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Household Salads Consumption in Japan: An Application of the Two-step Demand System*

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In Japan, the trend of outsourcing and simplification of meals is likely to expand. Looking at fresh vegetables, they are increasingly replaced by prepared salads. This paper aims to analysis the consumption structure of fresh vegetables used for salads by applying a LA/AIDS model taking into consideration the issue of zero-consumption, using micro data of the "Family Income and Expenditure Survey" by the Ministry of Internal Affairs and Communications in Japan. The main findings is followings. Salads are used more frequently by the households with a working wife and with fewer members, and the absolute value of their own-price elasticity decreased in the subject ten years. These suggest that salads have become more common and the impact of their price on the consumption amount is becoming smaller. Salads will become a more important element for outsourcing and simplification of meals.

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1. Introduction

As part of structural changes in household food demand in Japan, an escalating trend of food outsourcing and simplification, in which consumers depend more on outside of the household for cooking or eating, has been pointed out regarding consumption styles such as eating at home, eating out, and eating home-meal replacements. The background factors of this trend include rising income levels, increased employment rate of women, shrinking household size, an increase in the number of single-person households, advancement of aging in society, and increasingly diverse consumer lifestyles, which have contributed to boosting the opportunity cost of cooking at home, resulting in spending less time on cooking-related housework (McCracken and Brandt (1987), Kakino and Kusakari (1998) and Richards, Gao and Patterson (1998)). Thus, the style of food consumption seems to have changed based on the trend of replacing “eating at home” with “eating out” or “eating home-meal replacements.”

Looking at fresh vegetables, they are increasingly replaced by prepared salads, as indicated by the rise of pre-cut vegetable sets for salads and other products that satisfy the need for simplification. This trend is highlighted by the fact that demand for salads is rising while consumption of fresh vegetables is stagnant[1]. As Kusakari (2012) find that young people show stronger preference for simplification, the trend of outsourcing and simplification of food is likely to expand, making the substitutional relationship between salads and fresh vegetables an important issue in discussing the supply of fresh vegetables.

This paper therefore focuses on consumption of salads and clarifies quantitatively the substitutional/complementary relationships between salads and fresh vegetables and the impact of household attributes including family structure thereon, using the Linear Approximate of the Almost Ideal Demand System (**LA/AIDS**).

There have been many studies on food consumption both inside and outside Japan (Barnett and Serletis (2008), Clements, Selvanathan and Selvanathan (1996), Matsuda (2012)), most of which are econometric analyses based on elaborate demand system models. Studies in Japan include those by Matsuda (1996), Matsuda (2000), Shigeno (2012), Sumimoto and Kusakari (2005) (2008), though these studies—except that by Ishibashi (1997)—have weaknesses associated with their use of aggregated data such as the “***Annual Report on the***

[1] A recent trend in Japanese vegetable consumption is that consumers want to eat a lot of vegetables easily and do not want to spend much time cooking. In response, pre-cut vegetable sets containing several kinds of vegetables in a package have been drawing attention of vegetable producers and businesses as a new form of vegetable consumption. Since pre-cut vegetables are different from fresh, whole vegetables in several ways, such as that they are pre-cut and their prices are stabler than fresh, whole vegetables, they should probably be associated with different consumption patterns. However, there have been few studies concerning the consumption patterns of pre-cut vegetables.

Family Income and Expenditure Survey" by the Ministry of Internal Affairs and Communications.

Taking this point into consideration, this paper employs micro data of the "***Family Income and Expenditure Survey***" by the Ministry of Internal Affairs and Communications. To the best of our knowledge, this is the first attempt of using this data to analyze demand systems, not preceded by any previous studies.

Two advantages can be identified in the use of micro data of the ***Family Income and Expenditure Survey*** by the Ministry of Internal Affairs and Communications.

First, it enables consideration of detailed household attributes. The ***Family Income and Expenditure Survey's*** micro data comprises plenty of information regarding each household attribute, which enables us to clarify the relationships between each household attribute and demand structures by incorporating the household attributes into the demand system analysis.

Second, use of micro data enables estimation at certain time points. While most of the previous studies conduct analyses using time-series data due to the nature of aggregate data, use of micro data allows the present study to have access to nearly 7,000 samples monthly, enabling estimation in shorter periods of time.

When using the ***Family Income and Expenditure Survey's*** micro data, however, if the issue of zero consumption does not need to be considered, potential selection bias can appear. Consideration of zero consumption in demand system analysis is an econometrically interesting task. Akbay and Boz (2007) point out, "Estimating a complete demand system with censoring problems is one of the most challenging tasks in econometrics." Heien and Wessells (1990) are the first to estimate a demand system taking into consideration the issue of zero consumption, followed by Shonkwiler and Yen (1999) and Yen and Lin (2006), who point out the problems in the estimation of Heien and Wessells (1990).They proposed the two-step procedure which permits including of these censored observation and avoid potential selection bias. Today, the method of Shonkwiler and Yen (1999) is widely used as represented by Abdoul and Zheng (2010), Akbay and Boz (2007), Bilgic and Yen (2013), Dong, Gould and Kaiser (2004), Jonas and Roosen (2008) and Lasarte Navamuel, Rubiera Morollon and Paredes (2014).

2. Trends in consumption of salads

Before analyzing demand systems, let us confirm the changes in salad consumption based on the data of the "***Annual Report on the Family Income and Expenditure Survey***" by the Ministry of Internal Affairs and Communications. Figure 1 shows the changes in the per-capita spending on salads and fresh vegetables, as well as the four items (cabbages, lettuces, tomatoes and cucumbers) related to salads, which are considered in the demand system mentioned later, assuming the values in 1975 as 100. In this figure, we can see a nearly 40% decrease in the spending on fresh vegetables from 1975 to 2012, while the spending on salads has constantly increased since 1975, with a particularly sharp rise after 1987, reaching almost double in 2012. Although it is not appropriate to simply compare fresh vegetables with salads because their consumption scales are very different, the expansion in the consumption of salads over the past 25 years illustrates that salads have been increasingly replacing fresh vegetables as simplified food products. One of the factors causing this change may be the changes in household attributes, associated with changes in food consumption trends, such as outsourcing and simplification of cooking.

Focusing on the four items related to salads, we can see an increase of nearly 20% in the amount of spending on tomatoes and lettuces from that in 1975 while the amount of spending on fresh vegetables as a whole is decreasing. Consumption of cucumbers and cabbages, on the other hand, shows a decrease from the level of 1975. Spending on cucumbers, in particular, drops more drastically than that on fresh vegetables as a whole, decreasing to about one half from 1975 to 2012. On the contrary, consumption of cabbages turns to an increase in 2006, though the level is still lower than that of 1975. These observations indicate that the substitutional relationship between salads and fresh vegetables is not applicable to all items, and therefore it is important to discuss by item.

