Food Demand in Urban China: An Application of a Multi-Stage Censored Demand System

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Abstract

Since its economic reform, China has changed significantly as it makes its transition from a centrally-planned to a consumer-oriented economy and thus has gradually increased household income and changed consumption patterns in urban China. This study attempts to provide an in-depth understanding of heterogeneous consumer patterns in urban China by developing a multi-stage censored demand system using household data.

Specifically, this study develops an economic model considering heterogeneous consumption patterns across households and commodity groupings and estimates econometric models of a Quadratic Almost Ideal Demand System (QAIDS) using household data. Three methodologies are integrated including constructing a multi-stage demand system, incorporating demographic variables using the 'ordinary budget share scaling and translation' (OBSSAT), and employing a two-step estimator to deal with zero consumption problems.

This study covers three provinces in China, Shandong, Jiangsu, and Guangdong, and uses household data from 1998 provided by the National Bureau of Statistics (NBS). Based on the Chinese food guide pyramid, a three-level utility tree is constructed dividing 18 food items into five subgroups.

An empirical analysis is conducted by estimating econometric models to examine the impact of the potential factors, e.g., income and demographic variables, on food demand. The results show the uniqueness of this study in three dimensions. First, using the OBSSAT helps answer the question of "how to break down the heterogeneous consumption patterns in urban China?" In addition, our findings also show that China should be treated as several markets instead of *one*. Second, the QAIDS has not previously been applied to the study of food demand in urban China. Our results show that the QAIDS is superior to the AIDS; however, the degree of importance for the quadratic term decreases as demographic and censoring effects are considered in a demand system. Finally, 18 food items are broken down into five food subgroups and are estimated by a multi-stage censored QAIDS. Including this large food bundle in a demand system provides us detailed information of the relationship among food items.

Keywords: multi-stage censored demand system, food consumption, urban China

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1. Introduction

China, economically one of the fastest growing countries in the world during the last two decades, has attracted considerable attention from researchers and policy makers worldwide. Since its economic reform in 1978, China has changed significantly as it makes its transition from a centrally-planned to a market-based, consumer-oriented economy. This dramatic shift in the economic structure has gradually increased household income and changed consumption patterns in urban China. In addition, China's accession into the World Trade Organization (WTO) in December 2001 is likely to lead to greater integration into the international agricultural market. These changes have important implications for China itself and for the rest of the world in terms of international trade with China. As indicated by experiences from other countries in East Asia, such as Taiwan, Japan, and South Korea, China is expected to increase either meat imports or feed grain imports to increase animal production (Fan, Wailes, and Cramer, 1995). Thus, it is important to develop a food demand methodology that can rigorously capture these changes, provide a thorough understanding of food consumption, and make a better prediction of future food demand in China.

In the literature studying food demand in urban China, recent studies, including Chen (1996), Fan and Chern (1997), Han and Wahl (1998), Chern (1997 and 2000), and Liu and Chern (2001), estimating food demand in China have presented extremely different income elasticities for grain, offering divergent policy implications. A further investigation is required to determine which elasticity should policy makers use to predict future food demand in China. Since households always face numerous commodities when making decisions, in order to study a large food bundle in a demand system, the assumption of weakly separable preferences is necessary to break down the large commodity bundles into several workable commodity groups. Among previous studies for urban China, only Wu et al. (1995) estimated the first stage demand system with only two broad groups (i.e., commodities under study as one broad group and all others together as the second broad group). A reasonable specification of the first-stage budgeting process is not seen in any of these studies of consumption behavior in urban China. Lastly, household data become commonly used in this domain since household data provide detailed information for investigating household decision-making process. However, Chinese household data were not available until recently, studies using household data from urban China are limited. In order to provide a better understanding of heterogeneous consumer patterns in urban China using household data, this study attempts to develop a multi-stage censored demand system using a unified approach to incorporating demographic variables (Lewbel, 1985).

More specifically, this study has two major tasks: (1) to develop an economic model considering heterogeneous consumption patterns across households and commodity groupings by constructing a multi-stage demand system; and (2) to estimate an econometric model of a Quadratic Almost Ideal Demand System (QAIDS) dealing with zero consumption problems using household data. Three methodologies, including constructing a multi-stage demand system, incorporating demographic variables using the "ordinary budget share scaling and translation," and using a two-step estimator to deal with zero consumption problems, are integrated in this study.

The reminder of this paper is organized as follows. Section 2 introduces the economic model considering heterogeneous consumption patterns across commodity groupings by constructing a multi-stage demand system. In section 3, an econometric model of a censored QAIDS is specified which considers both a unified approach to incorporating demographic effects into a demand system and zero-consumption problem using micro household data. Data sources and descriptions are described in section 4 and the empirical results are presented in section 5. Finally, a summary and limitations are provided in the last section.

2. Economic Model

In order to pay specific attention to constructing a demand model for nondurable goods and services (commodities in brief) using household data, it is assumed that, for each household, preferences are weakly intertemporally separable, leisure is weakly separable from commodities, and durable commodities are weakly separable from nondurable commodities. For simplicity, a two-level demand structure is assumed, i.e., between groups and within groups. Motivated by Deaton and Muellbauer (1980a) as well as Lewbel (1989), the variables and notations used in this section are defined as follows:

N= the number of groups;

G= specific group with G=1, 2, …, N;

n_G= the number of goods in group G;

p_{Gi} and q_{Gi}= the price and quantity of the ith good in group G, respectively;

p_G and q_G= the vectors of prices and quantities in group G, respectively;

p and q= the vectors of all prices and quantities, respectively;

P_G and Q_G= the price and quantity indices for group G, respectively;

P and Q= the vectors of price indices (P_G) and quantity indices (Q_G), respectively;

$X_G = \sum_{i \in G} p_{Gi} q_{Gi}$ = total expenditure in group G;

X= $\sum X_G$ = total expenditure;

w_{Gi}= $p_{Gi}q_{Gi}/X_G$= the budget share of the i^{th} good in group G, relative to total expenditure in group G;

W_G= X_G/X= the budget share of group G;

A= a vector of demographical attributes that affect a household's preferences.

Under this structure, the weakly separable utility function for any household is given by:

(1) $$U\left[u_1(q_1 \mid A),\ldots,u_G(q_G \mid A),\ldots,u_N(q_N \mid A)\right] = U[u_1,\ldots,u_G,\ldots,u_N],$$

where U[.] is called the "broad-group" or the "between-group" utility function for all groups and u_G(.) is the "within-group" sub-utility function with the corresponding utility value, u_G. Since the physical quantities for broad groups do not exist, we assume their quantity and price indices (Q_G and P_G for G=1,2,…,N) by defining $Q_G = u_G(q_G \mid A)$ and $P_G = X_G / Q_G$, respectively (similar to Lewbel, 1989). Hence, the between-group allocation problem can be rewritten as:

(2) $$\underset{\{Q_G\}}{Max}\, U[Q_1,\ldots,Q_G,\ldots,Q_N] \quad s.t. \quad \sum_G P_G \times Q_G = \sum_G X_G = X\,.$$

This is (conceptually) a standard utility maximization problem. The solution to this problem can be expressed as a Marshallian demand system:

(3) $$Q_G^* = Q_G\left(P_1,\ldots,P_G,\ldots,P_N, X \mid A\right) = Q_G\left(P, X \mid A\right).$$

By duality, the corresponding indirect utility function, expenditure function, and Hicksian demand system are $\Psi\left[P, X \mid A\right], C\left[P, U \mid A\right]$, and $H_G\left(P, U \mid A\right)$, respectively.

Given the optimal quantity index for group G, i.e., utility level ($u_G^* = Q_G^*$) determined in the between-group allocation problem (the first step), the within-group commodity allocation problem can be expressed as:

(4) $$\underset{\{q_{Gi}\}}{Min}\, X_G = \sum_{i \in G} p_{Gi} q_{Gi} \quad s.t. \quad u_G(q_{Gi} \mid A) \geq u_G^* .$$

This cost minimization problem can be solved to determine the conditional Hicksian compensated demand systems.[1] By duality, the Marshallian demand systems can be expressed as:

(5) $$q_{Gi}^* = q_{Gi}(p_G, X_G \mid A) \quad \forall i \in G .$$

Again, by duality, the corresponding "within-group" indirect utility function, expenditure function, and conditional Hicksian demand system are $\psi_G[p_G, X_G \mid A]$, $C_G[p_G, u_G^* \mid A]$, and $h_{Gi}(p_G, u_G^* \mid A)$, respectively.

This construction of the two-step utility maximization program under the assumption of weak separability places no restriction on the between-group utility function U[.], no restriction on each of the sub-utility functions u_G(.), and no restriction on the incorporation of demographic attributes into both U[.] and u_G(.). Any of these specifications can be complicated, but once each of these is specified, both within-group and between-group demand systems can be estimated empirically (Lewbel, 1989). However, weak separability imposes strong restrictions on Slutsky substitution terms (Goldman and Uzawa, 1964). These restrictions are crucial to investigate the relationship between commodities in different groups via conditional and unconditional elasticities.

[1] The 'conditional' demand system means the demand system is determined given that the utility level in the first step is known.

Following Deaton and Muellbauer (1980a) and Carpentier and Guyomard (2001), the unconditional elasticities can be expressed as:

(6) Hicksian: $\tilde{\Sigma}_{ij} = \tilde{\varepsilon}_{ij} + w_{Hj} \cdot \eta_{Gi} \cdot \eta_{Hj} \cdot \tilde{\Sigma}_{GH}$,

(7) Marshallian: $\Sigma_{ij} = \varepsilon_{ij} + w_{Hj} \cdot \eta_{Gi} \cdot (\Sigma_{GH} + W_H \cdot \eta_G) \cdot (\eta_{Hj} - 1 + \delta_{GH})$, and

(8) Expenditure: $\eta_i = \eta_{Gi} \times \eta_G$.

where $\tilde{\Sigma}_{ij}$, the unconditional Hicksian compensated elasticities, for $i \in G$ with respect to the price of commodity $j \in H$, and $G, H = 1,2,\ldots,N$. $\tilde{\varepsilon}_{ij}$ is the conditional Hicksian price elasticity of commodity *i* with respect to the price of commodity *j* with $\tilde{\varepsilon}_{ij} = 0$ if $G \neq H$. Σ_{ij} is the unconditional Marshallian elasticities, for $i \in G$ with respect to the price of the commodity $j \in H$, and $G, H = 1,2,\ldots,N$, $\varepsilon_{ij} = 0$ if $G \neq H$, and $\delta_{GH} = 1$, if $G = H$ and $\delta_{GH} = 0$, if $G \neq H$. The η_{Gi} and η_{Hj} are the conditional expenditure elasticities of commodities *i* and *j*, respectively, and η_G is the expenditure elasticity of "between-group" commodity *G*. $\tilde{\Sigma}_{GG}$ is the between-group compensated elasticities for the quantity index of group *G* with respect to its own price index.

