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Research Paper

Weak Separability Testing and Estimation of Selected Food Commodities Demand System in Urban Households of Iran (Case of Citrus Fruits, Cucurbits and Vegetables)

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Abstract

The separability of consumer desires is a necessary condition for multi-stage budgeting and collectivization is consistent of commodity where costs are allocated between edible groups using price indices and intergroup allocations are made independent of other groups. In empirical studies of demand, the concept of separation is used to correctly estimate demand function and limit the number of parameters. For this purpose, data related to price index and cost of selected commodities (citrus fruits, cucurbits, and vegetables) derived from the Central Bank over 2016 in urban households of Iran were used. The results of the separability tests support the hypothesis that consumers first allocate their income to selected commodities in three groups (citrus fruits, cucurbits, and vegetables) and then approves the income allocation action between the types of its subgroups that are grouped. Also, the results of the system estimation showed that all groups had a negative intrinsic price elasticity. In the meantime, the price elasticity of the groups of citrus fruits (orange, tangerines, and lemon), cucurbits fruits (potato, tomato, and onion) and vegetables (the leafy ones) are equal to -0.83, -0.48 and -0.91, respectively. Given the income elasticity calculated for the three commodity groups, the second commodity group (potato, tomato, and onion) is more essential than the other commodity groups, which should be considered in government policies as to agricultural production and pricing.

Keywords:
Demand function; Rotterdam Model; selected food commodities, weak separability

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INTRODUCTION

Citrus fruits, cucurbits, and vegetables, which accounted for 29.5 percent of total Iranians households food and beverage costs in 2016, and baskets of commodities are due to a large share of the nutritional value and supply nutrients needed by households and agricultural exports is of special importance to families as well as policy makers in the agricultural sector. The investigation into the effective factors on the demand for these commodities can help how to control the market or other effective factors on their consumption. But, when topic of demand collection of households in great level of the country it comes, the subject aggregation of commodity groups it is found high importance.

Weak separability (WS) allows splitting a utility function (technology) into many sub-utility functions. As pointed out by Phillips & Park (1988), it is a necessary and sufficient condition for multi-stage budgeting that allows conditional demand systems where demand for a product belonging to a group depends only on the price of the products in the same group and on the expenditure allocated to that group. The consequences of this assumption are of great importance both to the method and to the policy implications of the results. With regard to the method, the conditional demand systems allow reducing the number of goods in the demand model, thereby facilitating the econometric estimation. This allows the use of flexible functional forms even if the number of goods in the demand system is large and avoiding Hanoch's (1975) apprehension as to the use of those functional forms in demand or supply analysis. This assumption also limits the possibility of substitution when goods are not closed to each other. With regard to policy, the WS allows evaluating price policies on a specific group of goods without carrying to the direct impacts on the consumption of goods not belong to that group. Given this importance, especially what concerns the econometric analysis, WS is widely used in demand analysis, but it is not generally tested leading to bias elasticity estimations and to a consequently wrong policy analysis when this assumption does not hold true. The only way to efficiently use WS is to test whether it is appropriate in the given context. Shabanzadeh & Mahmoodi (2016) investigated the aggregation conditions of fruits and nuts, vegetable varieties, beans, and vegetable products using the generalized aggregation method.

The concept of separability of preferences, which was originated in Leontief (1974), has been widely used in econometric modeling of consumer demand (Blackorby et al., 1978).

Although many empirical studies have used demand systems for agricultural commodities, most have employed weak separability as a maintained but untested hypothesis (exceptions are Pudney, 1981; Eales and Unnevehr, 1988; Nayga and Capps, 1994; Moschini et al., 1994). Most empirical studies reject separability restrictions when they are tested (Pudney, 1981).