[Insert **Figure 1** about here]

3. Analysis model

A common LA/AIDS model is as follows (Deaton and Muellbauer (1980)):

$$\boldsymbol{w_{ih} = \alpha_i + \sum_j \gamma_{ij} lnp_j + \beta_i ln(X_h/P_h) + \sum_k \lambda_k D_{kh} + e_{ih}} \quad (\mathbf{1})$$

where, $\boldsymbol{w_{ih}}$ represents the budget hare of the spending on the $\boldsymbol{i}$th item in household $\boldsymbol{h}$; $\boldsymbol{p_j}$ represents the price of the $\boldsymbol{j}$th item; $\boldsymbol{X_h}$ represents the total budget of spending in household $\boldsymbol{h}$; $\boldsymbol{P_h}$ is the Stone price index defined with $\boldsymbol{lnP = \sum_j w_j lnp_j}$; $\boldsymbol{D_h}$ represents the household attributes of household $\boldsymbol{h}$; $\boldsymbol{\alpha_i}$, $\boldsymbol{\gamma_{ij}}$, $\boldsymbol{\beta_i}$, and $\boldsymbol{\lambda_k}$ are parameters; and $\boldsymbol{e_{ih}}$ represents the error term. Here, separability of fresh vegetables and salads from other spending and consumers' utility maximization behavior are assumed. According to the theory of consumer behavior, the equation (1) needs to satisfy the constraint equation below:

$$\sum_i \alpha_i = 1, \sum_i \gamma_{ij} = 0, \sum_i \beta_i = 0, \sum_i \lambda_i = 0 \ \text{(adding up)} \quad (2)$$

$$\sum_i \gamma_{ij} = 0 \ \text{(homogenieity)} \quad (3)$$

$$\gamma_{ij} = \gamma_{ji} \ \text{(symmetry)} \quad (4)$$

Following Shonkwiler and Yen (1999), the problem of zero consumption is incorporated into the model as shown below. Specifically, in the first step, based on the estimation of a probit model in equation (5), presence of consumption of each item is regressed mainly with household attributes, so as to obtain a cumulative distribution function (**CDF**) $\boldsymbol{\Phi}$ and a probability density function (**PDF**) $\emptyset$.

$$d_{ih} = \sum_k \rho_k D_{kh} + u_{ih}, d_{hi} = \begin{cases} 1 \ if \ d_{ih}^* > 0 \\ 0 \ if \ d_{ih}^* \leq 0 \end{cases} \quad (5)$$

Here, $\boldsymbol{d_{ih}^*}$, $\boldsymbol{\rho_i}$, and $\boldsymbol{u_{ih}}$ represent latent variable, parameter, and the error term, respectively.

In the second step, the cumulative distribution function (**CDF**) $\boldsymbol{\Phi_{ih}}$ and the probability density function (**PDF**) $\emptyset_{ih}$ are incorporated into the **LA/AIDS** model of the equation (1), to obtain the formula below:

$$w_{ih} = \Phi_{ih} \times \left[\alpha_i + \sum_j \gamma_{ij} lnp_j + \beta_i ln(X_h/P_h) + \sum_k \lambda_k D_{kh} \right] + \delta_i \emptyset_{ih} + e_{ih} \quad (6)$$

Here, $\boldsymbol{\delta_i}$ is a parameter and must satisfy the constraint equation (2), to obtain $\sum_i \boldsymbol{\delta_i} = \mathbf{0}$.

Elasticities[2] in this model are defined with equations (7), (8) and (9), respectively.

$$\varepsilon_{ii} = -1 + \left(\frac{\gamma_{ij} - \beta_i w_{ih}}{w_{ih}} \right) \Phi_{ih} \ \text{(own} - \text{price elasticity)} \quad (7)$$

$$\varepsilon_{ij} = \left(\frac{\gamma_{ij} - \beta_i w_{jh}}{w_{ih}} \right) \Phi_{ih} \ \text{(cross} - \text{price elasticity)} \quad (8)$$

$$\varepsilon_{D_i} = \left(\frac{\lambda_k}{w_{ih}} \right) \Phi_{ih} \ \text{(demographic elasticity)} \quad (9)$$

[2] Elasticities defined here refer to **uncompensated price elasticity** or **Marshallian price elasticity.**

4. Data

The source of data on the amount of spending used to estimate demand systems is the Ministry of Internal Affairs and Communications Statistics Bureau's ***Family Income and Expenditure Survey*** micro data[3]. Specifically, the data comprises the amounts of spending on fresh vegetables and salads of two-or-more-person households between January 2000 and December 2010, and the attributes of the subject households of the survey. The amount of spending is divided by the number of household members to obtain the spending per person. For the price of each item, data of the Ministry of Internal Affairs and Communications Statistics Bureau's Annual Report on the Retail Price Survey is used.

The estimation period is 11 years from 2000 to 2010. Data of a sample size of around 7,000 households each month, exclusive of the data containing missing values and data from households engaging in agriculture, forestry, and fishery, is pooled for 12 months to conduct demand system analysis.

Items used for estimation are five items of cabbages, lettuces, tomatoes, cucumbers, and salads, as they are considered to be the major vegetables used for salads in households. In estimation, as mentioned above, with homogeneity and symmetry assumed, parameters of four equations, excepting the equation for the share of spending on salads, are estimated with the iterated seemingly unrelated regression (**ISUR**) method.

Table 1 shows the results of descriptive statistics and definitions of the items.

[Insert **Table 1** about here]

The sample size of each estimation is between 89,914 and 91,038. Annual household income changed from 6.99 million yen in 2000 to 6.11 million yen in 2010, indicating that annual household income has been decreasing due to the stagnant economy, though price fluctuation is not considered. The number of household members decreased from 3.20 in 2000 to 3.10 in 2010, the number of children per household decreased from 0.73 in 2000 to 0.64 in 2010, and the households with children aged 17 or younger also decreased from 0.41 in 2000 to 0.36 in 2010. These indicate that families are increasingly becoming nuclear, causing a decrease in the number of household members, with fewer children. As to other household attributes, the households in which the household head's wife has a job constantly accounted for over 30% of

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[3] The ***Family Income and Expenditure Survey*** targets two-or-more-person households not engaging in agriculture, forestry or fishery and studies the prices, quantities and the amounts of spending for goods they purchased. The survey is conducted for 6 consecutive months on approx. 8,000 households selected from throughout the country, who are replaced with other households after 6 months. To avoid hierarchy in survey results, one-sixth of the subject households are renewed each month, so as to obtain data of approx. 96,000 households (8,000 households × 12 months) in total annually. Households engaging in agriculture, forestry or fishery and single-person households were added to the survey subjects from the 2000 survey and the 2002 survey, respectively.

all households surveyed, while the households residing in an ordinance-designated city increased from 0.22 in 2000 to 0.29 in 2010. From these results of descriptive statistics, we can confirm progression of a decrease in household income, a decrease in the number of household members/children, and urbanization with regard to the households surveyed between 2000 and 2010.

