(2.862)	-0.862	(1.565)	–2.261**	(1.004)
Husband works part-time dummy	0.761	(1.305)	1.836	(1.906)	0.490	(0.674)	-0.782	(3.056)	-0.315	(1.692)	–2.779**	(1.109)
Husband's age	–0.049	(0.039)	–0.041	(0.033)	0.001	(0.011)	–0.417***	(0.069)	0.179***	(0.036)	0.182***	(0.027)
Wife's age	–0.069**	(0.031)	–0.018	(0.031)	0.016	(0.010)	–0.384***	(0.064)	0.229***	(0.033)	0.102***	(0.025)
Year income≥ JPY 10 million dummy	–0.463	(0.522)	–0.546	(0.429)	–0.242*	(0.144)	1.443	(0.950)	0.486	(0.498)	–0.180	(0.375)
Wife's occupation												
Blue-collar worker	–0.176	(0.518)	2.753***	(0.696)	–0.459	(0.280)	–1.019	(1.404)	–1.580*	(0.808)	1.648***	(0.505)
White-collar worker in the private sector	–0.321	(0.575)	1.683**	(0.688)	–0.504*	(0.264)	1.733	(1.422)	–1.653**	(0.802)	0.805	(0.500)
White-collar worker in the public sector	–0.493	(0.730)	1.482*	(0.778)	–0.341	(0.297)	1.027	(1.639)	–1.797**	(0.912)	1.448**	(0.602)
Husband's occupation												
Blue-collar worker	–0.476	(1.224)	–1.696	(1.844)	–0.142	(0.661)	1.517	(2.951)	-0.740	(1.594)	2.486**	(1.030)
White-collar worker in the private sector	–0.623	(1.333)	–3.090*	(1.867)	0.063	(0.669)	2.371	(3.029)	0.540	(1.635)	2.165**	(1.076)
White-collar worker in the public sector	–0.467	(1.421)	–2.639	(1.880)	–0.093	(0.680)	1.839	(3.106)	0.621	(1.673)	2.358**	(1.107)
Three major metropolitan areas	–0.579**	(0.287)	–0.777***	(0.251)	–0.047	(0.087)	3.201***	(0.544)	–0.567**	(0.284)	–1.015***	(0.213)
Log(food expenditure)	14.152*	(8.380)	6.922*	(4.137)	–3.468***	(1.319)	45.469***	(11.307)	–20.766***	(5.756)	–8.532*	(4.920)
Constant	–54.038	(37.062)	–16.528	(18.310)	19.908***	(5.828)	–151.422***	(50.082)	98.733***	(25.466)	37.225*	(21.741)
Hansen's J $\chi^2(6) = 4.44537$ ($p = 0.6166$)												

Note: Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The instrument variables are monthly real income and realized capital gain.

Table IV: GMM Estimates of Food Engel Curves for the Total Single Households (3,932)

	Sweets		Drinks and Alcohol		Dairy Products		Eating Out		Vegetables		Seafood	
Female dummy	4.697***	(0.365)	–5.116***	(0.587)	1.253***	(0.246)	–7.069***	(0.816)	6.319***	(0.640)	0.627*	(0.349)
Woman works full-time dummy	–0.590	(0.531)	1.465**	(0.670)	–0.674**	(0.284)	0.876	(1.211)	–2.195***	(0.748)	0.068	(0.512)
Woman works part-time dummy	–0.544	(0.809)	0.070	(1.014)	–0.336	(0.398)	–3.789**	(1.769)	1.643	(1.032)	0.624	(0.678)

Note: The instrument variables are monthly real income and realized capital gain. Hansen's J $\chi^2(6) = 1.90698$ ($p = 0.9281$). Robust standard errors are in parentheses. Other control variables are man works full-time dummy, man works part-time dummy, age, year income ≥ JPY 7 million dummy, blue-collar worker, white-collar worker in the private sector, white-collar worker in the public sector, three major metropolitan areas, Log(food expenditure), and constant. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table V: GMM Estimates of Food Engel Curves for Total Couple Households with the Correct Estimation Equation (10,982)