Research into the relationships within fruit demands suggests the usefulness of a demand system that employs multi-stage budgeting. However, no study has ever tested separability within fruits demands. This paper aims to determine an appropriate commodity aggregation within fruitage demand by performing tests for Hetero and homothetic weak separability within a demand system. Results would contribute to understanding the nature of fruits demand by showing how fruits consumers allocate fruitage expenditure. In doing so, the study will add to the small but growing body of empirical evidence on separability in demand for agricultural products. In addition, the elasticities generated by the model will illuminate the characteristics of fruits demand. As others have done (Eales & Unnevehr, 1988; Nayga & Capps, 1994), a complete demand system is not specified. Therefore, the results will be conditional on the correct but untested assumption that fruitage in aggregate is separate from all other commodities.

Lee et al. (2011) weak separation tests and generalized theory of Compound commodity performed the demand for beef meat. Erfani (2017) grouped the monetary assets using a non-parametric analysis of money demand in which 15 sub-groups of monetary assets were examined. How consumers allocate their spending across different commodities and services is always a matter of interest to economists and policymakers (Falsafian & Ghahremanzadeh, 2011; Alboghdady & Alashry, 2010). In Iran, few studies have used weak separation tests to estimate demand models. In this context, the present study is a pioneer, in particular by using the Rotterdam demand function estimation model. It contributes to enriching the relevant literature.

The main purpose of this study is to investigate the collectability of selected goods. The main assumptions of this study are as follows:

Assumption 1: the selected commodities (oranges, tangerines, lemons, potatoes, tomatoes, onions, and leafy vegetables) can be divided into two groups including citrus + cucurbits and leafy vegetables (Figure 1).

Assumption 2: the selected commodities (oranges, tangerines, lemons, potatoes, tomatoes, onions and leafy vegetables) can be divided into three groups of citrus fruits, cucurbits, and vegetables (Figure 2).