The percentage of spending on cabbages, lettuces, cucumbers, tomatoes and salads as a whole shows a moderate change between 2000 and 2010. Specifically, cabbages increased slightly to around 20%, while lettuces, cucumbers, tomatoes and salads maintain around 15%, 20%, 30% and 15%, respectively.

Table 2 shows the ratios of zero-consumption items in 2000 and 2010. Similar tendencies are observed in both 2000 and 2010. The number of samples purchasing all five items was as small as 13,477 (14.8% of total) in 2000 and 13,569 (15.0% of total) in 2010, while the samples containing one or more zero-consumption items represent around 85% of total. This indicates that presence of zero-consumption should not be ignored in conducting demand system analysis.

[Insert **Table 2** about here]

5. Results of estimation and interpretation

5.1. Results of estimation from the probit model

The probit model in the first step employs the presence of consumption of each item as the explained variable and the household attributes as the explanatory variable. Tokoyama and Egaitsu (1995) points out as the factors causing changes in the Japanese food consumption structure (1) shrinking family size, (2) increase of dual-income households, (3) urbanization, (4) decrease of self-employed households, and (5) increase of elderly households. This paper selects explanatory variables for the probit model according to the classification by Tokoyama and Egaitsu (1995). Specifically, the model employs "the number of household members" as the variable to represent shrinking family size, "wife's employment status" to represent the increase of dual-income households, "ordinance-designated city" to represent urbanization, and "age" to represent the increase of elderly households [4] . Other household attributes of "income," "women's rate," "number of children," and "whether the youngest child is school-aged" are also

[4] The decrease of self-employed households seems to refer mainly to the decrease in the number of households engaging in agriculture, forestry or fishery. However, since the households engaging in agriculture, forestry or fishery are likely to show a peculiar tendency in consumption of fresh vegetables, they are excluded from the analysis target of this paper. Therefore, we do not address the items regarding self-employed households.

considered. For presence of consumption of each item, dummy variables are added for each month to compensate for seasonal fluctuations.

Tables 3 and 4 show the results of estimation of the probit model in the first step. As in the case of descriptive statistics, only the estimation results for 2000 and 2010 are presented because of the limitations of paper width. As a result of a likelihood ratio test of the probit model, in all the estimation equations for cabbages, lettuces, tomatoes, cucumbers and salads, a null hypothesis that all parameters except constant terms are zero is rejected with a significance level of 1%. Of the 120 first-step estimates, 87.5% of total in 2000 and 86.7% of total in 2010, are statistically significant at 10-1 % significant levels. Although ***Pseudo*** $\boldsymbol{R^2}$ is as low as 0.005 in the estimation equation for salads in 2000, as Bilgic and Yen (2013) point out, ***Pseudo*** $\boldsymbol{R^2}$ tend to be low when cross-sectional data is used and the fit of the model is within an acceptable range.

[Insert **Table 3** about here]

[Insert **Table 4** about here]

Positive parameters in the estimation results of the probit model indicate that the larger the value of an explanatory variable is, the higher the probability of purchasing the subject item; while negative parameters indicate that the larger the value of an explanatory variable is, the lower the probability of purchasing the subject item.

For all items, “the number of household members,” “income” and “ordinance-designated city” mark positive parameters while “the number of children” marks negative parameters. This indicates that more household members, more household income, and more urbanized residence area result in higher probability of purchasing each item, and the greater number of children lowers the probability of purchasing each item.

A characteristic found unique to estimation of salad consumption is that “wife’s employment status” shows positive parameters. This confirms that the households with the wife having a job have a high probability of purchasing salads due to their preference for simplification of food.

Using the cumulative distribution function (**CDF**) and the probability density function (**PDF**) derived from the estimation results of the probit model above, we move on to the second step to conduct estimation of the demand system model.

5.2. Results of estimation from the LA/AIDS model

Tables 5 and 6 show the results of estimation of the **LA/AIDS** model in the second step. Because of the use of predicted probabilities $\boldsymbol{\Phi_{ih}}$ and densities $\emptyset_{ih}$ in the second step, conventional standard errors are incorrect. According to Bilgic and Yen (2013), we calculate the standard errors with a bootstrap procedure[5]. ***Adjusted*** $\boldsymbol{R^2}$ is between 0.402 and 0.634, indicating a good fit of the model[6]. Parameters of probability density are statistically significant in all the estimation equations, demonstrating the importance of removing selection bias related to zero-consumption.

[Insert **Table 5** about here]

[Insert **Table 6** about here]

Various elasticities calculated based on the estimated parameters are as shown in Tables 7 and 8. The elasticities are all evaluated with the average values of the samples.

[Insert **Table 7** about here]

[Insert **Table 8** about here]

First, in the estimation results for 2000, the own-price elasticity is significantly negative for all items with a significance level of 1%, satisfying the theoretical sign conditions. The cross price elasticity is positive between cabbages and lettuces and between lettuces and cucumbers, while it is negative between cabbages and tomatoes and between lettuces and tomatoes. The cross price elasticity of salads is negative with cabbages, lettuces, and cucumbers. The results of 2010, in addition to the results for 2000, present a positive value for the cross price elasticity of cucumber consumption with the price of tomatoes, while the elasticity between cucumbers and lettuce does not mark a significant value. From these results, we can see a substitutional relationship between cabbages and lettuces, and between lettuces and cucumbers; a complementary relationship between cabbages and tomatoes, and between lettuces and tomatoes; and complementary relationships of salad consumption with cabbages, lettuces, and cucumbers. These relationships confirm that cabbages and lettuces are used substitutionally depending on their prices, and tomatoes are used with other vegetables. Moreover, it is revealed that consumption of salads, which are a form of prepared food, is affected by the prices of other fresh vegetable items, and they are used in a complementary manner to other fresh vegetables.

As to the elasticity of each household attribute, the elasticity for cabbages is negative for “age” and “income” and positive for “the number of household members.” Lettuces mark a negative value for “age,” cucumbers mark positive values for “age” and “the number of

[5] Standard errors for the second-step estimates are calculated with 1,000 bootstrap replications.

[6] For example, ***Adjusted*** $\boldsymbol{R^2}$ of a **LA/AIDS** model is between 0.08 and 0.30, according to Akbay and Boz (2007).

household members," and the elasticity for tomatoes is positive for "age," "income," "female-dominated household" and "presence of children," and negative for "wife's employment status." Regarding salad consumption, "age," "income," "wife's employment status" and "ordinance-designated city" are significantly positive while "the number of household members" is significantly negative. These results mean that the attributes that affect consumption vary among the vegetables. For salads, in particular, it is quantitatively confirmed that salads are used by households living in an urban area and with the wife working.