In conclusion, the economic model is summarized in a series of steps for establishing empirical procedures in this study. First, since there is no restriction on the sub-utility function, any theoretically plausible demand functions, say the QAIDS, are viable candidates. Second, several techniques can be used to incorporate demographic attributes into any theoretically plausible demand system. We will use Lewbel's general procedure (Lewbel, 1985) to incorporate demographic variables in this study. Third, the estimation of subgroup demand systems can be used to recover $u_G(.)$ for all groups *G, for G=1,…,N*, and thus can be used to construct P_G for all G. Hence, the between-group utility function U[.] can be specified and thus the between-group budget share functions can be estimated. Last, the unconditional elasticities can be calculated by utilizing the within- and between-group elasticities from the two stages. The next section will specify an econometric model following the above four steps.[2]

3. Econometric Model

In this study, following Pollak and Wales (1992), an econometric model is specified for estimating food demand in urban China in four related steps: (1) select a functional form; (2) determine a method for incorporating demographic variables; (3) deal with zero consumption problems; and (4) specify the error structures.

On the basis of the economic model, a three-stage utility maximization is assumed to simplify the construction of the decision-making process for Chinese urban households. The first stage is to make choices among the broad groups.[3] The second stage is to determine the utilities obtained from the food sub-groups. And in the final stage, given the predetermined utility level for each sub-group, each household decides the optimal consumption levels of commodities within each sub-group to minimize the cost (more details on commodity groupings will be discussed in the next section). In addition, the indirect utility functions are assumed to be identical for all stages of the utility maximization framework.

Since the QAIDS has properties of both a flexible functional form (Fisher et al., 2001) and a nonlinear Engel function, which is more appropriate to household data (Banks et al., 1997), the QAIDS is chosen in this study.

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[2] This two-stage economic model of utility maximization can be extended to construct a multi-stage (three or more) demand system.

[3] Eight broad groups are considered in this study and will be discussed in more details in the next section.

The QAIDS (Banks et al., 1997) has an indirect utility function in logarithm as:

$$(9)\qquad \ln V = \frac{1}{[\kappa(p,X)]^{-1} + \lambda(p)},$$

where $\kappa(p,X) = \frac{\ln X - \ln a(p)}{b(p)}$, V is the indirect utility, p is a price vector and X represents the expenditure. In addition, $a(p)$, $b(p)$, and $\lambda(p)$ are price aggregators to be specified later. Its corresponding expenditure function in logarithm is given by:

$$(10)\qquad \ln X = \ln a(p) + \frac{b(p)}{[\ln V]^{-1} - \lambda(p)},$$

where

$$(11a)\qquad \ln a(p) = \alpha_0 + \sum_k \alpha_k \ln p_k + \frac{1}{2}\sum_j \sum_k \gamma_{jk} \ln p_k \ln p_j ,$$

$$(11b)\qquad b(p) = \prod_k p_k^{\beta_k} \text{, and}$$

$$(11c)\qquad \lambda(p) = \sum_k \lambda_k \ln p_k .$$

Applying Roy's identity to equation (9) or Shephard's lemma to equation (10), the QAIDS in share form can be expressed as:

$$(12)\qquad w_i = \alpha_i + \sum_k \gamma_{ik} \ln p_k + \beta_i \ln\left(\frac{X}{a(p)}\right) + \frac{\lambda_i}{b(p)} \cdot \left[\ln\left(\frac{X}{a(p)}\right)\right]^2,$$

where α, β, γ, and λ are parameters to be estimated. When all the λ*'s* are zero, the QAIDS reduces to the AIDS. Thus, the AIDS is nested in the QAIDS, which can be tested based on the statistical significance of λ or other statistical tests such as the likelihood ratio (LR) test, Wald test, etc.

The expenditure elasticity is provided by:

(13a) $E_i = 1 + \frac{1}{w_i} \cdot \frac{\partial w_i}{\partial \ln X}$,

where $\frac{\partial w_i}{\partial \ln X} = \beta_i + 2 \cdot \frac{\lambda_i}{b(p)} \cdot \ln\left(\frac{X}{a(p)}\right)$.

The Marshallian price elasticities (E_{ij}^M) can be computed by:

(13b) $E_{ij}^M = -\delta_{ij} + \frac{1}{w_i} \cdot \frac{\partial w_i}{\partial \ln p_j}$,

where $\delta_{ij} = \begin{cases} 0, & if \quad i \neq j \\ 1, & if \quad i = j \end{cases}$, and

$$\frac{\partial w_i}{\partial \ln p_j} = \gamma_{ij} - \left(\alpha_j + \sum_k \gamma_{jk} \ln p_k\right) \cdot \left(\frac{\partial w_i}{\partial \ln X}\right) - \beta_j \cdot \frac{\lambda_i}{b(p)} \cdot \left[\ln\left(\frac{X}{a(p)}\right)\right]^2.$$

The Hicksian compensated elasticities (E_{ij}^H) can be calculated by using the Slutsky equation, i.e.,

(13c) $E_{ij}^H = E_{ij}^M + w_j E_i$.

In this study, the QAIDS will be applied to one food group and five food subgroups, which will be discussed in depth later. Therefore, six complete demand systems will be estimated independently.

Lewbel (1985) proposed unified approaches to incorporating demographic or other effects into demand systems. Following Lewbel (1985, pp. 9-11), in this study, the modifying functions are specified, called 'ordinary budget share scaling and translation' (OBSSAT, in theorem 8), for our empirical analysis. The modifying functions are expressed as:

(14a) $X = f[X^*, p, r] = \beta(r) \cdot (X^*)^{[s(r)/\alpha(r)]} \widetilde{P}(p, r)$, (14b) $p_i^* = h_i(p,r) = \gamma(r) \cdot p_i^{\alpha(r)}$,

where $\widetilde{P}(p,r) = \prod_{i=1}^{n} p_i^{r_i}$, p_i^* is i^{th} modified price, X^* is a modified expenditure, r is a function of demographic characters A, and $\alpha(r)$, $\beta(r)$, $\gamma(r)$, and $s(r)$ are some specific functions of r. By theorem 4 (Lewbel, 1985, pp. 4-5), the demand system in share form can be derived as:

(15) $w_i(X,p,r) = s(r) \cdot w_i^*(X^*, p^*) + r_i$,

where $s(r) = 1 - \sum_{j=1}^{n} r_j$, $r_i \geq 0 \ \forall i$, $0 < s(r) \leq 1$.[4,5] This budget share is a function which is *independent* from $w_j^* \ \forall j \neq i$ and the modifying function $p_i^* = h_i(.)$ is *independent* from p_j for all $j \neq i$.[6]

If we specify $\alpha(r) = s(r) = a$ and $\gamma(r) = \beta(r) = 1$, as indicated in Lewbel (1985, p.10), then equation (15) can be simplified as:

(16) $w_i(X,p,r) = a \cdot w_i^*(X^*, p^*) + r_i$,

where $a = 1 - \sum_{j=1}^{n} r_j$, $X^* = X / \widetilde{P}$, $\widetilde{P}(p,r) = \prod_{i=1}^{n} p_i^{r_i}$, $p_i^* = p_i^a$, and $r_i = \sum_{k=1}^{K} \delta_{ik} A_k$.

Therefore, for an empirical analysis, a demand system with incorporation of demographic variables (equation 16) can be estimated as long as w_i^* is specified.

In this study, the QAIDS model with demographic variables can be expressed as:

(17) $w_i(X,p,r) = a \cdot w_i^*(X^*, p^*) + r_i$,

where $w_i^*(X^*, p^*) = \alpha_i + \sum_k \gamma_{ik} \ln p_k^* + \beta_i \ln\left(\frac{X^*}{a(p^*)}\right) + \frac{\lambda_i}{b(p^*)} \cdot \left[\ln\left(\frac{X^*}{a(p^*)}\right)\right]^2$,

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[4] See more restrictions in Lewbel (1985, p.10).

[5] A violation of $r_j \geq 0$ may happen in empirical studies.

[6] In the Extended Gorman (Bollino et al., 2000) w_i is a function of w_j* (i.e., not independent from w_j*.)

$$\ln a(p^*) = \alpha_0 + \sum_{i=1}^{n} \alpha_i \ln p_i^* + 1/2 \sum_{i=1}^{n} \sum_{j=1}^{n} \gamma_{ij} \ln p_i^* \ln p_j^* ,$$

$$b(p^*) = \prod_k (p_k^*)^{\beta_k} \text{ , and}$$

$$\ln X^* = \ln(X / \widetilde{P}) = \ln X - \ln \widetilde{P} = \ln X - \sum_{j=1}^{n} r_j \ln p_j .$$

The expenditure elasticity can be expressed as:

(18a) $$E_i = 1 + \frac{1}{w_i} \cdot \frac{\partial w_i}{\partial \ln X},$$

where $\frac{\partial w_i}{\partial \ln X} = a \cdot \frac{\partial w_i^*}{\partial \ln X^*}$ and $\frac{\partial w_i^*}{\partial \ln X^*} = a \cdot [\beta_i + 2 \cdot \frac{\lambda_i}{b(p^*)} \cdot \ln\left(\frac{X^*}{a(p^*)}\right)]$.

The Marshallian price elasticities (E_{ij}^M) can be computed by:

(18b) $$E_{ij}^M = -\bar{\delta}_{ij} + \frac{1}{w_i} \cdot \frac{\partial w_i}{\partial \ln p_j},$$

where $\bar{\delta}_{ij} = \begin{cases} 0, & if \quad i \neq j \\ 1, & if \quad i = j \end{cases}$, $\frac{\partial w_i}{\partial \ln p_j} = a \cdot [a \cdot \frac{\partial w_i^*}{\partial \ln p_j^*} - r_j \cdot \frac{\partial w_i^*}{\partial \ln X^*}]$, and

$$\frac{\partial w_i^*}{\partial \ln p_j^*} = \gamma_{ij} - \left(\alpha_j + \sum_k \gamma_{jk} \ln p_k^*\right) \cdot \left(\frac{\partial w_i^*}{\partial \ln X^*}\right) - \beta_j \cdot \frac{\lambda_i}{b(p^*)} \cdot \left[\ln\left(\frac{X^*}{a(p^*)}\right)\right]^2 .$$

And thus, the Hicksian price elasticities (E_{ij}^H) can be calculated by using the Slutsky equation as:

(18c) $$E_{ij}^H = E_{ij}^M + w_j E_i .$$

The elasticities with respect to demographic variable A_k can be expressed as:

(18d) $$E_{A_k}^i = \frac{A_k}{w_i} \cdot \frac{\partial w_i}{\partial A_k},$$

where $\frac{\partial w_i}{\partial A_k} = a \cdot \frac{\partial w_i^*}{\partial A_k} + w_i^* \frac{\partial a}{\partial A_k} + \frac{\partial r_i}{\partial A_k}$,

$$\frac{\partial r_i}{\partial A_k} = \delta_{ik}\ ,\ \frac{\partial a}{\partial A_k} = -\sum_{j=1}^{n} \frac{\partial r_j}{\partial A_k} = -\sum_{j=1}^{n} \delta_{jk}\ ,$$

$$\frac{\partial w_i^*}{\partial A_k} = \frac{\partial w_i^*}{\partial \ln X^*} \cdot \frac{\partial \ln X^*}{\partial A_k} + \sum_{j=1}^{n} \frac{\partial w_i^*}{\partial \ln p_j^*} \cdot \frac{\partial \ln p_j^*}{\partial A_k}\ ,$$

$$\frac{\partial \ln X^*}{\partial A_k} = \sum_{j=1}^{n} \delta_{jk} \ln p_j\ ,\ \frac{\partial \ln p_j^*}{\partial A_k} = -\ln p_j \cdot (\sum_{l=1}^{n} \delta_{lk})\text{, and}$$

$\frac{\partial w_i^*}{\partial \ln p_j^*}$ and $\frac{\partial w_i^*}{\partial \ln X^*}$ as discussed earlier.