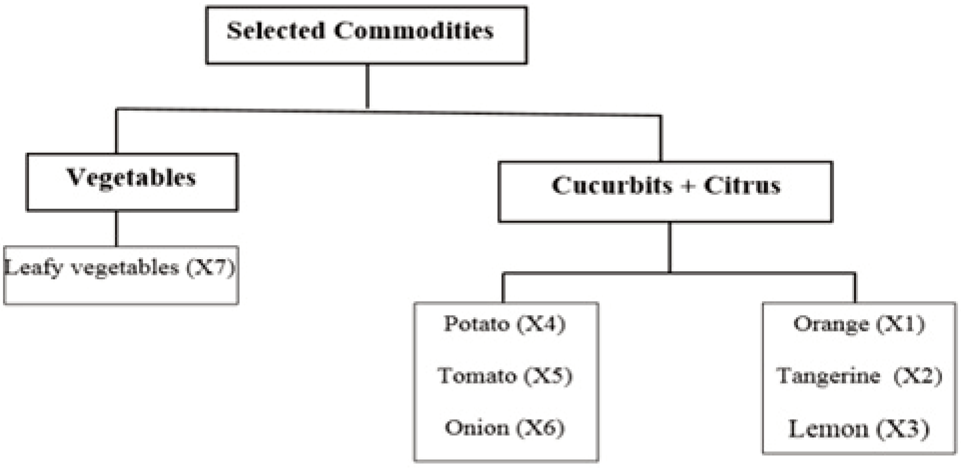

Figure 1. Grouping based on utility tree, 1

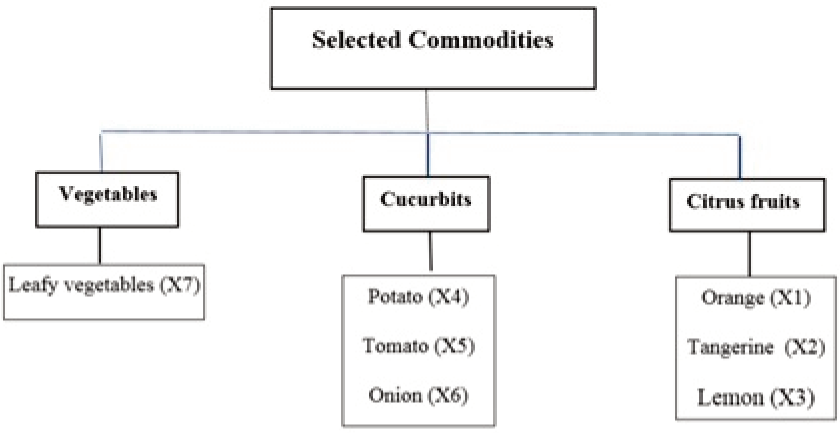

Figure 2. Grouping based on the utility tree, 2

Then, to achieve the objectives of the present study, the conditions of collecting selected goods on the basis of the above assumptions are investigated using weak separability tests, and finally, price elasticity and income elasticity are calculated based on … demand function.

METHODOLOGY

Separability, conceived independently by Leontief (1974) and Sono (1961), is a relative concept whose frame of reference is some partition of the commodity placed into mutually exclusive and exhaustive subsets. Separability conditions require the marginal rates of substitution between certain pairs of commodities to be functionally independent of the quantities of certain other commodities. Such conditions reduce the number of parameters that are included in the family of demand functions and make an estimation of the parameter spacing more feasible. In practice, however, it is impossible to look upon marginal utilities to determine the nature of separability. If separability restrictions are inconsistent with the true preference ordering of the representative consumer, empirical estimates of demand parameters for structuralare invalid. Thus, it is worthy to consider tests of separability (Moschini et al., 1994).

Separability can also be used to justify commodity aggregation. For instance, goods belonging to a group may be aggregated if the direct utility function is weakly separable. The stronger condition of homothetic weak separability of the direct utility function is, however, required when the objective is to arrive at a legitimate commodity aggregation and when a single price index is desired for each aggregate commodity (Moschini et al., 1994).

Separability types include symmetric and asymmetric separable structures (Blackorby et al., 1978), weak or strong separability, separability of the cost function (quasi-separability), separability of the direct or indirect utility function, separability of an implicit representation of the direct utility function (direct pseudoseparability), and separability of an implicit representation of the indirect utility function (indirect pseudoseparability). Several demand studies tested these assumptions (Blackorby et al., 1977; Byron, 1970; Jorgenson & Lau, 1975; Barnett and Choi, 1989; Hayes et al., 1990; Eales & Unnevehr, 1988; Pudney, 1981; Baccouche & Laisney, 1991; Nicol, 1991). The most important issue in these studies is how to determine appropriate grouping patterns.

Some demand studies involving separability may be divided into those using nonparametric methods and those using parametric methods. The former is not, however, conditional on the functional form of the utility function. This desirable property is offset by the fact that nonparametric tests are non-stochastic. Parametric tests are, on the other hand, conditional on the functional form of the utility function. Unlike nonparametric procedures, parametric test statistics follow, at least asymptotically, χ2 distributions, allowing statistical assessment of separability (Blackorby et al., 1978).

There is no logical difficulty in imposing separability of closely related goods as it does not imply that between-group responses are necessarily small, only that they conform to a specific pattern.

Rotterdam model

The absolute price version of the Rotterdam model was used (for detailed development of the Rotterdam model, see Theil, 1980). This specification is chosen because it is based on consumer demand theory (i.e., allowing the imposition of symmetry and homogeneity restrictions) and is sufficiently flexible to capture variations in consumer behavior, especially demand elasticities (Brester & Wohlgenant 1991; Capps & Love 2002). The *i*th equation of our estimated model is given by:

$$w_i \Delta \ln(q_i) = \theta_i \Delta \ln(Q) + \sum_{j=1} \pi_{ij} \Delta \ln(p_j) + \nu_i \ , \quad (1)$$

where w_i is the budget share of the ith product (time subscripts (t) on each variable are omitted for convenience), Δ is the standard first-difference operator [e.g., $\Delta \ln Y_t = \ln(Y_t) - \ln(Y_{t-1})$], q_i is the consumption of the ith product, p_j is the price of the jth product,; Δln (Q) is the divisia volume index [$\sum_{j=1}^{n} \pi_{ij} \Delta \ln(p_j)$], ν_i is a random error term, and θ_i and π_{ij} are parameters to be estimated.