Meanwhile, more household attributes are significant in the results for 2010 than those in 2010, indicating an increase in the impact of household attributes on vegetable consumption. Especially, tomatoes and salads mark significant values for many household attributes, demonstrating that they are easily influenced by such attributes.

Next, regarding salads, changes in the elasticity of price and household attributes from 2000 to 2010 are shown in Table 9. The consumption of salads has constantly maintained complementary relationships with other salad vegetables from 2000 through 2010. This implies the possibility that salad products and these salad vegetables are used together at family dining tables. Also, the salads' absolute value of own-price elasticity is becoming smaller, indicating that consumers are becoming less reactive to the price of salads.

[Insert **Table 9** about here]

As to the elasticity of household attributes, "age," "income," "ordinance-designated city" and "wife's employment status" mark positive values, indicating that households with these attributes frequently use salads. Meanwhile, such attributes as "the number of household members" and "presence of children" mark negative values, indicating that households with more members and with children use salads less frequently.

Incidentally, the absolute parameter values for "age," "income," "ordinance-designated city" and "presence of children" substantially increased from 2000 to 2010, confirming that the influence of these household attributes is becoming greater.

5. Conclusion

In this paper, we conducted analysis of the consumption structure of fresh vegetables used for salads by applying a **LA/AIDS** model taking into consideration the issue of zero-consumption, and clarified the substitutional or complementary relationships between subject items.

Income has been considered as an important determinant factor for consumption of fresh vegetables, and the results of our probit model estimation in the first step show positive values for income parameters of all items, confirming consistency with the results of existing studies. Based on this, the results of the demand system analysis taking into zero-consumption consideration show that the elasticity of income is positive for lettuces, tomatoes and salads, and negative for cabbages, and also revealed that in the **LA/AIDS** model, the impact of the income factor varies among items. It was also revealed by the demand system analysis based on economic theory that other household attributes, including ordinance-designated city, age or income of household, presence of children, and the rate of women, also influence the consumption amount of these fresh vegetables and salads, and that their form of influence has changed over the subject ten years.

In this paper, we clarified the structure where the households with a working wife, with fewer members, and elderly households use more salads. This means that the fact that salads are used as simplified food products is confirmed by the demand system analysis based on economic theory.

Regarding salads, while it is revealed that they are used more frequently by the households with a working wife and with fewer members, the absolute value of their own-price elasticity decreased in the subject ten years, indicating that salads have become more common in household consumption and the impact of their price on the consumption amount is becoming smaller. Meanwhile, the absolute values with regard to age, ordinance-designated city, and presence of children have been increasing, indicating that consumption of salads increases as the number of elderly households, households with fewer members, and households residing in urban areas increases. From this we can expect that salads will become a more important element for outsourcing and simplification of meals in Japan in the future.

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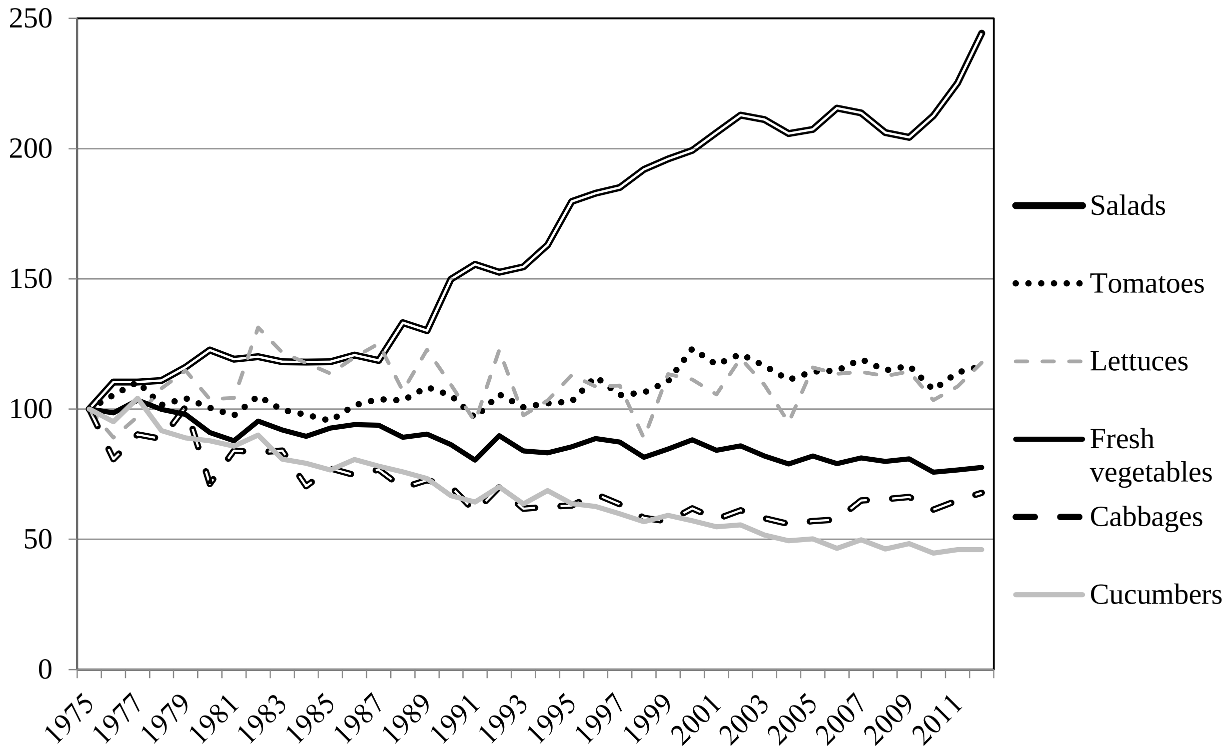

Figure 1 The relative changes in the per-capita spending on salads and fresh vegetables