If any of the demand systems in the two levels (between and within groups) have fewer households with zero consumption values, a standard maximum likelihood (ML) estimator or iterated seemingly unrelated regressor (SUR) can be used to estimate the parameters. However, if the zero observation problems are severe, techniques dealing with a censored demand system should be considered. Following Shonkwiler and Yen (1999) and Yen and Kan (2000), a two-step estimation procedure can be expressed as follows.

Consider a structure in which censoring of each commodity *i* is governed by a separate stochastic process $z_{it}'\tau_i + \upsilon_{it}$ such that

$$(19) \qquad w_{it} = \begin{cases} w_{it}(p, X \mid \theta) + \varepsilon_{it}, & if\ z_{it}'\tau_i + \upsilon_{it} > 0 \\ 0, & otherwise \end{cases},$$

where w_{it} denotes the observed expenditure share, θ represents all parameters in a certain demand system, z_{it} is a vector of exogenous variables, τ_i is a conformable parameter vector, and ε_{it} and υ_{it} are random errors.

The system of demand equations in share form can be written as:

$$(20) \qquad w_{it} = E(w_{it}) + \xi_{it} = \Phi(z_{it}'\tau_i) w_{it}(p, X \mid \theta) + \delta_i \phi(z_{it}'\tau_i) + \xi_{it}\ ,$$

where $\xi_{it} = w_{it} - E(w_{it})$, with $E(\xi_{it}) = 0$ and ξ_{it} is heteroscedastic with variance (Shonkwiler and Yen, 1999)

$$\text{(21)} \quad \begin{aligned} \operatorname{var}(\xi_{it}) = {} & \sigma_i^2 \Phi(z_{it}'\tau_i) + [1 - \Phi(z_{it}'\tau_i)]\{w_{it}^2(p, X \mid \theta) \cdot \Phi(z_{it}'\tau_i) + 2w_{it}(p, X \mid \theta)\delta_i \phi(z_{it}'\tau_i)\} \\ & - \delta_i^2 \{z_{it}'\tau_i \phi(z_{it}'\tau_i) + \phi^2(z_{it}'\tau_i)\} \end{aligned}.$$

Therefore, the system (20) can be estimated with a two-step procedure: (1) obtain ML probit estimates $\hat{\tau}_i$ using the binary outcomes $w_{it}= 0$ and $w_{it}> 0$; (2) calculate $\Phi(z_{it}'\hat{\tau}_i)$ and $\phi(z_{it}'\hat{\tau}_i)$ and then estimate θ and $\delta_1, \delta_2, \ldots, \delta_n$ in the system:

$$\text{(22)} \quad w_{it} = \Phi(z_{it}'\hat{\tau}_i) w_{it}(p, X \mid \theta) + \delta_i \phi(z_{it}'\hat{\tau}_i) + \eta_{it},$$

by the ML or SUR procedure. Since the right-hand side of the system (22) does not add up to one, therefore, the second-step estimation of the system should be based on the full n-vector. This also indicates that the adding-up condition is not satisfied.

Elasticities can be calculated by taking derivation of equation (22).[7] Namely,

$$\text{(23a)} \quad \frac{\partial E(w_i)}{\partial \ln p_j} = \Phi(z_{it}'\hat{\tau}_i) \cdot \frac{\partial w_i}{\partial \ln p_j},$$

$$\text{(23b)} \quad \frac{\partial E(w_i)}{\partial \ln X} = \Phi(z_{it}'\hat{\tau}_i) \cdot \frac{\partial w_i}{\partial \ln X}.$$

To summarize, this section attempts to propose an approach to analysis of food demand using recent Chinese urban household data. Indirect utility functions for the two levels of demand structure and an approach to incorporating demographic variables are specified. A limited dependent variable approach is then applied to capture the large proportion of zero observations.

4. Data Sources and Descriptions

[7] The elasticity formulas (23a,b) indicate that the explanatory variables *Z's* in the first step estimation do not include the variables, *p* and *X*, in the second step estimation, which is applied in this study.

The database is taken from the National Bureau of Statistics (NBS) in China. The NBS urban household survey contains huge amounts of household information, including household components, such as age, gender, and education levels of each household member; cash inflow and outflow; quantities and expenditures of major commodities, including 138 food items and 190 non-food items; and year-end housing conditions as well as ownership of durable goods. The households were selected by a two-stage stratified systematic random sampling scheme. In total, 25,000 households in 226 cities are surveyed each year. Since each selected household needed to keep accounts for a successive three year period, a rotation sampling scheme (1/3 of the households were replaced every year) was conducted to ease the burden. Finally, the database contains annual information which is different from other typical household surveys (e.g., the Nationwide Food Consumption Survey conducted by the U.S. Department of Agriculture covering a shorter period of time, say, one to two weeks). This study employs data collected from three provinces in urban China in 1998. These provinces are Shandong (near Beijing), Jiangsu (adjacent to Shanghai), and Guangdong (adjacent to Hong Kong), which represent diverse patterns of food consumption in urban China. There were over 2,000 observations each year. On the basis of the Chinese food guide pyramid and dietary guidelines, a three-level utility tree is constructed. Focusing on the food-at-home demand, eighteen food items are divided into five subgroups.

Figure 1 shows the utility tree used in this study. The broad group of food in Figure 1 contains six sub-groups, viz., (1) grains, (2) vegetables and fruits, (3) animal foods, (4) dairy and bean products, (5) fats, oils and sweets, and (6) others, which include those consumed-at-home food items not being considered in the five sub-groups of interest and food-away-from-home (FAFH). In this modified utility tree, each food subgroup consists of two to five food items, respectively. The descriptive analysis focuses on food consumption in the first five food subgroups.

Table 1 shows the provincial differences in the quantities of eighteen food items. Per capita consumptions of grains and fruits in Shandong are higher than the other two provinces while per capita rice consumption in Shandong is less than one fourth of that in either Jiangsu or Guangdong. However, flour consumption in Shandong is at least three times of that in Jiangsu and over ten times of that in Guangdong. As to animal food products, different patterns occurred as shown in Table 1. Among the three provinces, households in Shandong consumed the most eggs (17.33 Kg); households in Jiangsu consumed the most pork (20.51 Kg) and aquatic products (near 10 Kg); and households in Guangdong consumed the most beef and mutton (2.60 Kg) and poultry (over 10 Kg). In addition, people in Jiangsu consumed more dairy and bean products than the other two provinces. People in Jiangsu consumed more fats and oils at 9.13 Kg per capita whereas in Guangdong people consumed only 2.81 Kg. People in Shandong consumed more nuts and cakes than the other two provinces with an average of 4.41 Kg and 5.67 Kg, respectively. These descriptive statistics clearly show regional differences of food consumption in urban China.

Table 2 shows that approximately two thirds of the households consist of three members, accounting for 23% of total households in both Shandong and Jiangsu and 17% in Guangdong, which is the largest group followed by two or four persons in an average household. Single-person households and those with five or more members are not commonly seen. Thus, more attention is paid to household sizes of two to four members.

Per capita food consumptions with different household sizes are compared in Table 3. Most of the food items showed a decreasing trend of per capita consumption with respect to household size. Some of the food items reached a peak where there were one or two persons in a household; however, the difference in food consumption patterns between households of one or two persons is very marginal. This is understandable since most of these household members are adults. In addition, we need to note that there were only 0.24% of households with a single person. As to a household with more than three persons, usually the additional member is either a child or an elder family member; dramatically reduced per capita food consumption is expected since these additional family members usually do not need as much food as the two adult members.

Considering the income factor, the entire sample was divided into three income groups: low, middle, and high, with roughly 20%, 60%, and 20% of the pooled sample, respectively. The households with income ranging between 4,320 and 10,140 Yuan per capita in 1998 are classified as being in the middle-income group. From Table 4, Shandong has the largest percentage of households in the low-income group whereas Guangdong has 14.59% households in the high-income group. Hence, this table shows that among the three provinces, households in Guangdong were richer than those in Jiangsu and Shandong, which is the same as was discussed earlier.

Tables 5 and 6 summarize the consumption of 18 food items by income groups within the three provinces. Generally, the consumption volumes of most of the 18 food items increases when income climbs upward, especially for fresh vegetables, fresh fruits, and fresh milk; however, there are differences among the three provinces. As income increases, per capita rice consumption increases in Shandong but decreases in Guangdong.

Flour consumption decreases sharply in both Shandong and Jiangsu but increases marginally in Guangdong as income increases. As to animal protein food items, consumption of all five items in Shandong increases when income changes from low to middle but decreases from middle to high-income group. Most of the animal food items in Jiangsu show a rising trend except for beef and mutton. However, only eggs and aquatic products increase as income increases in Guangdong. As to dairy and bean products, milk increases sharply as it moves from a low to a high-income group. For example, the average per capita fresh milk consumption in Jiangsu is 3.41 Kg for the low-income group but 16.17 Kg for the high-income group. Yogurt is similar to fresh milk. Consumption of fats and oils in Jiangsu and Guangdong increases as income increases; however, Shandong shows a decreasing trend. All three provinces show an increasing trend in nuts and cakes when income groups move from low to high. Sugar, however, has a mixed relationship among the three provinces. To sum up, as income increases, urban Chinese households appear clearly to consume more fresh vegetables, fresh fruits, fresh milk, nuts, and cakes, but the relationships are mixed for animal products.

Householders play an important role in food consumption. Several characteristics about householders have been studied in the literature, e.g., Bhandari and Smith (2000). In this study, several demographic variables are considered in empirical studies such as age, gender, and education level of the householder. Due to limit of length, the comparison of food consumption by age group is discussed.