To avoid singularity in the estimated error variance-covariance matrix, we omit one share equation from the empirical model. The parameters of this omitted equation are recovered using the adding-up restrictions. In addition, symmetry and homogeneity restrictions are imposed as maintained assumptions to ensure that the demand model is consistent with the economic theory.

Adding-up restrictions are:

$$\sum_{j-1}^{n} \theta_j = 1 \quad and \quad \sum_{j} \pi_{ij} = 0, \qquad (2)$$

Homogeneity and symmetry are imposed by, respectively:

$$\sum_{j}^{n} \pi_{ij} = 0 \quad and \quad \pi_{ij} = \pi_{ij}. \qquad (3)$$

Although the Rotterdam model is not derived from an underlying utility or expenditure function, it satisfies the integrability conditions when homogeneity and symmetry are imposed (Deaton & MuellBauer 1980; Capps & Love 2002).

Each system is estimated using iterated seemingly unrelated regression, allowing for the correlation between errors from different equations (i.e., the covariance matrix of the entire system is not diagonal). Error terms are expected to be correlated as we are estimating demands for the related products.

Equations (1)-(3) generate compensated price elasticities given by (Barten, 1993):

$$\varepsilon_{ij} = \frac{\pi_{ij}}{w_i} \qquad (4)$$

The expenditure elasticity is represented by (Barten, 1993):

$$\eta_i = \frac{\theta_i}{w_i} \qquad (5)$$

The Rotterdam model's coefficient estimates are of limited value except for calculating elasticities. Therefore, we focus on the model's estimated elasticities (as shown above).

Data

In this study, the demand for the selected commodities (citrus fruits, cucurbit fruits, and leafy vegetables) in Iran was estimated using cross-sectional data. For the urban society, these statistics were collected from the Central Bank and Statistics Center of Iran in 2016.

1. Citrus fruits: oranges, tangerines, and lemons
2. Cucurbits fruits: potatoes, tomatoes, and onions
3. Leafy vegetables: dried vegetables, edible vegetables, varieties of cabbage, lettuce, celery, spinach, mushrooms, and parsley

In this study, the selected commodities are divided into three groups: citrus fruits, cucurbit fruits, and vegetables (Table 1). The average consumer price (p) and the average annual consumption (q) are individually included in the demand system based on their price share and price index. Then, the separability constraints are tested on these groups.

Tests of weak separability

The necessary and sufficient conditions for weak separability are that the intergroup off-diagonal terms in the Slutsky substitution matrix be proportional to the corresponding income derivatives of the goods in question.

To characterize weak separability, the utility function U(q) appears as a function of n sub-utility functions such that:

$$U(q)=U_0[U_1(q_1), U_2(q_2),..., U_s(q_s)] \qquad (6)$$

Table 1

Average Cost Share (W) and Average Purchase per Year (Q) and Average Price of Different Types of Commodity (P)

Commodities		W	Quantity (kg)	Price (IRR)
	Orange (X1)	0.13164738	29.02	27416.9194
Citrus (Fruits)	Tangerine (X2)	0.049089	9.57	31001.0449
	Lemon (X3)	0.023667	2.08	68767.7885
	potato (X4)	0.17949	76.52	14176.5029
Cucurbits	tomato (X5)	0.180233	70.46	15459.5089
	onion (X6)	0.14885	43.46	20699.6088
Vegetables	Vegetables(X7)	0.287024	50.69	34221.52