Source: ***Annual Report on the Family Income and Expenditure Survey***

Table 1 Definitions and sample statistics of demographic variables

Variable	Definition	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Age	Average age of household member	43.5	44.0	44.7	44.7	44.8	45.6	46.3	46.8	46.8	46.7	47.2
Number of household members	Number of members in the household	3.20	3.20	3.20	3.20	3.20	3.10	3.10	3.10	3.10	3.10	3.10
Income	household income (10,000 yen/year)	699	681	671	652	643	632	633	634	627	626	611
Wife's employment status	1 if the housewife has employed in full-time job and 0 otherwise	0.35	0.34	0.34	0.33	0.33	0.33	0.33	0.33	0.34	0.34	0.34
Women's rate	Rate of female members in the household	52.3	52.3	52.0	52.1	52.0	52.0	52.0	52.1	51.9	52.3	52.2
Female-dominated household	1 if Ratio of female members in the household >50 and 0 otherwise	0.30	0.30	0.29	0.29	0.29	0.28	0.28	0.28	0.28	0.29	0.28
Number of children	Number of children < 17 years of age	0.73	0.72	0.71	0.70	0.70	0.67	0.65	0.64	0.64	0.65	0.64
Presence of children	1 if the number of children aged under 17 in the household >0 and otherwise 0	0.41	0.40	0.40	0.40	0.40	0.38	0.37	0.36	0.36	0.37	0.36
School attendance of the youngest child												
Kindergarten	1 if the youngest child attend kinder garten and otherwise 0	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.09	0.10	0.09	0.09
Primary school	1 if the youngest child attend primary school and otherwise 0	0.14	0.14	0.13	0.13	0.14	0.13	0.13	0.13	0.13	0.14	0.13
Secondary school	1 if the youngest child attend secondary school and otherwise 0	0.06	0.06	0.05	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05
High school	1 if the youngest child attend high school and otherwise 0	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
University	1 if the youngest child attend university and otherwise 0	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Ordinance-designated city	1 if the household is located in an ordinance-designated city and otherwise 0	0.22	0.22	0.22	0.22	0.23	0.23	0.24	0.24	0.27	0.28	0.29
Price												
Price of Cabbages	Price of cabbages (yen/kg)	147.1	165.5	148.8	165.4	182.9	170.7	179.7	150.2	154.0	158.7	183.1
Price of Lettuces	Price of lettuces (yen/kg)	464.3	472.2	419.7	449.9	524.3	400.7	416.0	432.5	414.1	408.3	487.0
Price of Tomatoes	Price of tomatoes (yen/kg)	555.0	554.4	556.5	555.9	602.5	575.7	577.9	596.0	579.0	580.6	654.3
Price of Cucumbers	Price of cucumbers (yen/kg)	513.9	501.4	487.2	502.3	515.9	474.7	530.3	519.6	541.0	501.3	529.8
Price of Salads	Price of salads (yen/kg)	1260.0	1266.2	1277.6	1291.7	1303.9	1319.6	1316.1	1335.4	1371.2	1367.7	1348.9
Expenditure												
Cabbages Expenditure	Expenditure for cabbage per-capita (yen/month)	62.1	65.5	61.7	68.6	70.1	67.1	74.2	69.8	71.6	75.4	81.6
Lettuces Expenditure	Expenditure for lettuce per-capita (yen/month)	62.7	60.4	60.8	62.2	62.9	58.8	61.3	64.6	60.6	60.8	66.1
Tomatoes Expenditure	Expenditure for tomato per-capita (yen/month)	187.2	185.0	190.8	188.2	188.4	186.5	196.4	203.2	191.0	198.2	205.3
Cucumbers Expenditure	Expenditure for cucumber per-capita (yen/month)	113.0	107.1	108.0	106.1	104.7	95.5	102.1	106.1	101.2	98.7	101.1
Salads Expenditure	Expenditure for salad per-capita (yen/month)	75.1	75.8	81.4	82.4	82.5	83.1	86.8	86.7	89.1	87.8	91.6
Expenditure share of Cabbages	Expenditure share of cabbages	0.17	0.18	0.17	0.18	0.19	0.19	0.19	0.18	0.20	0.20	0.21
Expenditure share of Lettuces	Expenditure share of lettuces	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Expenditure share of Tomatoes	Expenditure share of tomatoes	0.31	0.31	0.31	0.30	0.30	0.31	0.31	0.31	0.31	0.31	0.30
Expenditure share of Cucumbers	Expenditure share of cucumbers	0.24	0.23	0.23	0.22	0.22	0.21	0.21	0.21	0.21	0.20	0.20
Expenditure share of Salads	Expenditure share of salads	0.14	0.14	0.14	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Sample size		91,038	90,765	90,773	90,400	90,155	90,503	90,289	90,131	89,914	90,115	90,161

Source: Authors' Calculations

Table 2 The ratios of zero-consumption items

The numunber of samples containing zero-consumption items	2000		2010	
0	13,477	14.8%	13,569	15.0%
1	30,971	34.0%	29,836	33.1%
2	24,975	27.4%	24,328	27.0%
3	14,414	15.8%	14,967	16.6%
4	7,201	7.9%	7,461	8.3%
Total	91,038	100.0%	90,161	100.0%

Source: Authors' Calculations

Table 3 First-step probit estimates (2000)

	Cabbages	Lettuces	Salads	Tomatoes	Cucumbers
Constant	0.334 ***	-0.218 ***	-0.425 ***	-0.199 ***	-0.367 ***
	9.7	-6.7	-13.3	-5.8	-10.3
Age	-0.002 ***	-0.004 ***	0.000	0.005 ***	0.006 ***
	-6.4	-11.7	-0.5	14.2	15.4
Number of household members	0.132 ***	0.126 ***	0.020 ***	0.035 ***	0.126 ***
	20.9	21.4	3.6	5.7	18.7
Income	0.000005	0.000196 ***	0.000089 ***	0.000293 ***	0.000193 ***
	0.4	17.6	8.6	23.5	15.0
Wife's employment status	-0.064 ***	-0.025 ***	0.114 ***	-0.088 ***	-0.057 ***
	-6.3	-2.6	12.4	-8.7	-5.4
Women's rate	-0.002 ***	-0.001 **	0.000	0.001 ***	0.000
	-6.8	-2.5	-1.1	4.4	0.3
Number of children	-0.059 ***	-0.127 ***	-0.101 ***	-0.032 ***	-0.087 ***
	-5.1	-11.7	-9.6	-2.9	-7.2
School attendance of the youngest child					
Kindergarten	-0.112 ***	0.006	0.105 ***	0.078 ***	0.152 ***
	-4.6	0.3	4.7	3.3	6.1
Primary school	0.017	0.191 ***	0.154 ***	0.086 ***	0.241 ***
	0.7	8.9	7.4	3.9	10.3
Secondary school	0.143 ***	0.320 ***	0.165 ***	0.119 ***	0.258 ***
	5.6	13.4	7.3	4.8	9.8
High school	0.162 ***	0.352 ***	0.053 ***	0.133 ***	0.248 ***
	7.1	16.2	2.6	6.0	10.4
University	0.097 ***	0.139 ***	-0.026	0.078 **	0.132 ***
	3.0	4.6	-0.9	2.4	3.9
Ordinance-designated city	0.138 ***	0.100 ***	0.075 ***	0.193 ***	0.127 ***
	12.2	9.4	7.4	16.8	10.7
Monthly dummy variables					
February	0.117 ***	-0.062 ***	-0.023	0.064 ***	0.212 ***
	5.3	-3.0	-1.1	3.0	9.7
March	0.120 ***	0.134 ***	0.066 ***	0.275 ***	0.498 ***
	5.5	6.4	3.2	12.6	21.7
April	0.192 ***	0.398 ***	0.020	0.424 ***	0.617 ***
	8.7	18.9	1.0	18.9	26.3
May	0.294 ***	0.467 ***	0.038 *	0.668 ***	0.768 ***
	13.2	22.0	1.8	28.4	31.6
June	0.165 ***	0.419 ***	0.000	0.720 ***	0.611 ***
	7.5	19.9	0.0	30.1	26.1
July	0.086 ***	0.466 ***	0.011	0.463 ***	0.325 ***
	3.9	21.9	0.6	20.4	14.6
August	0.304 ***	0.329 ***	0.049 **	0.247 ***	0.439 ***
	13.5	15.7	2.4	11.3	19.4
September	0.343 ***	0.339 ***	0.022	0.247 ***	0.468 ***
	15.2	16.2	1.1	11.3	20.6
October	0.302 ***	0.338 ***	0.006	0.011	0.470 ***
	13.4	16.1	0.3	0.5	20.6
November	0.051 **	0.225 ***	-0.001	-0.098 ***	0.093 ***
	2.3	10.7	-0.1	-4.6	4.3
December	-0.045 **	0.127 ***	0.069 ***	-0.099 ***	0.143 ***
	-2.1	6.1	3.3	-4.7	6.5
Pseudo R^2	0.020	0.036	0.005	0.045	0.039
Log-Likelihood	-50002.6	-57484.8	-60717.3	-49452.3	-44490.7
Likelihood ratio statistics	2063.9***	4333.4***	585.8***	4623.8***	3640.7***

