

A NEW APPROACH TO THE DESCRIPTION OF ALIMENTARY CONSUMPTION PATTERNS: THE CASE OF GREECE

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Abstract

The understanding of the formation and the evolution of alimentary consumption patterns requires a broad and multidimensional approach. Foods are either of plant or animal, agricultural or industrial origin, and in these forms they play their biological role; the consumption of foods has consequences (social, economical, health, etc.) on an individual level as well as on a wider collective level. In this essay we attempt to describe alimentary patterns in Greece (1957-2005) from three different dimensions: Natural (animal or plant origin), technical (agricultural or industrial origin) and biological (nutritional properties). The description – which is the base of interpretation – is done through charts and tables, based on numerical indicators that are deduced from simple functions-illustrations. The tables are simple or double-entry and we present spreading diagrams.

Περίληψη

Η κατανόηση της διαμόρφωσης και εξέλιξης των διατροφικών προτύπων αναγκαστεί πολύπλευρης αντιμετώπισης. Τα τρόφιμα επιτελώντας το ζωτικό βιολογικό τους ρόλο είναι φυτικής ή ζωικής προέλευσης, αγροτικά ή βιομηχανικά, με συνέπειες και σε ατομικό αλλά και ευρύτερα συλλογικό επίπεδο (οικονομικό, κοινωνικό, υγείας κ.ο.κ.). Η εργασία αυτή επιχειρεί να περιγράψει τα διατροφικά πρότυπα στην Ελλάδα (1957-2005) από τρεις διαφορετικές διαστάσεις: Φυσική (ζωικής ή φυτικής προέλευσης), τεχνική (αγροτικής ή βιομηχανικής προέλευσης) και βιολογική (θρεπτικές ιδιότητες). Η περιγραφή, που αποτελεί τη βάση της ερμηνείας, γίνεται με πίνακες και διαγράμματα, που βασίζονται σε αριθμοδείκτες οι οποίοι εξάγονται με απλές απεικονίσεις-συναρτήσεις. Οι πίνακες είναι απλής-διπλής εισόδου και τα διαγράμματα είναι διασποράς.

JEL Classification: E21, M31, Q11

Keywords: alimentary consumption patterns, physical, technical, biological characteristics

1. Introduction

The original feature of this paper is the decomposition and reconstruction of statistical data from the National Statistical Service of Greece (ESYE). These allow the description by a physical aspect (grain, meat, fish, oil-fat, dairy, vegetables, fruit, sugar confectionery, non-alcoholic beverages, expenditure on food away from home away from home, other foods) without making reclassifications through technical and biological characteristics. This methodology is followed and accepted by other scientific studies, in available literature. As a result, industrial and biological characteristics of dietary standards cannot be distinguished, but only their physical properties (plant and animal) can be estimated.

In this study, instead, we process the data of the Household Budget Surveys (H.B.S.) and reclassified them with criteria according to agricultural and industrial features, and added also biological characteristics in to our consideration. The results are presented in tables and graphs, and describe the alimentary consumption patterns of the 1950's (traditional-«Mediterranean») and those of the early 2000-2010 (industrial-internationalized-«Western origin»).

This paper is divided into three parts. The first attempts to explain the importance of division and reclassification of data in order to describe the alimentary consumption patterns from a physical, biological and technical perspective. The second part describes the method (functions, indicators, tables and charts) that can describe comprehensively the alimentary consumption patterns. The third part presents the empirical results of our paper.

We conclude that this new method is possible a) to describe comprehensively alimentary consumption patterns and b) to allow the qualitative description and characterization, for instance, of agricultural or industrial, «Mediterranean», and «Western origin» alimentary consumption patterns.

2. Data: Processing and Reclassification

2a. Natural Features

Under this criterion (natural features) alimentary consumption patterns are characterized as either plant or animal origin. If the costs for products of plant origin surpass those of animal (at rates above 50%, see also L. Malassis 1979 pp. 188 & 198, and 1986 p. 187), as, for example, happens with the traditional Mediterranean alimentary consumption patterns, then alimentary patterns are indicated – from a natural point of view – as natural. If however, the cost of animal foods is more, as in the 1980's, then the alimentary patterns are indicated of an animal origin.