W: Share of each commodity in the total cost of the selected household commodity

where *q* is the vector of consumption goods. Based on Goldman and Uzawa (1964), if the commodity *i* in group *r* is separable from the commodity *j* in group *s*, then we have

$$S_{ij} = \theta_{rs}\left(\frac{\partial q_i}{\partial y}\right)\left(\frac{\partial q_j}{\partial y}\right) \quad \text{for all } i \in r \text{ and } j \in s \qquad (7)$$

where S_{ij} is the appropriate element in the Slutsky substitution matrix, *q*'s are quantities, and is an intergroup coefficient which is a measure of the degree of substitutability between groups of the commodities. Using Eq. (7) for commodities *i* and *k* in groups *r* and *j* in group *s*, we have

$$\frac{S_{ij}}{\frac{\partial q_i}{\partial y}} = \frac{S_{kj}}{\frac{\partial q_k}{\partial y}} \quad \text{for all } i,k \in r \text{ and } j \in s \qquad (8)$$

Utilizing Eq. (8), the restrictions for weak separability may be expressed as

$$\frac{\varepsilon^*_{ij}}{\varepsilon^*_{kj}} = \frac{N_i}{N_k} \quad \text{for all } i,k \in r \text{ and } j \in s \qquad (9)$$

where e^*_{ij} is compensated cross-price elasticity between commodities in group *r* and in group *s*, and N_i represents the expenditure elasticity of the commodity *i*. Under the assumption of weak separability of the direct utility function, the ratio of compensated cross-price elasticities of two commodities within the same group (r) with respect to the third commodity in another group (s) is equal to the ratio of their expenditure elasticities.

From Eq. (9), this result implies, for the Rotterdam model, a nonlinear restriction on parameters p_{ij} where i, k∈r and j∈s. This restriction is given by

$$\frac{p_{ij}}{p_{ij}} = \frac{q_i}{q_k} \qquad (10)$$

Operationally then, given such nonlinearity, the test for separability hinges on a statistic with degrees of freedom equal to the number of restrictions. The number of restrictions depends on the partitioning of commodities into separable groups. The procedure commonly rests on either a Wald test or a likelihood ratio test. The key feature of Eq. (10) is that the separability restrictions hold not only locally but also globally. This result sets the Rotterdam model apart from other functional forms such as the Translog and AIDS. Several a priori groupings of the disaggregated fruit products are specified, based primarily on intuition, to test weak separability (Table 2).

The types of goods for weak separability test are categorized according to the two utility trees (Table 3& 4).

$$U_1 = U^O\left(f(X_1, X_2, X_3, X_4, X_5, X_6), f(X_7)\right)$$

$$U_2 = U^O\left(f(X_1, X_2, X_3), f(X_4, X_5, X_6), f(X_7)\right)$$

Table 2

Possible Utility Trees for this Analysis

Commodity products		**Utility tree***	
		1	**2**
	Orange (X1)	A	A
Citrus (Fruits)	Tangerine (X2)	A	A
	Lemon (X3)	A	A
	potato (X4)	A	B
Cucurbits (Fruits)	tomato (X5)	A	B
	onion (X6)	A	B
Vegetables	Vegetables(X7)	B	C
No. of commodity groups		2	3
No. of joint tests		5	12

** In each tree, all commodities with the same letter are assumed to belong to the same group. Commodities with different letters are assumed to be weakly separable.*