Source: Authors' Calculations

***significant at 0.01; **significant at 0.05; *significant at 0.10.

Upper row: Coefficient, Lower row: Z-Score.

Table 4 First-step probit estimates (2010)

	Cabbages		Lettuces		Salads		Tomatoes		Cucumbers	
Constant	0.252	***	-0.486	***	-0.442	***	-0.334	***	-0.582	***
	6.5		-13.6		-12.7		-9.0		-15.3	
Age	0.000		0.000		0.000		0.006	***	0.008	***
	-0.6		-0.4		-1.0		16.1		20.6	
Number of household members	0.162	***	0.148	***	0.043	***	0.023	***	0.157	***
	23.2		23.7		7.2		3.6		22.9	
Income	0.000005		0.000157	***	0.000142	***	0.000367	***	0.000173	***
	0.4		12.4		11.8		25.9		12.4	
Wife's employment status	-0.070	***	-0.039	***	0.129	***	-0.109	***	-0.054	***
	-6.6		-4.0		13.6		-10.8		-5.2	
Women's rate	-0.001	***	0.001	*	-0.001	***	0.002	***	0.001	***
	-4.3		1.9		-2.6		8.1		3.0	
Number of children	-0.108	***	-0.128	***	-0.092	***	-0.001		-0.092	***
	-8.6		-11.2		-8.2		-0.1		-7.5	
School attendance of the youngest child										
Kindergarten	-0.066	**	0.056	**	-0.115	***	0.166	***	0.149	***
	-2.5		2.3		-4.8		6.5		5.8	
Primary school	0.053	**	0.167	***	0.003		0.007		0.124	***
	2.2		7.5		0.1		0.3		5.3	
Secondary school	0.088	***	0.203	***	0.136	***	0.034		0.113	***
	3.2		8.1		5.6		1.3		4.3	
High school	0.093	***	0.250	***	0.161	***	0.006		0.087	***
	3.7		10.8		7.4		0.3		3.6	
University	0.007		0.165	***	0.016		0.066	**	0.046	
	0.2		5.5		0.6		2.2		1.4	
Ordinance-designated city	0.082	***	0.055	***	0.090	***	0.128	***	0.108	***
	7.8		5.7		9.7		12.6		10.4	
Monthly dummy variables										
February	0.119	***	0.128	***	-0.022		0.077	***	0.059	***
	5.3		6.1		-1.1		3.6		2.7	
March	0.253	***	0.318	***	0.065	***	0.191	***	0.154	***
	11.1		15.2		3.1		8.8		7.1	
April	0.163	***	0.287	***	0.062	***	0.265	***	0.468	***
	7.2		13.7		3.0		12.1		20.6	
May	0.343	***	0.416	***	0.080	***	0.592	***	0.766	***
	14.8		19.8		3.9		25.8		31.7	
June	0.119	***	0.476	***	0.028		0.694	***	0.632	***
	5.3		22.5		1.4		29.5		27.0	
July	0.063	***	0.469	***	0.077	***	0.465	***	0.219	***
	2.8		22.1		3.7		20.7		10.0	
August	0.195	***	0.275	***	0.135	***	0.230	***	0.326	***
	8.6		13.2		6.5		10.6		14.7	
September	0.262	***	0.369	***	0.078	***	0.102	***	0.394	***
	11.4		17.6		3.8		4.8		17.6	
October	0.251	***	0.192	***	0.094	***	-0.092	***	0.280	***
	10.9		9.2		4.5		-4.4		12.7	
November	0.012		0.224	***	0.058	***	-0.166	***	0.009	
	0.6		10.7		2.8		-7.9		0.4	
December	0.103	***	0.315	***	0.089	***	0.092	***	0.016	
	4.6		15.0		4.3		4.3		0.8	
Pseudo R^2	0.014		0.021		0.010		0.040		0.038	
Log-Likelihood	-47133.6		-57987.7		-60791.8		-51595.5		-48614.8	
Likelihood ratio statistics	1343.6***		2518.1***		1179.1***		4332.1***		3849.3***	

Source: Authors' Calculations

***significant at 0.01; **significant at 0.05; *significant at 0.10.

Upper row: Coefficient, Lower row: Z-Score.