According to Chinese dietary guidelines, households are divided into three groups according to the age of the householder. Group 1 consists of households with the householder below 45 years of age; group 2 is between 45 and 60 and the last group includes those over 60 years of age. Table 7 shows the distribution of households among age groups by provinces. Most householders in Shandong are aged below 45. Jiangsu has the most householders over 60 years old. In Guangdong, householders are distributed evenly between low and middle age groups, presenting a similar situation as in Jiangsu but having a smaller percentage of householders over 60.

Even though the age distribution is different among the three provinces, according to Tables 8 and 9, the food consumption patterns are quite similar, i.e., most of the food items increase in volume when the householder gets older, especially in Shandong. For example, fifteen out of eighteen food items in Shandong present an increasing trend as age goes up. Jiangsu and Guangdong show a similar pattern. The increasing trend may be explained by a testable assumption that when householders get older, they prefer to eat at home instead of eating in restaurants. However, dairy products, including fresh milk and yogurt, exhibit a decreasing trend in Guangdong when an age group gets older.

To sum up, this section describes the data sources and compares the descriptive statistics. The demographic variables are important factors in explaining food consumption in China, including household size, income groups, and age of householders. Each factor has its unique impact on food consumption. In the next section, we will use econometric models to incorporate these demographic variables into a demand system to reflect their impact on food demand analysis.

5. Empirical Results

An empirical analysis is conducted by estimating econometric models in a sequence of six steps: (1) Engel curve analysis, (2) the QAIDS, (3) the QAIDS with demographic variables, (4) the censored QAIDS with demographic variables, (5) the second-stage demand system, and (6) calculation of unconditional elasticities. This empirical analysis allows us to examine the impact of the effects of each factor, such as income, prices, demographic variables, and zero consumption, on the demand system.

A Working-Leser form of a single equation approach is used to determine if a demand system requires the quadratic term in log income. The equation is augmented by incorporating demographic variables and can be expressed as:

$$(24) \qquad w_i = \alpha_i + \sum_{k=1}^{K} \delta_{ki} A_k + \beta_i \ln X + \gamma_i (\ln X)^2 ,$$

where w_i = budget share of food i for i=1,…,18,

$A_k = k^{th}$ demographic variable,

$\ln X$ = logarithm of expenditure, and

α_i's, β_i's, γ_i's, and δ_{ki}'s are parameters to be estimated.

The results show that thirteen out of eighteen food items have an estimated γ_i not statistically different from zero at the 0.05 level.[8] Only the r_i coefficients for rice, fresh fruits, pork, bean products, and fats and oils are significant at the 0.05 level. This result also shows that at least one of the food items in each group has a non-linear Engel curve. In conclusion, the QAIDS model works properly by fitting the dataset from urban China and thus is used in the remaining analysis including incorporation of demographic variables and censored demand systems.

Next, a demand analysis is conducted considering eighteen food items which are consumed at home. The QAIDS is utilized to test the significance of the necessity of a quadratic term in log income.[9] The Wald test results are presented in Column 2, Table 10. Without incorporation of demographic variables, the null hypothesis, $\lambda_i = 0$, is rejected

[8] The empirical results are available upon request from the authors.
[9] The definitions of variables and parameter estimates are available upon request from the authors.

for eleven out of eighteen food items. Only pork, poultry, eggs, yogurt, fats and oils, sugar, and cakes do not reject $\lambda_i = 0$ at the 0.05 significant levels. This indicates that the QAIDS model fits the Chinese urban household data better than the AIDS model.

With incorporation of demographic variables, the results of hypotheses testing of $\lambda_i = 0$ vs. $\lambda_i \neq 0$ can be again observed from Column 3 in Table 10. Table 10 shows that, with incorporation of demographic variables, the explanatory power of the QAIDS has been diluted since only seven out of eighteen *λ's* present statistically different from zero, including four food items in group 1 and fresh milk, bean products, and nuts. We also find that the QAIDS can be reduced to the AIDS in four food items (fresh vegetables, fresh fruits, beef and mutton, and aquatic products) since the *λ's* are not statistically important when incorporating demographic variables. This may be because the effect of demographic variables on budget share dominates the effect of the quadratic term in log income.

The Wald test results of $\lambda_i = 0$ vs. $\lambda_i \neq 0$ in the censored QAIDS with incorporation of demographic variables are presented in the last column in Table 10. Again, the purpose is to investigate whether the quadratic term of log income is important or not. Interestingly, parameter estimates of rice, potatoes, and nuts are statistically different from zero at the 0.10 level using the Wald test. This finding shows that most of the budget shares are linear in log income.

As for incorporation of demographic variables, eleven demographic variables are created from eight different demographic characters, such as household size; age, gender, and education level of the householder; dummy variables of provinces and ownerships of refrigerators. The empirical results show that these demographic variables have a significant impact on all six QAIDS models (five food subgroups and one aggregate food group) under the framework of the multi-stage demand system. Specifically, among the considered demographic variables, regional differences have the most inference in determining consumption patterns among the three provinces. Other important factors include household size, income group and age of householder.

In order to compare elasticities, homogeneity and symmetry conditions are imposed. The unconditional Hicksian and Marshallian price elasticities as well as unconditional expenditure elasticities are calculated by equations 6-8, respectively. These unconditional elasticities are presented in Tables 11 and 12. Table 11 shows the unconditional elasticities derived from the basic QAIDS model without considering any effects whereas Table 12 exhibits those elasticities from the censored QAIDS with incorporation of demographic variables. Generally, the unconditional elasticities from Table 11 are closer to unity than those from Table 12. In addition, for expenditure and own-price elasticities, all of them have correct signs. From Table 12, *aquatic products* have the highest unconditional expenditure elasticity (1.240) and *nuts* have the lowest (0.640), whereas from Table 11, the highest unconditional expenditure elasticity is *fresh milk* (1.559) and the lowest is *bean products* (0.507). Rice is also income elastic with 1.138 (Table 12). As for own-price elasticities, Table 11 shows a wide range from -2.673 (flour) to -0.238 (coarse grains); whereas in Table 12, the range is narrower from -1.066 (fresh milk) to -0.619 (cakes) and only two food items have unconditional own-price elasticities over unity in absolute value (-1.004 for beef and mutton and –1.066 for fresh milk). Hence, the unconditional elasticities are not fluctuated when censoring and incorporation of demographic variables are considered. Table 12 also presents the unconditional Hicksian price elasticities. The trend of unconditional Hicksian price elasticities is similar to those of Marshallian price elasticities. All the Hicksian own-price elasticities have a negative sign. In addition, from the unconditional Hicksian cross-price elasticities, most of the food items are net substitutes and many of them are close to zero, indicating weak cross-price effects. In this study, the expenditure (income) elasticity for the food broad group is estimated using the Working-Leser form (equation 24). The expenditure elasticity for the food broad group is 0.657 and thus the unconditional expenditure elasticity with respect to total living expenditure can be calculated.The unconditional expenditure elasticities with respect to total living expenditure are also shown in Tables 11 and 12. Since all unconditional elasticities are multiplied by 0.657, most of the unconditional elasticities become smaller than unity except for fresh milk (1.025, in Table 11). This finding indicates that most of the eighteen food items are normal goods, as expected. However, as for rice and flour, their income elasticities are still higher than expected.

To sum up, the expenditure and price elasticities show that a censored demand approach and a multi-stage demand system improve these estimates which is important to policy makers for forecasting future food consumption trends in urban China.

6. Concluding Remarks

China, since its economic reform in 1978, has changed significantly as it makes its transition from a centrally-planned to a consumer-oriented economy. The dramatic shift in the economic structure has gradually increased household income and changed consumption patterns in urban China. This study attempts to provide a new understanding of heterogeneous consumer patterns in urban China by developing a multi-stage censored demand system using household data.

This study analyzes data from three provinces, Shandong, Jiangsu, and Guangdong in China and uses urban household data (2,000 observations each year) from 1998 provided by the National Bureau of Statistics in China. On the basis of the Chinese food guide pyramid, a three-level utility tree is constructed that divides 18 food items into five food subgroups.

An empirical analysis is conducted by estimating econometric models in a sequence of six steps. This empirical analysis allows us to examine the impact of the effects of each factor, such as income, prices, demographic variables, and zero consumption on the demand system. The empirical results show the uniqueness of this study in three dimensions. First, to our knowledge, the 'ordinary budget share scaling and translation', one of the unified approaches to incorporating demographic variables, has not previously been used in any applied demand analysis. This approach provides us a potential answer to the problem of "how to break down the heterogeneous consumption patterns in urban China?" In addition, should China be treated as one market or several markets? This question can also be answered by incorporation of demographic variables. Second, the QAIDS has not yet been applied to study food demand in urban China. Banks et al. (1993) and Blundell et al. (1997) found that the QAIDS model has more income fluctuation and is more suitable for household data than its linear counterpart the AIDS model. Our results show that the QAIDS is superior to the AIDS; however, the degree of importance decreases as other effects are incorporated into the demand system. Finally, eighteen consumed-at-home food items are broken down into five food subgroups and are estimated by a multi-stage censored QAIDS. Including this large food bundle in a demand system is not commonly seen in empirical studies.

Some limitations should be noted in this study. First, this analysis is based on the dataset from three provinces in urban China and attempts to provide an indicator for foreseeing future consumption patterns in urban China. However, not all of the urban areas in China, especially the inner provinces, are as prosperous as the three provinces in this study. Whether or not the economy in these inner urban areas will grow quickly enough to catch up with the food consumption patterns as indicated in the three provinces in this study is another issue. How that growth in economy will affect food consumption in China is still uncertain at the present time.

Second, certain methodological issues are not considered in this study. For example, the multi-stage demand system is not fully estimated since there are no price indices available to estimate a demand system for non-food groups. A remedy of estimating a single equation is used to calculate income elasticities, which are useful for policy makers. In addition, the methodology for deriving total income effects needs to be developed in order to enhance the value of this study. Price variation reflects both quality and quantity. How to decompose price or how demographic factors impact prices faced by consumers are not addressed in this study. Price is another important issue needing in depth study in the near future.

Third, there are other general procedures available in the literature to incorporate demographic variables into a demand system for a comparison of methodologies. A comparison of 'ordinary budget share scaling and translation' with other commonly-used procedures, e.g. five procedures in Pollak and Wales (1981) or Bollino et al. (2000), would provide some empirical evidence for selection of procedures to incorporate demographic variables.

Finally, as for themethodology dealing with zero consumption problems, Shonkwiler and Yen's approach still has problems such as adding-up property being unsatisfied. A complete demand system considering either a one-step simulation method or other two-step approaches would be good to extend and to compare the performances.