Table 3

Weak Separability Tests (i, k,j Combinations) for Utility Tree 1

	j								
	1	2	3	4	5	6	7	$\frac{\varepsilon^*_{ij}}{\varepsilon^*_{kj}} = \frac{N_i}{N_k}$	$\frac{\pi_{ij}}{\pi_{kj}} = \frac{\theta_i}{\theta_k}$
1,2							t	$\frac{\varepsilon_{17}}{\varepsilon_{27}} = \frac{\theta_1}{\theta_2}$	$\frac{\pi_{17}}{\pi_{27}} = \frac{\theta_1}{\theta_2}$
2,3							T	$\frac{\varepsilon_{27}}{\varepsilon_{37}} = \frac{\theta_2}{\theta_3}$	$\frac{\pi_{27}}{\pi_{37}} = \frac{\theta_2}{\theta_3}$
3,4							T	$\frac{\varepsilon_{37}}{\varepsilon_{47}} = \frac{\theta_3}{\theta_4}$	$\frac{\pi_{38}}{\pi_{47}} = \frac{\theta_3}{\theta_4}$
4,5							T	$\frac{\varepsilon_{47}}{\varepsilon_{57}} = \frac{\theta_4}{\theta_5}$	$\frac{\pi_{47}}{\pi_{57}} = \frac{\theta_4}{\theta_5}$
5,6							T	$\frac{\varepsilon_{57}}{\varepsilon_{67}} = \frac{\theta_5}{\theta_6}$	$\frac{\pi_{57}}{\pi_{67}} = \frac{\theta_5}{\theta_6}$
6,7									

Note: The t's represent non-redundant tests.

Linearization method of nonlinear constraints;

$$\frac{\pi_{17}}{\pi_{27}} = \frac{\theta_1}{\theta_2} \cdots \xrightarrow{yields} \theta_1 \times \pi_{27} - \theta_2 \times \pi_{17} = 0$$

$$\frac{\pi_{27}}{\pi_{37}} = \frac{\theta_2}{\theta_3} \cdots \xrightarrow{yields} \theta_2 \times \pi_{37} - \theta_3 \times \pi_{27} = 0$$

$$\frac{\pi_{38}}{\pi_{47}} = \frac{\theta_3}{\theta_4} \cdots \xrightarrow{yields} \theta_4 \times \pi_{38} - \theta_3 \times \pi_{47} = 0$$

$$\frac{\pi_{47}}{\pi_{57}} = \frac{\theta_4}{\theta_5} \cdots \xrightarrow{yields} \theta_5 \times \pi_{47} - \theta_4 \times \pi_{57} = 0$$

Following the earlier discussion, it is verified that this structure entails 12 non-redundant restrictions related to the unrestricted utility U2 (q). For the Rotterdam specification, these non-redundant restrictions can be represented as:

$$U_2 = U^O (f(X_1, X_2, X_3), f(X_4, X_5, X_6), f(X_7))$$

$$\frac{\pi_{14}}{\pi_{24}} = \frac{\theta_1}{\theta_2} \quad , \quad \frac{\pi_{15}}{\pi_{25}} = \frac{\theta_1}{\theta_2}$$

$$\frac{\pi_{16}}{\pi_{26}} = \frac{\theta_1}{\theta_2} \quad , \quad \frac{\pi_{17}}{\pi_{27}} = \frac{\theta_1}{\theta_2}$$

$$\frac{\pi_{24}}{\pi_{34}} = \frac{\theta_2}{\theta_3} \quad , \quad \frac{\pi_{25}}{\pi_{35}} = \frac{\theta_2}{\theta_3}$$

$$\frac{\pi_{26}}{\pi_{36}} = \frac{\theta_2}{\theta_3} \quad , \quad \frac{\pi_{27}}{\pi_{37}} = \frac{\theta_2}{\theta_3}$$

The number of non-redundant weak separability restrictions for any utility tree can be determined by

$$(\frac{1}{2})[N^2 + N - S^2 + S - \sum_{S} n_S(n_S + 1)] \tag{11}$$

where N is the number of products in the utility tree, S is the number of separable groups in the utility tree, and *ns* is the number of products in groups. For example in utility tree 1, the number of weak separability restrictions required is 5. In this case, N is 7, S is 2, n_1 is 6 (orange, tangerines, lemon, potato, tomato, and onion), and n_2 is 1 (Vegetable products). The (i, k, j) combinations or restrictions involved for utility tree 1, where products *i* and *k* are in group *r* and product *j* is in group *s*, are shown in Table 5.