	Sweets		Drinks and Alcohol		Dairy Products		Eating Out		Vegetables		Seafood	
Wife's income share	1.222**	(0.609)	–2.642***	(0.794)	0.982***	(0.322)	2.568*	(1.528)	0.535	(0.868)	–0.659	(0.610)
Wife works full-time dummy	–0.426	(0.305)	0.006	(0.385)	–0.327*	(0.184)	1.054	(0.748)	–0.886*	(0.470)	–0.217	(0.328)
Wife works part-time dummy	0.223	(0.389)	–0.301	(0.507)	–0.139	(0.219)	–1.930**	(0.966)	0.809	(0.571)	–0.232	(0.404)

Note: The instrument variables are monthly real income and realized capital gain. Hansen's J $\chi^2(6) = 6.97366$ ($p = 0.3233$). Other control variables are husband works full-time dummy, husband works part-time dummy, husband's age, wife's age, year income ≥ JPY 10 million dummy, wife's occupation (blue-collar worker, white-collar worker in the private sector, white-collar worker in the public sector), husband's occupation (blue-collar worker, white-collar worker in the private sector, white collar worker in the private sector), three major metropolitan areas, Log(food expenditure), and constant. Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table VI: GMM Estimates of Food Engel Curves for Couple Households Younger Than 60 Years Old with the Correct Estimation Equation (3,334)

	Sweets		Drinks and Alcohol		Dairy Products		Eating Out		Vegetables		Seafood	
Wife's income share	1.402	(0.984)	–2.318	(1.439)	0.248	(0.440)	7.556***	(2.688)	–3.197**	(1.352)	–1.254	(0.935)
Wife works full-time dummy	–1.299***	(0.489)	–0.547	(0.721)	0.031	(0.343)	3.779**	(1.829)	–0.672	(0.858)	–1.348**	(0.559)
Wife works part-time dummy	–0.131	(0.561)	–0.862	(0.801)	–0.069	(0.360)	2.008	(1.959)	–0.163	(0.917)	–1.689***	(0.619)

Note: The instrument variables are monthly receipt income and realized capital gain. Hansen's J $\chi^2(6) = 3.41341$ ($p = 0.7555$). Other control variables are husband works full-time dummy, husband works part-time dummy, husband's age, wife's age, year income ≥ JPY 10 million dummy, wife's occupation (blue-collar worker, white-collar worker in the private sector, white-collar worker in the public sector), husband's occupation (blue-collar worker, white-collar worker in the private sector, white collar worker in the private sector), three major metropolitan areas, Log(food expenditure), and constant. Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table VII: GMM Estimates of Food Engel Curves for Couple Households with the Correct Equation and Hayashi's (1995) Instrumental Variables (10,982)

	Sweets		Drink and Alcohol		Dairy Products		Eating Out		Vegetables		Seafood	
Wife's income share	1.446***	(0.470)	–1.682**	(0.709)	0.693**	(0.290)	3.991***	(1.354)	–0.735	(0.733)	–0.683	(0.505)
Wife works full-time dummy	–0.553***	(0.202)	1.019***	(0.295)	–0.507***	(0.127)	2.490***	(0.582)	–2.055***	(0.317)	–0.137	(0.230)
Wife works part-time dummy	0.100	(0.347)	1.338**	(0.588)	–0.380*	(0.209)	1.428	(0.991)	–0.887	(0.584)	–0.785*	(0.423)

Note: The instrument variables are annual household income, realized capital gain, and net financial assets. Hansen's J $\chi^2(12) = 37.2181$ (p = 0.0002). Other control variables are husband works full-time dummy, husband works part-time dummy, husband's age, wife's age, annual household income ≥ JPY 15 million dummy, Log(food expenditure), and constant. Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table VIII: GMM Estimates of Food Engel Curves for Couple Households Younger Than 65 Years Old with the Correct Estimation Equation (5,184)