Table 5 Second-step estimates of the LA/AIDS model (2000)

	Cabbages	Lettuces	Salads	Tomatoes	Cucumbers
Constant	0.347 ***	0.240 ***	0.226 ***	0.234 ***	-0.047
	7.63	6.19	2.88	5.07	-0.54
Age	-0.0015 ***	-0.0011 ***	-0.0002	0.0006 **	0.0022 ***
	-6.64	-6.32	-0.51	2.42	7.71
Income	-0.000064 ***	0.000000	0.000021 **	0.000017 **	0.000027 **
	-9.29	-0.05	2.31	2.06	2.29
Number of household members	0.021 ***	0.006 **	-0.046 ***	-0.008 ***	0.027 ***
	5.17	2.12	-11.97	-3.13	6.13
Wife's employment status	-0.002	-0.002	0.010	-0.024 ***	0.019 **
	-0.46	-0.44	1.26	-4.65	2.20
Female-dominated household	-0.010 **	-0.004	-0.008	0.018 ***	0.005
	-2.12	-1.06	-1.13	3.34	0.80
Presence of children	-0.016 **	-0.015 **	-0.035 ***	0.061 ***	0.005
	-2.15	-2.36	-3.04	7.55	0.49
Ordinance-designated city	-0.010 *	-0.009 **	0.022 ***	-0.003	0.001
	-1.85	-2.25	3.22	-0.69	0.10
Seasonal dummy variables					
April/May/June	-0.062 ***	-0.023 ***	-0.018 *	0.021 *	0.082 ***
	-7.70	-3.29	-1.93	1.92	6.67
July/August/September	-0.057 ***	0.016 **	-0.025 ***	0.008	0.058 ***
	-7.85	2.49	-2.72	0.99	5.56
October/November/December	0.000	0.012 **	-0.002	-0.011	0.001
	0.07	1.97	-0.26	-1.45	0.11
Sum of expenditure for five item	0.023 ***	-0.016 ***	-0.165 ***	0.111 ***	0.047 ***
	8.50	-4.61	-24.46	28.90	8.69
Price of Cabbages	0.040 ***				
	2.95				
Price of Lettuces	0.054 ***	0.006			
	6.77	0.63			
Price of Cucumbers	-0.084 ***	-0.038 ***	0.139 ***		
	-7.08	-3.73	5.89		
Price of Tomatoes	-0.025 **	-0.035 ***	0.048 ***	-0.014	
	-2.29	-3.24	3.01	-0.76	
Price of Salads	0.015	0.013	-0.064 ***	0.026 *	0.011
	1.27	1.17	-3.35	1.75	0.53
PDF for each food groups	0.389 ***	0.201 ***	0.001	0.244 ***	-0.835 ***
	7.55	6.15	0.02	6.24	-9.96

Source: Authors' Calculations
***significant at 0.01; **significant at 0.05; *significant at 0.10.
Upper row: Coefficient, Lower row: Z-Score.

Table 6 Second-step estimates of the LA/AIDS model (2010)

	Cabbages	Lettuces	Salads	Tomatoes	Cucumbers
Constant	0.347 ***	0.240 ***	0.226 ***	0.234 ***	-0.047
	7.63	6.19	2.88	5.07	-0.54
Age	-0.0015 ***	-0.0011 ***	-0.0002	0.0006 **	0.0022 ***
	-6.64	-6.32	-0.51	2.42	7.71
Income	-0.000064 ***	0.000000	0.000021 **	0.000017 **	0.000027 **
	-9.29	-0.05	2.31	2.06	2.29
Number of household members	0.021 ***	0.006 **	-0.046 ***	-0.008 ***	0.027 ***
	5.17	2.12	-11.97	-3.13	6.13
Wife's employment status	-0.002	-0.002	0.010	-0.024 ***	0.019 **
	-0.46	-0.44	1.26	-4.65	2.20
Female-dominated household	-0.010 **	-0.004	-0.008	0.018 ***	0.005
	-2.12	-1.06	-1.13	3.34	0.80
Presence of Children	-0.016 **	-0.015 **	-0.035 ***	0.061 ***	0.005
	-2.15	-2.36	-3.04	7.55	0.49
Ordinance-designated city	-0.010 *	-0.009 **	0.022 ***	-0.003	0.001
	-1.85	-2.25	3.22	-0.69	0.10
Seasonal dummy variables					
April・May・June	-0.062 ***	-0.023 ***	-0.018 *	0.021 *	0.082 ***
	-7.70	-3.29	-1.93	1.92	6.67
July・August・September	-0.057 ***	0.016 **	-0.025 ***	0.008	0.058 ***
	-7.85	2.49	-2.72	0.99	5.56
October・November・December	0.000	0.012 **	-0.002	-0.011	0.001
	0.07	1.97	-0.26	-1.45	0.11
Sum of expenditure for five item	0.023 ***	-0.016 ***	-0.165 ***	0.111 ***	0.047 ***
	8.50	-4.61	-24.46	28.90	8.69
Price of Cabbages	0.040 ***				
	2.95				
Price of Lettuces	0.054 ***	0.006			
	6.77	0.63			
Price of Cucumbers	-0.084 ***	-0.038 ***	0.139 ***		
	-7.08	-3.73	5.89		
Price of Tomatoes	-0.025 **	-0.035 ***	0.048 ***	-0.014	
	-2.29	-3.24	3.01	-0.76	
Price of Salads	0.015	0.013	-0.064 ***	0.026 *	0.011
	1.27	1.17	-3.35	1.75	0.53
PDF for each food groups	0.389 ***	0.201 ***	0.001	0.244 ***	-0.835 ***
	7.55	6.15	0.02	6.24	-9.96

Source: Authors' Calculations
***significant at 0.01; **significant at 0.05; *significant at 0.10.
Upper row: Coefficient, Lower row: Z-Score.

Table 7 Price and demographic elasticities of food items (2000)

	Cabbages	Lettuces	Salads	Tomatoes	Cucumbers
Price of Cabbages	-0.907 ***	0.148 ***	-0.028	-0.093 ***	-0.043
	-19.48	4.14	-0.94	-3.84	-1.26
Price of Lettuces	0.123 ***	-0.950 ***	-0.012	-0.175 ***	0.104 ***
	3.63	-19.22	-0.41	-7.33	2.97
Price of Salads	-0.170 ***	-0.111 **	-0.804 ***	-0.009	-0.024
	-3.76	-2.44	-12.64	-0.27	-0.41
Price of Tomatoes	-0.104 **	-0.242 ***	0.175 ***	-0.938 ***	-0.078 *
	-2.36	-5.36	4.54	-21.94	-1.67
Price of Cucumbers	0.012	0.226 ***	0.131 ***	-0.038	-1.275 ***
	0.27	4.74	2.67	-1.13	-18.82
Age	-0.006 ***	-0.007 ***	0.004 ***	0.002 ***	0.002 *
	-5.82	-5.85	4.69	3.04	1.87
Income	-0.00021 ***	0.00002	0.00005 *	0.00006 ***	0.00002
	-8.35	0.90	1.80	3.28	0.48
Number of household members	0.061 ***	-0.013	-0.122 ***	0.001	0.104 ***
	4.77	-1.23	-11.68	0.08	8.44
Wife's employment status	-0.024	0.013	0.064 **	-0.052 ***	0.007
	-1.20	0.86	2.07	-4.20	0.21
Female-dominated household	-0.045 **	-0.007	-0.045 **	0.041 ***	0.034
	-2.33	-0.44	-2.17	3.31	1.63
Presence of children	-0.059 **	-0.018	-0.077 **	0.056 ***	0.070 **
	-2.04	-0.71	-2.28	3.13	2.15
Ordinance-designated city	-0.030	-0.055 ***	0.079 ***	0.009	-0.040
	-1.32	-3.19	3.12	0.54	-1.27

Source: Authors' Calculations
***significant at 0.01; **significant at 0.05; *significant at 0.10.
Upper row: Coefficient, Lower row: Z-Score.