The Wald statistic has the difficulty of sketching nonlinear constraints (Gregory & Veall, 1985). Wald statistics are based on the linearization of nonlinear constraints and this linearization may vary depending on how we present nonlinear constraints in algebraic form.

Since the Wald test in large samples tends to reject the null hypothesis of skewed, in these cases, it would be more appropriate to use the adjusted Wald statistic (Eales & Unnevehr, 1988).

The Wald statistic is calculated as follows (Judge et al., 1986).

$$W^* = \frac{W/J}{MT/(MT - K)} \tag{12}$$

where W is normal wald statistic, J is the number of restrictions, T is the number of views, M is the number of equations in the system, and K is the number of parameters in the system.

RESULTS AND DISCUSSION

At a significant level of 5% with 5 degrees of freedom in the chi-square table, the value of this statistic is 11.07. Given that the calculated value is greater than the table value, the separability hypothesis is strongly rejected. That is, it is not possible to combine seven products in the groups of citrus fruits and cucurbit fruits, as well as a vegetable group. Therefore, the demand function should be estimated for seven independent goods. Similarly, calculations should be made

Table 4
Weak Separability Tests (i, k,j Combinations) for Utility Tree 2

				J			
i, k	1	2	3	4	5	6	7
1,2				t	t	t	t
2,3				t	t	t	t
3,4							
4,5			t				t
5,6			t				t
6,7							

Note: The t's represent non-redundant tests.

Table 5
Results of Weak Separability Tests

Utility tree	Number of restrictions	Critical value [a]	Wald test	Adjusted Wald test	Decision (5%)
1	5	11.07	202.2	39.47	Rejected
2	12	21.02	198.6	16.15	Accepted

[a], *level of significance is 0.05*

for 7 price elasticities, 7 cost elasticities, and 42 cross elasticity elasticities. At the square-2 table at the 5 percent significance level with 12 degrees of freedom, the value of this statistic is 21.02. Since the computation value is smaller than the table value, the separability hypothesis is then accepted. That is, it is possible to combine seven products into two groups of citrus fruits and cucurbit fruits alongside one vegetable group.

In the present study, the demands for selected commodities were subdivided into seven subgroups. The study tested two weak separation hypotheses for the selected groups which are the necessary and sufficient condition for two-stage budgeting. If any hypothesis were rejected, the demand system would be estimated using cumulative data without their separation and if the hypothesis were rejected, the data for each group must be estimated separately in the demand system, Here are two utility trees for the subgroups of the selected commodities, which were tested by applying separation constraints using the Adjusted Wald test (Table 5). In Utility Tree 1, according to the chi-2 table at the significant level of 0.05 with 5 degrees of freedom, the value of this table is 39.47. Since the computation value is greater than the table value, the separability hypothesis is rejected.

In fact, the test result assumes that consumers first allocate a portion of their costs to the selected commodities, regardless of their type, and then the accepted allocates the selection between the types of goods selected based on their price. Thereby, using cumulative data on these commodities as two groups of citrus and cucurbits (oranges, tangerines, potatoes, tomatoes, and onions), as well as the vegetable groups, will produce skewed results in the estimation of demand systems. In Utility tree 2, according to the chi-2 table at the significant level of 0.05 with 12 degrees of freedom, the value of this statistic is 21.02. Since the calculated value is smaller than the chi-2 table value, then the separability hypothesis is accepted. Therefore, the demand for the selected commodities in the utility tree 2 can be divided into two separate groups and analyzed.

The present study used the Rotterdam model. The system of equations consists of three equations of linear cost shares, which reduces the number of equations to two equations in terms of collectability conditions. This system was estimated using the Seemingly Unrelated Regression Equation (SURE) method, and homogeneity and symmetry constraints were applied to the model and the traction system was calculated to complete the discussion on the estimated results.