In the 1950s (H.B.S. 1957-58, see I. Sotiropoulos-M. Ntemousis, 2002, p. 458) rates (%) of participation in two major categories of total expenditure for food were 60.2% (plant ingredients) and 39.8% (animal ingredients). At current prices this means: 210.6 drachmae for plant ingredients, 139.1 drachmae for animal ingredients, and 349.7 total drachmas. On the contrary, during the 1980s, (H.B.S. 1981/82) the animal food ingredients were more (52.1% animal vs. 47.9% plant ingredients), while at the beginning of the first decade of 2000 (H.B.S. 2004/05) plant ingredients exceed again over animal ingredients in food (53.0% plant vs. 47.0% animal ingredients).

2.b Technical Features

Under this criterion, alimentary patterns are described either as agricultural or industrial origin. If the costs for agricultural products exceed those of industrial products, like in traditional «Mediterranean» alimentary patterns, then these dietary patterns are indicated as of agricultural origin. If, however, industrial food products exceed agricultural, then alimentary patterns are designated as of industrial origin.

According to data from H.B.S. 1957/58, alimentary patterns in Greece can be not considered as agricultural anymore, and are in a process of industrialization, which is intensified over time. The agricultural ingredients were 43.5% of the total in the data of H.B.S. 1957/58 but 29.9% in the H.B.S. 2004/05. In contrast, industrial ingredients, were 56.5% in the data of H.B.S. 1957/58 but 70.1% in the recent H.B.S. 2004/05.

2.c Biological features

Nutrition sciences investigate data such as the concentration of alimentary patterns in nutrients, with a commonly accepted indicator for measuring overall efficiency, energy points (=calories). The data used in this case result from the respective findings of nutrition science (biology, food chemistry, medicine, etc.), which use specific indicators each time for proteins, fats, sugars, vitamins, minerals and a few trace elements, etc. (see also L. Malassis, 1986, pp. 28-52). The World Health Organization (WHO) uses the following standards:

A = Less than 2.200 calories per capita per day (malnutrition)

B = 2.200 – 2.600 calories per capita per day (poor feeding)

C = 2.600 – 3.200 calories per capita per day (enough food)

D = more than 3.200 calories per capita per day (overfeeding)

In the early 1960s, Greece (at a general population level) was just moving from the poor feeding category (2.820 calories) – according to WHO – while at the end of the study period (2005), is characterized by overfeeding (3.680 calories).

3. Methods

Functions and indicators used to describe alimentary consumption patterns

If, however, we must describe alimentary patterns from all aspects (as «feature packets»: K. Lankaster 1966, p. 133), it is necessary to create a common index. A simple and applicable index in all three cases (natural, technical, biological features) could be created as follows:

$$Q_{\text{index of plant ingredients}} = \frac{\text{rate \% of plant ingredients}}{50} \quad (1)$$

$$Q_{\text{index of animal ingredients}} = \frac{\text{rate \% of animal ingredients}}{50} \quad (2)$$

Where: «plant %» or «animal %» the percentage % of plant or animal ingredients that make up the respective diets.

Applying the data of H.B.S. 1957/58, our indices receive the following values:

$$Q_{\text{index of plant ingredients}} = \frac{\text{rate \% of plant ingredients}}{50} = \frac{60.2}{50} = 1.20 \text{ for plant origin foods, and}$$

$$Q_{\text{index of animal ingredients}} = \frac{\text{rate \% of animal ingredients}}{50} = \frac{39.8}{50} = 0.80 \text{ for animal origin food, with: } 50 = \text{the } 50\% \text{ rate when working on data rates.}$$

The logic behind using the 50% rate is as follows: it is a marginal point (≥ 50) of characterization of patterns from a natural (animal or plant products) and a technical aspect (industrial or agricultural products) and, given that percentages of each category do not vary anywhere but only between 0% and 100%, the values of the index range between ≥ 0 to ≤ 2 .