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Table 1. Comparison of Food Consumption for 18 Food Items in Urban China, 1998

Food Item[a, b, c]	Shandong mean	Shandong (s.d.)	Jiangsu mean	Jiangsu (s.d.)	Guangdong mean	Guangdong (s.d.)	Pooled Data mean	Pooled Data (s.d.)
Q_1	13.71	(14.95)	65.38	(43.25)	51.61	(28.61)	44.96	(39.06)
Q_2	24.18	(24.54)	6.79	(15.77)	1.47	(6.57)	10.75	(19.72)
Q_3	2.44	(4.71)	1.97	(4.53)	1.80	(2.17)	2.07	(4.06)
Q_4	12.96	(9.21)	9.89	(7.51)	5.96	(6.00)	9.72	(8.18)
Q_5	103.96	(46.47)	115.52	(60.55)	111.78	(40.65)	110.76	(51.20)
Q_6	74.77	(40.26)	63.99	(40.75)	47.76	(30.34)	62.67	(39.28)
Q_7	12.77	(7.95)	20.51	(12.28)	19.39	(12.04)	17.73	(11.52)
Q_8	2.10	(2.70)	1.61	(2.63)	2.60	(2.96)	2.06	(2.78)
Q_9	2.47	(2.49)	7.19	(6.16)	10.63	(7.10)	6.70	(6.46)
Q_{10}	17.33	(10.19)	13.20	(8.37)	8.18	(4.67)	13.04	(8.91)
Q_{11}	4.35	(4.16)	9.45	(7.59)	8.77	(7.14)	7.63	(6.92)
Q_{12}	8.78	(14.59)	9.57	(15.35)	5.55	(9.72)	8.14	(13.78)
Q_{13}	0.80	(3.26)	1.74	(5.45)	1.03	(2.52)	1.23	(4.12)
Q_{14}	6.30	(5.23)	8.08	(6.21)	4.82	(4.58)	6.56	(5.63)
Q_{15}	5.40	(4.98)	9.13	(6.78)	6.79	(4.78)	7.26	(5.92)
Q_{16}	1.12	(1.74)	2.42	(2.20)	2.81	(2.42)	2.12	(2.25)
Q_{17}	4.41	(3.59)	3.64	(3.39)	2.42	(1.92)	3.53	(3.20)
Q_{18}	5.67	(4.34)	3.16	(2.89)	4.62	(3.77)	4.38	(3.81)

[a] The 18 basic food items are: (1) rice, (2) flour, (3) coarse grains, (4) potatoes, (5) fresh vegetables, (6) fresh fruits, (7) pork, (8) beef and mutton, (9) poultry, (10) eggs, (11) aquatic products, (12) fresh milk, (13) yogurt, (14) bean and its products, (15) fats and oils, (16) sugar, (17) nuts, and (18) cakes.

[b] Unit: Kilogram

[c] Standard deviations are in parentheses.

Table 2. Percentage of Households by Household Size, 1998

Household Size	Shandong	Jiangsu	Guangdong	Pooled
		--- % ---		
1	0.05	0.20	0.00	0.24
2	2.15	7.27	1.37	10.79
3	23.38	23.13	17.42	63.93
4	4.93	5.47	7.42	17.81
5	0.98	2.44	2.54	5.95
6 or more	0.24	0.54	0.49	1.27
TOTAL	31.72	39.04	29.23	100.00

Table 3. Comparison of Food Consumption for 18 Food Items by Household Size, 1998

Food Item [a, b, c]	Household Size 1	2	3	4	5	6 or more
Q_1	73.40 (96.21)	74.20 (54.29)	39.23 (34.90)	45.53 (34.80)	49.47 (33.69)	50.62 (33.14)
Q_2	30.20 (40.80)	15.51 (28.26)	10.00 (18.43)	10.95 (18.80)	7.88 (13.34)	15.19 (20.46)
Q_3	7.80 (11.88)	3.61 (8.17)	1.79 (2.83)	1.97 (3.20)	1.68 (2.94)	5.50 (9.01)
Q_4	22.80 (9.52)	15.90 (12.71)	9.12 (6.95)	8.56 (7.46)	7.53 (6.42)	11.04 (8.08)
Q_5	131.60 (32.30)	170.18 (74.03)	104.05 (43.53)	104.10 (42.17)	97.06 (31.41)	97.81 (32.59)
Q_6	109.20 (51.62)	81.67 (51.51)	63.97 (37.89)	52.98 (32.80)	46.15 (29.89)	40.23 (22.10)
Q_7	40.20 (36.18)	27.14 (15.98)	16.38 (10.12)	16.60 (9.80)	17.84 (10.68)	16.69 (10.49)
Q_8	2.20 (2.17)	2.59 (4.69)	2.05 (2.47)	1.86 (2.33)	1.96 (2.65)	1.15 (1.54)
Q_9	11.60 (5.73)	10.17 (8.77)	6.11 (5.82)	6.73 (6.66)	6.56 (5.87)	5.92 (4.68)
Q_{10}	28.60 (10.26)	19.02 (12.14)	12.77 (8.58)	11.47 (6.66)	9.76 (6.42)	10.42 (4.93)
Q_{11}	12.60 (11.50)	13.04 (9.93)	6.92 (5.93)	7.10 (6.85)	6.76 (6.05)	8.27 (6.19)
Q_{12}	5.60 (7.70)	11.51 (21.16)	8.73 (13.24)	5.38 (10.47)	5.30 (10.15)	2.69 (5.71)
Q_{13}	0.00 (0.00)	1.98 (7.32)	1.28 (3.49)	0.75 (3.76)	1.10 (3.68)	0.27 (0.67)
Q_{14}	16.60 (8.62)	12.46 (8.01)	5.78 (4.73)	6.36 (5.16)	4.75 (3.57)	5.46 (4.19)
Q_{15}	19.80 (18.42)	12.02 (8.67)	6.57 (5.21)	7.09 (5.00)	6.16 (4.20)	6.73 (4.31)
Q_{16}	2.00 (2.24)	3.42 (2.92)	1.91 (2.10)	2.05 (2.13)	2.23 (1.92)	2.23 (2.23)
Q_{17}	7.00 (6.32)	5.62 (4.68)	3.30 (2.94)	3.36 (2.77)	2.58 (2.20)	3.19 (2.56)
Q_{18}	11.20 (10.94)	5.14 (5.01)	4.53 (3.70)	3.85 (3.35)	3.17 (2.61)	2.46 (1.70)

[a] The 18 basic food items are: (1) rice, (2) flour, (3) coarse grains, (4) potatoes, (5) fresh vegetables, (6) fresh fruits, (7) pork, (8) beef and mutton, (9) poultry, (10) eggs, (11) aquatic products, (12) fresh milk, (13) yogurt, (14) bean and its products, (15) fats and oils, (16) sugar, (17) nuts, and (18) cakes.
[b] Unit: Kilogram
[c] Standard deviations are in parentheses.

Table 4. Comparison of Percentage of Households by Income Group, 1998

Income Group	Shandong	Jiangsu	Guangdong	Pooled
		--- % ---		
Low	11.42	7.66	0.93	20.01
Middle	18.98	27.28	13.71	59.98
High	1.32	4.10	14.59	20.01
TOTAL	31.72	39.04	29.23	100.00

Table 5. Comparison of Food Consumption for 18 Food Items by Income Group in Shandong, 1998

Food Item[a, b, c]	Income Group: Low mean	Low (s.d)	Middle mean	Middle (s.d)	High mean	High (s.d)
Q_1	11.71	(13.80)	14.68	(15.51)	17.00	(14.94)
Q_2	28.11	(25.30)	22.88	(24.14)	8.70	(13.54)
Q_3	1.96	(3.00)	2.67	(5.44)	3.30	(5.16)
Q_4	12.70	(8.41)	13.23	(9.83)	11.15	(6.13)
Q_5	93.98	(40.30)	107.48	(47.07)	139.70	(62.38)
Q_6	61.15	(31.91)	80.80	(41.68)	105.89	(46.84)
Q_7	10.53	(6.57)	14.10	(8.40)	12.96	(8.14)
Q_8	2.08	(2.79)	2.18	(2.71)	1.22	(1.12)
Q_9	2.35	(2.48)	2.56	(2.52)	2.15	(1.96)
Q_{10}	15.85	(7.83)	18.22	(11.12)	17.41	(12.90)
Q_{11}	3.91	(4.18)	4.61	(4.17)	4.41	(3.59)
Q_{12}	4.53	(9.27)	10.43	(15.05)	21.85	(27.96)
Q_{13}	0.29	(0.81)	1.08	(4.07)	1.15	(2.97)
Q_{14}	5.50	(4.08)	6.66	(5.56)	8.19	(7.87)
Q_{15}	5.55	(4.30)	5.42	(5.41)	3.74	(3.72)
Q_{16}	1.26	(2.30)	1.08	(1.34)	0.56	(0.89)
Q_{17}	3.57	(3.11)	4.84	(3.71)	5.37	(4.38)
Q_{18}	4.87	(4.05)	6.12	(4.43)	6.22	(4.51)

[a] The 18 basic food items are: (1) rice, (2) flour, (3) coarse grains, (4) potatoes, (5) fresh vegetables, (6) fresh fruits, (7) pork, (8) beef and mutton, (9) poultry, (10) eggs, (11) aquatic products, (12) fresh milk, (13) yogurt, (14) bean and its products, (15) fats and oils, (16) sugar, (17) nuts, and (18) cakes.

[b] Unit: Kilogram

[c] Standard deviations are in parentheses.

Table 6. Comparison of Food Consumption for 18 Food Items by Income Group in Jiangsu and Guangdong, 1998

	Income Group					
Food	Low		Middle		High	
Item [a, b, c]	mean	(s.d)	mean	(s.d)	mean	(s.d)
Jiangsu						
Q_1	59.97	(36.08)	67.59	(43.99)	60.81	(49.44)
Q_2	9.13	(17.06)	6.58	(16.16)	3.85	(8.50)
Q_3	3.54	(7.66)	1.55	(3.32)	1.85	(2.69)
Q_4	9.34	(6.70)	9.99	(7.54)	10.26	(8.68)
Q_5	100.31	(48.79)	117.56	(59.65)	130.39	(78.81)
Q_6	47.12	(30.35)	65.48	(38.45)	85.64	(57.35)
Q_7	17.13	(7.69)	21.10	(12.65)	22.90	(15.27)
Q_8	0.89	(1.53)	1.79	(2.89)	1.74	(2.11)
Q_9	4.80	(3.63)	7.71	(6.29)	8.13	(7.83)
Q_{10}	10.65	(5.34)	13.63	(8.51)	15.13	(10.79)
Q_{11}	6.50	(4.68)	9.94	(7.52)	11.71	(10.52)
Q_{12}	3.41	(7.36)	10.31	(15.13)	16.17	(22.55)
Q_{13}	0.64	(2.61)	1.81	(5.42)	3.32	(8.39)
Q_{14}	6.99	(5.08)	8.34	(6.55)	8.37	(5.66)
Q_{15}	8.54	(4.77)	9.20	(6.70)	9.76	(9.83)
Q_{16}	2.10	(1.76)	2.48	(2.22)	2.69	(2.70)
Q_{17}	3.04	(2.53)	3.68	(3.45)	4.56	(4.17)
Q_{18}	2.48	(1.85)	3.19	(2.92)	4.27	(3.84)
Guangdong						
Q_1	74.21	(31.91)	56.57	(28.81)	45.51	(26.62)
Q_2	0.16	(0.37)	1.25	(7.05)	1.77	(6.31)
Q_3	0.84	(0.90)	1.58	(2.00)	2.08	(2.34)
Q_4	4.68	(5.98)	6.01	(6.23)	6.00	(5.80)
Q_5	95.32	(35.08)	105.98	(36.93)	118.29	(43.22)
Q_6	19.79	(11.87)	39.31	(25.33)	57.47	(32.00)
Q_7	16.42	(7.45)	20.11	(12.36)	18.91	(11.95)
Q_8	2.32	(2.16)	2.79	(3.35)	2.44	(2.59)
Q_9	11.47	(6.28)	10.42	(7.21)	10.78	(7.05)
Q_{10}	6.42	(4.05)	7.73	(4.32)	8.72	(4.95)
Q_{11}	5.74	(2.79)	8.37	(6.38)	9.34	(7.90)
Q_{12}	0.79	(1.55)	3.71	(7.26)	7.57	(11.45)
Q_{13}	0.37	(0.96)	0.86	(2.16)	1.23	(2.86)
Q_{14}	5.05	(4.22)	4.24	(4.06)	5.36	(4.98)
Q_{15}	6.21	(4.09)	6.72	(4.46)	6.89	(5.12)
Q_{16}	2.63	(2.29)	3.29	(2.64)	2.37	(2.11)
Q_{17}	1.32	(1.20)	2.10	(1.87)	2.78	(1.93)
Q_{18}	2.05	(1.96)	4.06	(3.41)	5.31	(4.01)