The income elasticities of the study groups indicate that for one percent change in income (with other conditions being constant, such as commodity prices and interrupted share of goods cost from household expenses at a given time), demand for commodities will change by a few percents.

According to Table 6, the income elasticity of the citrus group and cucurbit group was positive and smaller than one, indicating that this food commodity was essential for households. The income elasticity of the vegetable group equals 1.07, and since it is larger than one, this group is in the luxury consumer basket indicating that when household spending increases by one percent, group expenditure increases by 1.07 percent. This indicates that as the income or expenditure of household increases, the vegetable group budget share also increases. The present research is consistent with the results of Raghfar et al. (2017) who investigated the food baskets in urban households of Iran using system requirements equation.

To measure demand sensitivity to commodity price and income changes, elasticity estimation is needed to calculate demand elasticities using model estimation results.

Accordingly, the intrinsic price elasticity, compensation crossover, and income in the three selected commodity groups are reported in Table (6). According to Table (6), it can be stated that all commodity groups have provided demand law and have negative intrinsic price elasticity. The price elasticity of vegetables group is -0.91, which shows the strongest response among commodity groups to price changes. Therefore, if the price of the vegetable group increases by 1percent, the demand will decrease by 0.91 percent. As a result, households are moving out of the group faster than other groups with vegetables price changes. The cross-sectional elasticity of the vegetable group with citrus and cucurbit groups is positive, which means that this group of foodstuffs is substituted, so if the citrus and cucurbits group are increased by one percent, the demand for the vegetable group will be 0.3 and will increase by 0.2 percent.

Table 6
Compensated Price Elasticities and Expenditure Elasticities for the Commodities (Citrus , Cucurbits, Vegetables) under Classical Restrictions

Commodities	Citrus (Fruit)	Cucurbits	Vegetables	Income elasticity
Citrus (Fruit)	-0.83	-	-	0.89
Cucurbits	0.04	-0.48	-	0.64
Vegetables	0.30	0.2	-0.91	1.07

In this study, compensatory price elasticities for all groups negative were obtained, indicating a negative relationship between the price of the commodity and the demand for those commodities. Also, the magnitude of all compensatory price elasticities of the studied groups was less than one, so the demand for these commodities is unbearable.

CONCLUSION AND POLICY IMPLICATIONS

Nutrition and food consumption are very important in household budget planning. The analysis of the allocation of household income to goods and services is of interest to economists and politicians, and estimating the demand for goods and services is important in identifying future preferences and needs. Recognizing household consumption priorities will help plan to increase their welfare.

The results of this study show that due to weak separation tests, the group of the selected commodity group can be considered in three groups, i.e. citrus (orange, tangerine, and lemon) and cucurbits (potatoes, tomatoes and onions) and calculates of demand system estimates by estimating three general demand functions aggregate for groups (citrus, cucurbits and vegetable) since the collection forms are not included. Therefore, the use of cumulative data of the three composite groups to obtain the system of demand equations will obtain invalid parameters.

Since the present study has used the central bank's price index to assess the conditions of fruits (citrus), cucurbits, and vegetable grouping, the results of the study show that economic studies can be performed using the central bank grouping and statistics center of Iran, and if these indicators are used, the results can be reliable.

Given the revenue elasticity calculated for the three commodity groups, it can be seen that the second commodity group (potato-tomato-onion) is more essential than the other commodity groups, which should be considered in government policy for agricultural production and pricing.

The basic suggestion of the application of the present study is that prior to any action on the demand system approach, there should be weak resolution tests. Also, the use of adaptive and separable groups in the selection of specific functional forms of utility, the estimation of elasticity, and the calculation of aggregation of groups in different ways.

Investigating the conditions of compounding agricultural commodities in economic matters is of great importance. So, paying attention to this can make the conditions for a macroeconomic policy more meaningful. Due to the importance of citrus fruits, cucurbits, and vegetables group in the Iranian household consumption basket, the present study investigated the conditions of compounding under different assumptions in the selected commodities group.

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