	Sweets		Drinks and Alcohol		Dairy Products		Eating Out		Vegetables		Seafood	
Wife's income share	2.183***	(0.598)	–2.185**	(0.923)	0.388	(0.353)	5.150***	(1.865)	–1.686*	(0.941)	–0.428	(0.658)
Wife works full-time dummy	–0.982***	(0.282)	1.100***	(0.409)	–0.296*	(0.159)	2.238**	(0.934)	–1.434***	(0.442)	–0.216	(0.315)
Wife works part-time dummy	–0.291	(0.497)	1.673**	(0.834)	–0.327	(0.283)	0.504	(1.506)	0.074	(0.826)	–0.898	(0.607)

Note: The instrument variables are monthly receipt income and realized capital gain. Hansen's J $\chi^2(6) = 4.03594$ ($p = 0.6718$). Other control variables are husband works full-time dummy, husband works part-time dummy, husband's age, wife's age, annual household income ≥ JPY 15 million dummy, Log(food expenditure) and constant. Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table IX: GMM Estimates of Food Engel Curves for Total Couple Households with the Non-Correct Estimation Equation (10,982)

	Sweets		Drinks and Alcohol		Dairy Products		Eating Out		Vegetables		Seafood	
Wife's income share	1.139**	(0.487)	–1.972***	(0.706)	0.435	(0.290)	3.650***	(1.366)	–1.019	(0.743)	–0.962*	(0.531)
Wife works full-time dummy	–0.606***	(0.210)	0.935***	(0.295)	–0.525***	(0.127)	2.477***	(0.597)	–1.982***	(0.324)	–0.082	(0.241)
Wife works part-time dummy	0.282	(0.371)	1.462**	(0.583)	–0.414**	(0.210)	1.612	(1.023)	–1.166**	(0.594)	–1.048**	(0.441)

Note: The instrument variables are monthly receipt income and realized capital gain. Hansen's J $\chi^2(6) = 7.0937$ ($p = 0.3123$). Other control variables are husband works full-time dummy, husband works part-time dummy, husband's age, wife's age, annual household income ≥ JPY 15 million dummy, Log(food expenditure), and constant. Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix A. Sample Statistics from the 2004 NSFIE

	Single Woman		Single Man		Couple	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Sweets (%)	9.946	7.631	4.756	5.078	7.759	4.842
Drinks and alcohol (%)	8.704	7.800	14.795	11.032	10.464	7.284
Dairy products (%)	5.113	4.985	2.459	3.071	4.544	3.287
Eating out (%)	30.524	19.348	56.321	24.517	26.291	14.936
Vegetables (%)	21.710	12.493	8.007	10.401	21.489	9.148
Seafood (%)	9.141	7.425	4.235	6.209	11.550	6.327
Other (%)	14.862	9.548	9.429	8.897	17.904	8.964
Food expenditure (¥)	35570.360	19306.760	47528.200	25583.100	64759.820	26647.380
Woman (or wife) works full-time dummy	0.325	0.469			0.144	0.352
Woman (or wife) works part-time dummy	0.081	0.273			0.132	0.339
Man (or husband) works full-time dummy			0.730	0.444	0.394	0.489
Man (or husband) works part-time dummy			0.021	0.145	0.034	0.181
Man's (or husband's) age			44.830	19.095	62.363	13.575
Woman's (or wife's) age	61.065	17.968			59.435	13.048
Annual household income ≥ JPY 6 million dummy	0.044	0.204	0.137	0.344		
Annual household income ≥ JPY 7 million dummy	0.025	0.156	0.094	0.292		
Annual household income ≥ JPY 10 million dummy					0.067	0.249
Annual household income ≥ JPY 15 million dummy					0.011	0.106
Three major metropolitan areas	0.385	0.487	0.515	0.500	0.400	0.490
Woman's (or wife's) occupation						
Blue-collar worker	0.131	0.337			0.119	0.323
White-collar worker in the private sector	0.143	0.350			0.088	0.283
White-collar worker in the public sector	0.065	0.247			0.038	0.190
Other	0.067	0.251			0.033	0.179
Unemployed	0.594	0.491			0.723	0.447
Man's (or husband's) occupation						
Blue-collar worker			0.208	0.406	0.160	0.367
White-collar worker in the private sector			0.314	0.464	0.187	0.390
White-collar worker in the public sector			0.162	0.369	0.077	0.267
Other			0.067	0.251	0.003	0.058
Unemployed			0.248	0.432	0.572	0.495
Wives' income share					0.377	0.225
Monthly receipt income (¥)	389564.600	290563.200	485271.700	314459.100	736760.300	547516.200
Monthly real income (¥)	162275.400	116126.800	259204.500	156238.400	308487.500	331393.400
Realized capital gain (¥)	59.230	2863.875	1650.138	62229.110	671.090	31228.130
Household year income (10,000 ¥)	250.948	158.597	389.299	203.914	514.900	284.462
Household net financial asset (10,000 ¥)	944.367	1294.456	540.922	1125.793	1500.034	1988.500
Observation	2478		1454		10982	