[a] The 18 basic food items are: (1) rice, (2) flour, (3) coarse grains, (4) potatoes, (5) fresh vegetables, (6) fresh fruits, (7) pork, (8) beef and mutton, (9) poultry, (10) eggs, (11) aquatic products, (12) fresh milk, (13) yogurt, (14) bean and its products, (15) fats and oils, (16) sugar, (17) nuts, and (18) cakes.
[b] Unit: Kilogram
[c] Standard deviations are in parentheses.

Table 7. Comparison of Percentage of Households by Age Group, 1998

Age Group	Shandong	Jiangsu	Guangdong	Pooled
		--- % ---		
Below 45	21.72	15.91	15.76	53.39
Between 45 and 60	8.88	14.69	11.32	34.90
Above 60	1.12	8.44	2.15	11.71
TOTAL	31.72	39.04	29.23	100.00

Table 8. Comparison of Food Consumption for 18 Basic Food Items by Age Group in Shandong, 1998

Food	Age Group					
	Below 45		Between 45 and 60		Above 60	
Item [a, b, c]	mean	(s.d)	mean	(s.d)	mean	(s.d)
Q_1	11.64	(12.89)	17.83	(17.31)	21.22	(22.22)
Q_2	20.53	(21.92)	29.92	(25.52)	49.22	(38.85)
Q_3	1.91	(2.77)	2.77	(3.95)	10.00	(17.44)
Q_4	11.50	(7.27)	14.58	(10.13)	28.17	(16.92)
Q_5	94.91	(40.28)	117.10	(45.03)	174.91	(77.04)
Q_6	70.13	(39.46)	82.84	(38.97)	100.65	(47.31)
Q_7	11.48	(6.68)	14.50	(8.63)	23.91	(12.86)
Q_8	1.96	(2.59)	2.24	(2.55)	3.74	(4.71)
Q_9	2.54	(2.47)	2.27	(2.37)	2.70	(3.51)
Q_{10}	15.95	(9.18)	18.82	(10.02)	32.30	(15.67)
Q_{11}	3.79	(3.53)	5.19	(4.76)	8.52	(6.55)
Q_{12}	8.27	(12.91)	8.03	(12.93)	24.61	(35.62)
Q_{13}	0.78	(2.04)	0.79	(4.99)	1.30	(4.99)
Q_{14}	5.02	(3.82)	8.25	(5.74)	15.61	(9.41)
Q_{15}	4.56	(4.08)	6.70	(5.52)	11.26	(9.08)
Q_{16}	1.07	(1.82)	1.10	(1.26)	2.22	(2.88)
Q_{17}	3.81	(3.23)	5.34	(3.62)	8.57	(5.30)
Q_{18}	5.57	(3.98)	5.41	(4.42)	9.74	(7.44)

[a] The 18 basic food items are: (1) rice, (2) flour, (3) coarse grains, (4) potatoes, (5) fresh vegetables, (6) fresh fruits, (7) pork, (8) beef and mutton, (9) poultry, (10) eggs, (11) aquatic products, (12) fresh milk, (13) yogurt, (14) bean and its products, (15) fats and oils, (16) sugar, (17) nuts, and (18) cakes.
[b] Unit: Kilogram
[c] Standard deviations are in parentheses.

Table 9. Comparison of Food Consumption for 18 Basic Food Items by Age Group in Jiangsu and Guangdong, 1998

	Age Group					
Food	Below 45		Between 45 and 60		Above 60	
Item[a, b, c]	mean	(s.d)	mean	(s.d)	mean	(s.d)
Jiangsu						
Q_1	53.19	(35.97)	67.87	(42.34)	84.03	(49.77)
Q_2	3.09	(9.25)	7.52	(15.62)	12.49	(22.55)
Q_3	1.38	(3.27)	1.90	(3.71)	3.21	(6.98)
Q_4	7.63	(5.43)	9.59	(6.56)	14.66	(9.93)
Q_5	88.98	(42.13)	117.14	(53.20)	162.73	(71.82)
Q_6	58.02	(34.35)	65.84	(40.01)	72.03	(50.54)
Q_7	17.04	(8.80)	20.59	(12.23)	26.92	(15.12)
Q_8	1.40	(2.25)	1.47	(2.09)	2.25	(3.79)
Q_9	5.91	(4.44)	6.85	(5.07)	10.17	(9.06)
Q_{10}	10.86	(6.04)	13.34	(8.05)	17.37	(10.75)
Q_{11}	7.72	(5.33)	9.20	(7.24)	13.14	(10.16)
Q_{12}	9.15	(13.52)	9.14	(14.75)	11.12	(19.15)
Q_{13}	1.84	(4.60)	1.82	(6.53)	1.42	(4.81)
Q_{14}	5.88	(4.07)	8.45	(6.15)	11.57	(7.76)
Q_{15}	7.05	(5.29)	9.18	(6.37)	12.97	(8.17)
Q_{16}	1.95	(1.72)	2.36	(2.06)	3.44	(2.84)
Q_{17}	2.48	(2.46)	3.91	(3.10)	5.38	(4.42)
Q_{18}	2.90	(2.43)	3.32	(3.24)	3.39	(3.04)
Guangdong						
Q_1	47.85	(26.95)	54.49	(28.98)	64.00	(33.59)
Q_2	1.39	(4.98)	1.66	(8.68)	1.11	(3.21)
Q_3	1.91	(2.30)	1.78	(2.09)	1.16	(1.36)
Q_4	5.42	(5.01)	6.39	(6.87)	7.70	(7.32)
Q_5	107.98	(40.00)	113.43	(38.61)	131.02	(49.85)
Q_6	48.21	(30.61)	46.91	(30.97)	48.91	(25.02)
Q_7	18.50	(10.55)	20.03	(13.11)	22.57	(15.48)
Q_8	2.34	(2.32)	2.77	(2.71)	3.66	(6.33)
Q_9	10.38	(6.73)	10.66	(6.81)	12.34	(10.39)
Q_{10}	8.08	(4.54)	8.12	(4.59)	9.27	(5.82)
Q_{11}	7.99	(6.13)	9.28	(7.93)	11.84	(8.56)
Q_{12}	6.53	(10.99)	4.48	(7.78)	3.95	(8.20)
Q_{13}	1.06	(2.38)	1.00	(2.53)	0.93	(3.40)
Q_{14}	4.58	(4.17)	4.96	(4.50)	5.89	(7.09)
Q_{15}	6.31	(4.26)	6.97	(4.90)	9.34	(6.74)
Q_{16}	2.51	(2.19)	3.02	(2.65)	3.93	(2.34)
Q_{17}	2.26	(1.89)	2.65	(2.01)	2.39	(1.50)
Q_{18}	4.80	(4.02)	4.55	(3.60)	3.70	(2.37)

[a] The 18 basic food items are: (1) rice, (2) flour, (3) coarse grains, (4) potatoes, (5) fresh vegetables, (6) fresh fruits, (7) pork, (8) beef and mutton, (9) poultry, (10) eggs, (11) aquatic products, (12) fresh milk, (13) yogurt, (14) bean and its products, (15) fats and oils, (16) sugar, (17) nuts, and (18) cakes.

[b] Unit: Kilogram

[c] Standard deviations are in parentheses.

Table 10. Comparison of the Wald Test Results of the QAIDS vs. AIDS, 1998

Test	Basic	Demographic	Censored
$\lambda_i = 0$ vs. $\lambda_i \neq 0$ [a]			
Food item 1	14.05	11.04	**2.28**
Food item 2	8.28	6.23	**2.46**
Food item 3	9.82	3.48	**1.97**
Food item 4	231.03	20.01	**2.85**
Food item 5	48.23	**1.43**	-
Food item 6	48.23	**1.43**	-
Food item 7	**0.55**	**1.10**	**2.39**
Food item 8	7.36	**1.42**	**1.83**
Food item 9	**0.41**	**0.43**	**0.77**
Food item 10	**0.54**	**0.03**	**0.77**
Food item 11	10.52	**2.59**	**2.24**
Food item 12	40.34	5.00	**0.29**
Food item 13	**0.96**	**1.19**	**0.28**
Food item 14	34.21	4.92	**0.29**
Food item 15	**2.71**	**1.47**	**2.58**
Food item 16	**0.25**	**2.02**	**1.18**
Food item 17	34.63	8.80	6.35
Food item 18	**0.55**	**0.17**	**0.66**

[a] The 18 basic food items are: (1) rice, (2) flour, (3) coarse grains, (4) potatoes, (5) fresh vegetables, (6) fresh fruits, (7) pork, (8) beef and mutton, (9) poultry, (10) eggs, (11) aquatic products, (12) fresh milk, (13) yogurt, (14) bean and its products, (15) fats and oils, (16) sugar, (17) nuts, and (18) cakes.