Table 8 Price and demographic elasticities of food items (2010)

	Cabbages	Lettuces	Salads	Tomatoes	Cucumbers
Price of Cabbages	-0.868 ***	0.260 ***	-0.139 ***	-0.112 ***	-0.031
	-17.05	7.13	-4.21	-4.39	-0.71
Price of Lettuces	0.190 ***	-0.960 ***	-0.043	-0.119 ***	-0.011
	6.39	-20.69	-1.50	-4.69	-0.27
Price of Salads	-0.328 ***	-0.162 ***	-0.543 ***	0.073 *	-0.306 ***
	-7.35	-3.47	-8.17	1.94	-4.21
Price of Tomatoes	-0.118 ***	-0.135 ***	0.272 ***	-1.113 ***	-0.030
	-2.92	-2.77	6.13	-25.48	-0.54
Price of Cucumbers	0.039	0.072	-0.088	0.008	-0.993 ***
	0.88	1.47	-1.65	0.24	-12.27
Age	-0.006 ***	-0.005 ***	0.003 **	0.001	0.004 ***
	-5.47	-4.55	2.54	1.02	3.80
Income	-0.00024 ***	0.00000	0.00006 **	0.00004 **	0.00010 **
	-9.29	-0.05	2.31	2.06	2.29
Number of household members	0.077 ***	0.029 **	-0.129 ***	-0.019 ***	0.103 ***
	5.17	2.12	-11.97	-3.13	6.13
Wife’s employment status	-0.009	-0.008	0.027	-0.057 ***	0.070 **
	-0.46	-0.44	1.26	-4.65	2.20
Female-dominated household	-0.039 **	-0.020	-0.022	0.042 ***	0.019
	-2.12	-1.06	-1.13	3.34	0.80
Presence of children	-0.061 **	-0.066 **	-0.097 ***	0.144 ***	0.018
	-2.15	-2.36	-3.04	7.55	0.49
Ordinance-designated city	-0.038 *	-0.040 **	0.060 ***	-0.008	0.003
	-1.85	-2.25	3.22	-0.69	0.10

Source: Authors' Calculations

***significant at 0.01; **significant at 0.05; *significant at 0.10.

Upper row: Coefficient, Lower row: Z-Score.

Table9 The Changes in price and demographic elasticities of salads from 2000 to 2010

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Price of Cabbages	-0.028	-0.145 ***	-0.018	-0.027	-0.073 **	-0.048 *	-0.020	-0.110 ***	-0.074 **	-0.145 ***	-0.139 ***
	-0.94	-4.97	-0.50	-0.95	-2.31	-1.78	-0.64	-3.17	-2.08	-4.24	-4.21
Price of Lettuces	-0.012	-0.041	-0.080 ***	-0.035	0.000	0.010	-0.020	0.001	-0.004	0.008	-0.043
	-0.41	-1.52	-2.60	-1.34	-0.02	0.40	-0.71	0.03	-0.12	0.25	-1.50
Price of Salads	-0.804 ***	-0.727 ***	-0.714 ***	-0.774 ***	-0.574 ***	-0.712 ***	-0.818 ***	-0.745 ***	-0.607 ***	-0.595 ***	-0.543 ***
	-12.64	-12.15	-11.09	-12.64	-9.83	-13.14	-13.08	-11.28	-8.44	-8.57	-8.17
Price of Tomatoes	0.175 ***	0.199 ***	0.135 ***	0.199 ***	0.122 ***	0.234 ***	0.247 ***	0.249 ***	0.197 ***	0.328 ***	0.272 ***
	4.54	5.29	3.62	4.98	3.25	6.48	5.98	6.04	4.08	6.89	6.13
Price of Cucumbers	0.131 ***	0.176 ***	0.123 ***	0.089 *	-0.062	-0.015	0.070	0.073 *	-0.048	-0.117 **	-0.088
	2.67	3.87	2.94	1.91	-1.51	-0.38	1.48	1.66	-0.97	-2.13	-1.65
Age	0.001	0.001	0.000	0.001	0.000	0.000	0.000	-0.001	-0.001	0.000	0.000
	0.67	0.90	-0.34	0.71	-0.46	0.62	-0.12	-0.66	-1.63	-0.32	-0.51
Income	0.00005 *	0.00005 *	0.00004 *	0.00008 ***	0.00009 ***	0.00008 ***	0.00007 ***	0.00004 **	0.00004	0.00006 ***	0.00006 **
	1.80	1.69	1.96	2.86	3.22	2.95	2.60	2.02	1.44	2.94	2.31
Number of household members	-0.122 ***	-0.117 ***	-0.115 ***	-0.112 ***	-0.116 ***	-0.135 ***	-0.117 ***	-0.118 ***	-0.128 ***	-0.126 ***	-0.129 ***
	-11.68	-10.40	-10.87	-9.89	-9.90	-13.99	-10.63	-11.66	-12.67	-12.40	-11.97
Wife's employment status	0.064 **	0.068 **	0.025	0.061 **	0.088 ***	0.030	0.024	0.018	0.012	0.031	0.027
	2.07	2.52	0.92	2.44	3.62	1.46	0.96	0.88	0.46	1.36	1.26
Female-dominated household	-0.045 **	-0.005	-0.020	-0.007	-0.044 **	-0.015	-0.034 *	-0.031	-0.016	-0.018	-0.022
	-2.17	-0.23	-1.01	-0.35	-2.02	-0.78	-1.75	-1.64	-0.82	-0.93	-1.13
Presence of children	-0.077 **	-0.073 **	-0.095 ***	-0.075 **	-0.079 **	-0.049	-0.099 ***	-0.095 ***	-0.138 ***	-0.097 ***	-0.097 ***
	-2.28	-2.25	-2.98	-2.32	-2.37	-1.59	-3.07	-3.07	-4.36	-3.03	-3.04
Ordinance-designated city	0.079 ***	0.055 **	0.052 ***	0.069 ***	0.083 ***	0.077 ***	0.062 ***	0.079 ***	0.079 ***	0.078 ***	0.060 ***
	3.12	2.45	2.62	3.35	3.92	4.46	3.13	3.96	3.59	4.06	3.22

Source: Authors' Calculations

***significant at 0.01; **significant at 0.05; *significant at 0.10.

Upper row: Coefficient, Lower row: Z-Score.