Monthly receipt income includes monthly real income and non-real income. Non-real income includes cashed saving deposits, sale property, debt, and insurance proceeds. The categories are divided as follows: "sweets" include Japanese cakes, candies, Western cakes, and similar items; "eating out" includes cooked food and general meals eaten outside the home; "vegetables" include vegetables and fruits; "drinks and alcohol" include alcoholic and non-alcoholic beverages; "dairy products" includes eggs and dairy products; "seafood" includes fish and shellfish; and "other" includes meat and cereals.

References

Baxter, J. and Tai, T.-O. (2016) "Inequalities in Unpaid Work: A Cross-National Comparison," in *Handbook on Well-Being of Working Women*. Springer: Netherlands, 653-671.

Beydoun, M.A., Powell, L.M. and Wang, Y.F. (2009) "Reduced Away-From-Home Food Expenditure and Better Nutrition Knowledge and Belief Can Improve Quality of Dietary Intake Among US Adults" *Public Health Nutrition* **12**, 369-381.

Browning, M., Bourguignon, F., Chiappori, P.A. and Lechene, V. (1994) "Income and Outcomes - A Structural Model of Intrahousehold Allocation" *Journal of Political Economy* **102**, 1067-1096.

Browning, M., Chiappori, P.A. and Lewbel, A. (2013) "Estimating Consumption Economies of Scale, Adult Equivalence Scales, and Household Bargaining Power" *Review of Economic Studies* **80**, 1267-1303.

Cherchye, L., De Rock, B. and Vermeulen, F. (2012) "Married with Children: A Collective Labor Supply Model with Detailed Time Use and lntrahousehold Expenditure Information" *American Economic Review* **102**, 3377-3405.

Chiappori, P.A. (1992) "Collective Labor Supply and Welfare" *Journal of Political Economy* **100**, 437-467.

Christensen, L.R., Jorgenson, D.W. and Lau, L.J. (1975) "Transcendental Logarithmic Utility Functions" *American Economic Review* **65**, 367-383.

Deaton, A. and Muellbauer, J. (1980) *Economics and Consumer Behavior*, Cambridge University Press: Cambridge.

Hayashi, F. (1995) "Is the Japanese Extended Family Altruistically Linked - A Test Based on Engel Curves" *Journal of Political Economy* **103**, 661-674.

Hayashi, F. (2000) *Econometrics*, Princeton University Press: Princeton.

Jaworowska, A., Blackham, T., Davies, I.G. and Stevenson, L. (2013) "Nutritional Challenges and Health Implications of Takeaway and Fast Food" *Nutrition Reviews* **71**, 310-318.

Kohara, M. and Kamiya, Y. (2016) "Maternal Employment and Food Produced at Home: Evidence from Japanese Data" *Review of Economics of the Household* **14**, 417-442.

Nayga, R.M. (1996) “Wife’s Labor Force Participation and Family Expenditures for Prepared Food, Food Prepared at Home, and Food Away from Home” *Agricultural and Resource Economics Review* **25**, 179-186.

Phipps, S.A. and Burton, P.S. (1998) “What’s Mine Is Yours? The Influence of Male and Female Incomes on Patterns of Household Expenditure” *Economica* **65**, 599-613.

Yen, S.T. (1993) “Working Wives and Food Away from Home - The Box-Cox Double Hurdle Model” *American Journal of Agricultural Economics* **75**, 884-895.