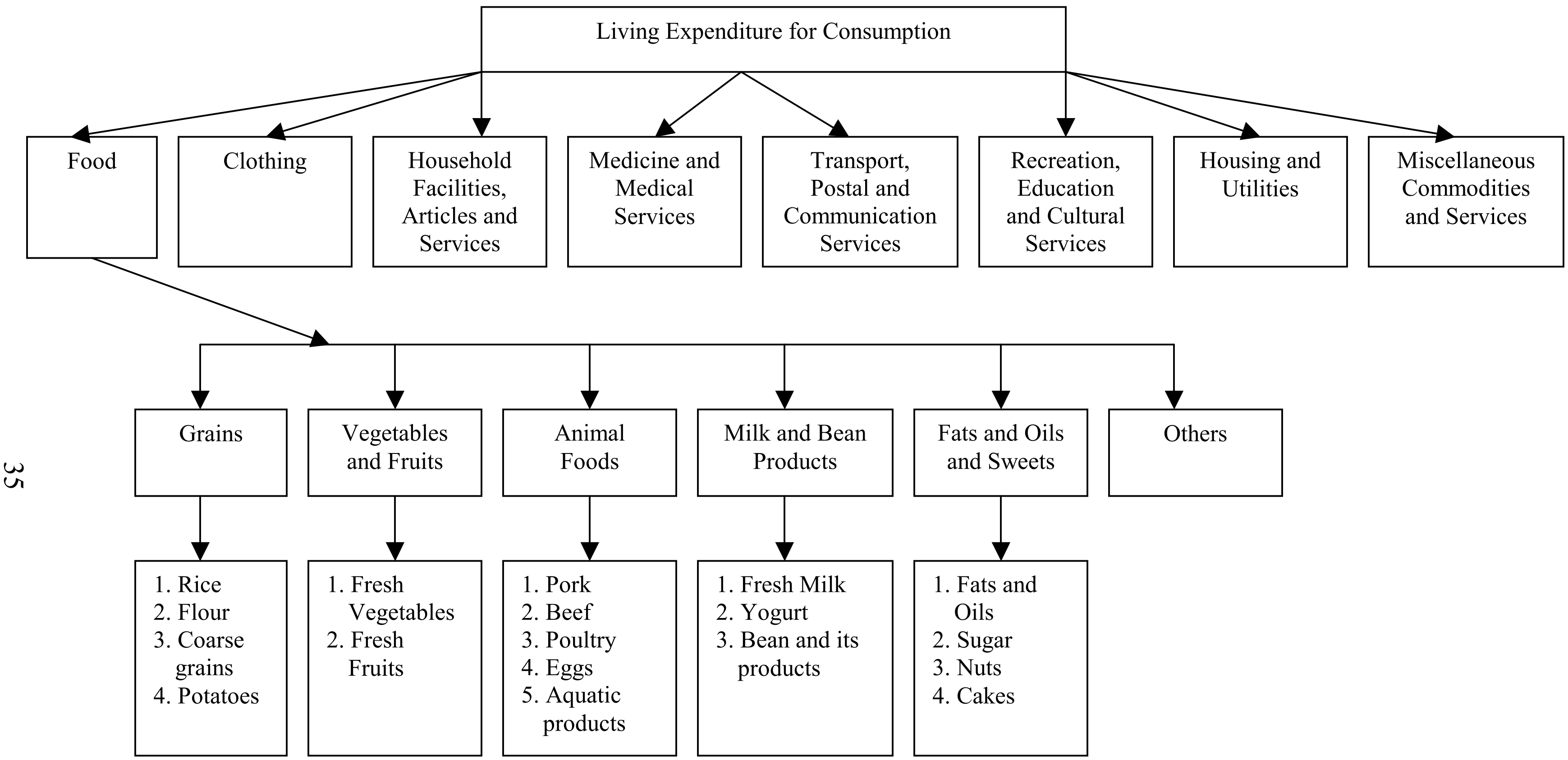

Figure 1. A Modified Utility Tree for Urban Households in China

Food [a]	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
C [b]	1.214	0.878	0.511	0.483	0.949	1.076	1.060	0.722	1.180	0.504	1.279	1.585	1.239	0.515	1.195	0.619	0.846	0.920
UF [b]	1.330	0.963	0.560	0.529	0.835	0.947	1.180	0.803	1.313	0.561	1.424	**1.559**	1.218	0.507	0.981	**0.508**	0.694	0.755
UB [b]	0.874	0.633	0.368	0.348	0.549	0.622	0.776	0.528	0.863	0.369	0.936	**1.025**	0.801	0.333	0.645	**0.334**	0.456	0.496
Marshallian									Price	of [a]								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	-1.689	0.779	0.054	0.335	-0.306	-0.225	-0.134	-0.023	-0.043	-0.069	-0.042	0.056	0.010	0.023	-0.012	-0.005	-0.012	-0.027
2	3.038	**-2.673**	-0.151	-0.591	-0.222	-0.163	-0.097	-0.017	-0.031	-0.050	-0.031	0.040	0.008	0.017	-0.008	-0.004	-0.008	-0.020
3	0.721	-0.485	**-0.238**	-0.217	-0.129	-0.095	-0.056	-0.010	-0.018	-0.029	-0.018	0.023	0.004	0.010	-0.005	-0.002	-0.005	-0.012
4	1.251	-0.554	-0.061	-0.844	-0.122	-0.090	-0.053	-0.009	-0.017	-0.028	-0.017	0.022	0.004	0.009	-0.005	-0.002	-0.005	-0.011
5	-0.112	-0.027	-0.006	-0.019	-0.551	-0.051	0.032	-0.003	0.018	-0.022	0.027	-0.002	-0.0006	-0.001	-0.047	-0.006	-0.019	-0.044
6	-0.127	-0.030	-0.007	-0.021	-0.084	-0.598	0.036	-0.004	0.020	-0.025	0.030	-0.003	-0.0007	-0.002	-0.053	-0.007	-0.022	-0.050
7	-0.049	-0.017	-0.004	-0.014	-0.022	-0.009	-0.959	0.123	0.074	-0.082	-0.092	-0.012	-0.003	-0.006	-0.038	-0.007	-0.019	-0.043
8	-0.033	-0.012	-0.003	-0.010	-0.015	-0.006	1.085	-0.989	-0.479	-0.292	0.038	-0.008	-0.002	-0.004	-0.026	-0.005	-0.013	-0.030
9	-0.054	-0.019	-0.005	-0.016	-0.024	-0.010	0.039	-0.160	-1.078	0.300	-0.143	-0.014	-0.003	-0.006	-0.043	-0.007	-0.021	-0.048
10	-0.023	-0.008	-0.002	-0.007	-0.010	-0.004	0.059	-0.059	0.061	-0.566	0.060	-0.006	-0.001	-0.003	-0.018	-0.003	-0.009	-0.021
11	-0.059	-0.021	-0.005	-0.017	-0.027	-0.011	-0.365	-0.034	0.020	-0.044	-0.708	-0.015	-0.003	-0.007	-0.046	-0.008	-0.023	-0.052
12	0.277	0.041	0.006	0.018	-0.055	-0.032	-0.077	-0.019	-0.019	-0.067	-0.013	-1.768	-0.173	-0.201	0.272	0.016	0.073	0.163
13	0.216	0.032	0.004	0.014	-0.043	-0.025	-0.060	-0.015	-0.015	-0.052	-0.010	-0.691	-1.007	0.024	0.212	0.013	0.057	0.128
14	0.090	0.013	0.002	0.006	-0.018	-0.010	-0.025	-0.006	-0.006	-0.022	-0.004	-0.153	0.006	-0.549	0.088	0.005	0.024	0.053
15	0.006	-0.006	-0.002	-0.007	-0.159	-0.115	-0.092	-0.016	-0.029	-0.050	-0.028	0.087	0.016	0.037	-0.756	0.032	0.118	-0.015
16	0.003	-0.003	-0.001	-0.004	-0.082	-0.060	-0.048	-0.008	-0.015	-0.026	-0.015	0.045	0.009	0.019	-0.049	-0.621	0.073	0.275
17	0.004	-0.004	-0.002	-0.005	-0.112	-0.081	-0.065	-0.012	-0.021	-0.035	-0.020	0.061	0.012	0.026	0.146	0.034	-0.633	0.013
18	0.005	-0.004	-0.002	-0.005	-0.122	-0.088	-0.071	-0.013	-0.023	-0.038	-0.022	0.067	0.013	0.028	0.115	-0.006	-0.058	-0.530

[a] The 18 basic food items are: (1) rice, (2) flour, (3) coarse grains, (4) potatoes, (5) fresh vegetables, (6) fresh fruits, (7) pork, (8) beef and mutton, (9) poultry, (10) eggs, (11) aquatic products, (12) fresh milk, (13) yogurt, (14) bean and its products, (15) fats and oils, (16) sugar, (17) nuts, and (18) cakes.

[b] C means conditional expenditure elasticities and UF and UB indicate unconditional expenditure elasticities with respect to food expenditure and total living expenditure, respectively.

Table 11. Unconditional Elasticities for 18 Food Items, the QAIDS, 1998

(Continued)

Table 11. Continued

Hicksian	Price of[a]																	
Food[a]	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	-1.581	0.809	0.061	0.357	-0.092	-0.071	0.112	0.010	0.043	0.020	0.051	0.093	0.018	0.040	0.062	0.005	0.019	0.043
2	3.116	-2.652	-0.146	-0.575	-0.067	-0.051	0.081	0.008	0.031	0.015	0.037	0.067	0.013	0.029	0.045	0.004	0.014	0.031
3	0.767	-0.473	-0.235	-0.208	-0.039	-0.030	0.047	0.004	0.018	0.009	0.022	0.039	0.008	0.017	0.026	0.002	0.008	0.018
4	1.295	-0.542	-0.058	-0.835	-0.037	-0.028	0.044	0.004	0.017	0.008	0.020	0.037	0.007	0.016	0.025	0.002	0.008	0.017
5	-0.043	-0.008	-0.001	-0.005	-0.416	0.046	0.186	0.017	0.072	0.034	0.085	0.021	0.004	0.009	-0.0007	-0.00005	-0.0002	-0.0005
6	-0.049	-0.009	-0.002	-0.005	0.068	-0.488	0.211	0.020	0.082	0.039	0.097	0.024	0.005	0.010	-0.0008	-0.00006	-0.0002	-0.0005
7	0.048	0.009	0.002	0.005	0.168	0.128	-0.741	0.152	0.150	-0.002	-0.009	0.021	0.004	0.009	0.027	0.002	0.008	0.019
8	0.032	0.006	0.001	0.004	0.114	0.087	1.234	-0.969	-0.427	-0.238	0.094	0.014	0.003	0.006	0.019	0.001	0.006	0.013
9	0.053	0.010	0.002	0.006	0.187	0.143	0.282	-0.127	-0.993	0.389	-0.051	0.023	0.004	0.010	0.030	0.002	0.009	0.021
10	0.023	0.004	0.0008	0.002	0.080	0.061	0.162	-0.045	0.097	-0.528	0.099	0.010	0.002	0.004	0.013	0.001	0.004	0.009
11	0.057	0.011	0.002	0.006	0.202	0.155	-0.102	0.002	0.113	0.052	-0.607	0.025	0.005	0.011	0.033	0.003	0.010	0.023
12	0.404	0.076	0.014	0.044	0.195	0.149	0.211	0.020	0.082	0.039	0.097	-1.725	-0.164	-0.182	0.358	0.028	0.108	0.245
13	0.316	0.059	0.011	0.035	0.153	0.117	0.165	0.015	0.064	0.030	0.076	-0.656	-1.001	0.039	0.280	0.022	0.085	0.192
14	0.131	0.025	0.004	0.014	0.063	0.049	0.068	0.006	0.027	0.013	0.031	-0.139	0.009	-0.543	0.116	0.009	0.035	0.080
15	0.086	0.016	0.003	0.009	-0.001	-0.0008	0.089	0.008	0.034	0.016	0.041	0.114	0.022	0.049	-0.702	0.039	0.140	0.037
16	0.045	0.008	0.002	0.005	-0.0006	-0.0004	0.046	0.004	0.018	0.008	0.021	0.059	0.011	0.025	-0.021	-0.617	0.085	0.302
17	0.061	0.011	0.002	0.007	-0.0008	-0.0006	0.063	0.006	0.024	0.011	0.029	0.081	0.015	0.035	0.184	0.039	-0.617	0.049
18	0.066	0.012	0.002	0.007	-0.0008	-0.0006	0.068	0.006	0.027	0.012	0.031	0.088	0.017	0.038	0.157	-0.0004	-0.041	-0.490

[a] The 18 basic food items are: (1) rice, (2) flour, (3) coarse grains, (4) potatoes, (5) fresh vegetables, (6) fresh fruits, (7) pork, (8) beef and mutton, (9) poultry, (10) eggs, (11) aquatic products, (12) fresh milk, (13) yogurt, (14) bean and its products, (15) fats and oils, (16) sugar, (17) nuts, and (18) cakes.

[b] C indicates conditional expenditure elasticities and U means unconditional expenditure elasticities.

Food [a]	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
C [b]	1.068	1.026	0.858	0.768	0.978	1.033	0.995	1.062	1.054	0.810	1.128	1.055	0.963	0.958	1.170	0.961	0.727	0.947
UF [b]	1.138	1.093	0.914	0.818	0.872	0.921	1.093	1.167	1.158	0.890	**1.240**	1.000	0.912	0.908	1.030	0.845	**0.640**	0.834
UB [b]	0.748	0.719	0.601	0.538	0.573	0.605	0.719	0.767	0.762	0.585	**0.815**	0.657	0.600	0.597	0.677	0.556	**0.421**	0.548
Marshallian									Price	of [a]								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	-0.862	0.064	0.029	0.089	-0.164	-0.119	-0.056	-0.006	-0.017	-0.029	-0.014	-0.001	0.0006	0.023	-0.025	-0.004	-0.016	-0.032
2	0.205	-0.954	0.014	0.081	-0.158	-0.114	-0.054	-0.006	-0.016	-0.027	-0.013	-0.001	0.0005	0.022	-0.024	-0.004	-0.015	-0.031
3	0.313	0.013	-0.925	0.053	-0.132	-0.095	-0.045	-0.005	-0.014	-0.023	-0.011	-0.0009	0.0004	0.018	-0.020	-0.003	-0.013	-0.026
4	0.370	0.046	-0.006	-0.898	-0.118	-0.085	-0.040	-0.004	-0.012	-0.021	-0.010	-0.0008	0.0004	0.016	-0.018	-0.003	-0.011	-0.023
5	-0.062	-0.017	-0.004	-0.013	-0.832	0.056	0.003	0.002	0.004	-0.008	0.009	-0.006	-0.0008	0.011	0.001	-0.0004	-0.007	-0.010
6	-0.065	-0.018	-0.004	-0.013	0.085	-0.905	0.003	0.002	0.004	-0.008	0.010	-0.007	-0.0008	0.012	0.001	-0.0004	-0.007	-0.011
7	-0.024	-0.008	-0.001	-0.005	-0.028	-0.022	-0.924	0.011	-0.006	0.074	-0.038	-0.020	-0.004	-0.0008	-0.034	-0.005	-0.018	-0.038
8	-0.026	-0.009	-0.002	-0.006	-0.030	-0.024	0.061	**-1.004**	-0.007	0.002	0.005	-0.021	-0.004	-0.0008	-0.036	-0.005	-0.019	-0.041
9	-0.026	-0.009	-0.002	-0.006	-0.030	-0.023	-0.024	0.002	-0.907	-0.016	0.008	-0.021	-0.004	-0.0008	-0.036	-0.005	-0.019	-0.041
10	-0.020	-0.007	-0.001	-0.004	-0.023	-0.018	0.195	0.001	0.027	-0.914	-0.028	-0.016	-0.003	-0.0006	-0.028	-0.004	-0.015	-0.031
11	-0.027	-0.009	-0.002	-0.006	-0.032	-0.025	-0.111	0.003	-0.017	-0.050	-0.828	-0.023	-0.004	-0.0009	-0.039	-0.006	-0.020	-0.044
12	0.047	0.010	0.003	0.009	0.026	0.017	-0.094	-0.012	-0.031	-0.039	-0.031	**-1.066**	-0.016	-0.023	0.107	0.013	0.020	0.065
13	0.042	0.009	0.003	0.008	0.024	0.016	-0.086	-0.011	-0.029	-0.036	-0.029	-0.041	-0.993	0.026	0.098	0.012	0.019	0.059
14	0.042	0.009	0.003	0.008	0.024	0.016	-0.085	-0.011	-0.029	-0.036	-0.028	-0.040	0.008	-0.971	0.097	0.012	0.018	0.059
15	-0.029	-0.009	-0.002	-0.006	-0.023	-0.018	-0.099	-0.012	-0.033	-0.041	-0.033	0.020	0.005	0.046	-0.786	0.018	0.088	-0.116
16	-0.024	-0.008	-0.001	-0.005	-0.019	-0.015	-0.081	-0.010	-0.027	-0.034	-0.027	0.017	0.004	0.038	0.078	-0.895	0.053	0.111
17	-0.018	-0.006	-0.001	-0.004	-0.014	-0.011	-0.061	-0.008	-0.021	-0.025	-0.021	0.013	0.003	0.029	0.042	0.016	-0.706	0.153
18	-0.024	-0.007	-0.001	-0.005	-0.019	-0.015	-0.080	-0.010	-0.027	-0.033	-0.027	0.016	0.004	0.037	-0.020	0.014	-0.019	**-0.619**

[a] The 18 basic food items are: (1) rice, (2) flour, (3) coarse grains, (4) potatoes, (5) fresh vegetables, (6) fresh fruits, (7) pork, (8) beef and mutton, (9) poultry, (10) eggs, (11) aquatic products, (12) fresh milk, (13) yogurt, (14) bean and its products, (15) fats and oils, (16) sugar, (17) nuts, and (18) cakes.

[b] C means conditional expenditure elasticities and UF and UB indicate unconditional expenditure elasticities with respect to food expenditure and total living expenditure, respectively.

Table 12. Unconditional Elasticities for 18 Food Items, the Censored QAIDS with Demographic Variables, 1998

(Continued)

Table 12. Continued

Hicksian Food [a]	Price of [a] 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	-0.769	0.089	0.035	0.108	0.019	0.014	0.154	0.023	0.057	0.048	0.066	0.031	0.007	0.037	0.038	0.005	0.010	0.028
2	0.294	-0.929	0.020	0.100	0.018	0.013	0.148	0.022	0.055	0.046	0.064	0.030	0.007	0.036	0.037	0.005	0.010	0.027
3	0.388	0.033	-0.921	0.068	0.015	0.011	0.124	0.018	0.046	0.039	0.053	0.025	0.006	0.030	0.031	0.004	0.008	0.022
4	0.436	0.064	-0.002	-0.884	0.014	0.010	0.111	0.016	0.041	0.035	0.048	0.022	0.005	0.027	0.028	0.003	0.007	0.020
5	0.009	0.002	0.0006	0.002	-0.692	0.157	0.164	0.024	0.061	0.051	0.071	0.018	0.004	0.022	0.050	0.006	0.013	0.036
6	0.010	0.002	0.0006	0.002	0.233	-0.798	0.173	0.025	0.064	0.054	0.075	0.019	0.004	0.023	0.052	0.007	0.014	0.038
7	0.065	0.016	0.004	0.013	0.147	0.105	-0.722	0.038	0.065	0.148	0.039	0.011	0.002	0.013	0.027	0.003	0.007	0.019
8	0.070	0.017	0.004	0.014	0.157	0.112	0.277	-0.975	0.069	0.081	0.087	0.011	0.003	0.014	0.028	0.004	0.008	0.020
9	0.069	0.017	0.004	0.014	0.156	0.111	0.190	0.031	-0.832	0.063	0.089	0.011	0.003	0.014	0.028	0.004	0.007	0.020
10	0.053	0.013	0.003	0.011	0.120	0.086	0.360	0.024	0.084	-0.854	0.034	0.009	0.002	0.010	0.022	0.003	0.006	0.016
11	0.074	0.018	0.005	0.015	0.167	0.119	0.118	0.034	0.064	0.033	-0.741	0.012	0.003	0.015	0.030	0.004	0.008	0.022
12	0.128	0.032	0.008	0.025	0.187	0.133	0.091	0.013	0.033	0.028	0.039	**-1.038**	-0.010	-0.011	0.163	0.020	0.043	0.117
13	0.117	0.029	0.008	0.023	0.171	0.122	0.083	0.012	0.031	0.026	0.036	-0.016	-0.988	0.038	0.149	0.018	0.039	0.107
14	0.116	0.029	0.008	0.023	0.170	0.121	0.082	0.012	0.030	0.026	0.035	-0.014	0.013	-0.960	0.148	0.018	0.039	0.106
15	0.055	0.014	0.004	0.011	0.142	0.102	0.091	0.013	0.034	0.029	0.039	0.049	0.011	0.059	-0.729	0.025	0.112	-0.062
16	0.045	0.011	0.003	0.009	0.117	0.083	0.075	0.011	0.028	0.023	0.032	0.040	0.009	0.048	0.125	-0.889	0.072	0.155
17	0.034	0.009	0.002	0.007	0.088	0.063	0.057	0.008	0.021	0.018	0.024	0.030	0.007	0.037	0.078	0.020	-0.692	0.187
18	0.045	0.011	0.003	0.009	0.115	0.082	0.074	0.011	0.027	0.023	0.032	0.040	0.009	0.048	0.026	0.020	-0.0004	**-0.575**

[a] The 18 basic food items are: (1) rice, (2) flour, (3) coarse grains, (4) potatoes, (5) fresh vegetables, (6) fresh fruits, (7) pork, (8) beef and mutton, (9) poultry, (10) eggs, (11) aquatic products, (12) fresh milk, (13) yogurt, (14) bean and its products, (15) fats and oils, (16) sugar, (17) nuts, and (18) cakes.

[b] C indicates conditional expenditure elasticities and U means unconditional expenditure elasticities.