When formulas (1) or (2) are applied for agricultural ingredients of alimentary patterns, we get:

$$Q_{\text{index of agricultural ingredients}} = \frac{\text{rate \% of agricultural ingredients}}{50} \quad (3)$$

When applied to industrial ingredients we get:

$$Q_{\text{index of industrial ingredients}} = \frac{\text{rate \% of industrial ingredients}}{50} \quad (4)$$

Hence, the general form of the index is:

$$Q_{\text{index of alimentary ingredients X}} = \frac{\text{rate \% of alimentary ingredients X}}{50} \quad (5)$$

where: X = plant, animal, agricultural or industrial ingredients.

When processing data concerning values (e.g. costs), quantities (eg kg or pieces), indices of food biological composition (eg kcal for calories, etc.), the formula takes the following form:

a) In the case of expenditure (costs):

$$Q_{\text{index of plant ingredients}} = \frac{\text{Cost of plant ingredients}}{\left(\text{Total category cost} / 2 \right)} \quad (6)$$

$$Q_{\text{index of animal ingredients}} = \frac{\text{Cost of animal ingredients}}{\left(\text{Total category cost} / 2 \right)} \quad (7)$$

$$Q_{\text{index of agricultural ingredients}} = \frac{\text{Cost of agricultural ingredients}}{\left(\text{Total category cost} / 2 \right)} \quad (8)$$

$$Q_{\text{index of industrial ingredients}} = \frac{\text{Cost of industrial ingredients}}{\left(\text{Total category cost} / 2 \right)} \quad (9)$$

$$Q_{\text{index of alimentary ingredients X}} = \frac{\text{Cost of alimentary ingredients X}}{\left(\text{Total category cost} / 2 \right)} \quad (10)$$

b) In the case of quantities (where instead of expenditure data we use data quantities):

$$Q_{\text{index of plant ingredients}} = \frac{\text{Quantity of plant origin ingredients}}{\left(\text{Total category quantity} / 2 \right)} \quad (11)$$

$$Q_{\text{index of animal ingredients}} = \frac{\text{Quantity of animal origin ingredients}}{\left(\text{Total category quantity} / 2 \right)} \quad (12)$$

$$Q_{\text{index of agricultural ingredients}} = \frac{\text{Quantity of agricultural origin ingredients}}{\left(\text{Total category quantity} / 2 \right)} \quad (13)$$

$$Q_{\text{index of industrial ingredients}} = \frac{\text{Quantity of industrial origin ingredients}}{\left(\text{Total category quantity} / 2 \right)} \quad (14)$$

$$Q_{\text{index of alimentary ingredients X}} = \frac{\text{Quantity of alimentary ingredients X}}{\left(\text{Total category quantity} / 2 \right)} \quad (15)$$

c) In the case of biological features (eg calories):

$$Q_{\text{index of biological ingredients}} = \frac{\text{Calories}}{\text{WHO's standard (e.g. 2200, 2600, 3200)}} \quad (16)$$

$$Q_{\text{index of alimentary ingredients X}} = \frac{\text{Quantity of biological ingredients X}}{\text{Standard base of biomedical sciences}} \quad (17)$$

Examples (with cost data):

$$Q_{\text{index of plant ingredients}} = \frac{210.6}{\left(349.7 / 2 \right)} = 1.20 \quad (\text{applying formula (6) to data from H.B.S. 1957/58}) \quad (\text{see also}$$

results from formula (1) above).

$$Q_{\text{index of animal ingredients}} = \frac{139.1}{\left(349.7 / 2 \right)} = 0.80 \quad (\text{applying formula (7) to data from H.B.S. 1957/58}) \quad (\text{see also}$$

results from formula (2) above).

$$Q_{\text{index of biological ingredients}} = \frac{\text{Calories}}{\text{WHO's standard (e.g. 2200, 2600, 3200)}}$$

$$Q_{\text{index of biological ingredients}} = \frac{2820}{2600} = 1.08 \quad (\text{applying formula (16) to WHO data})$$

Thus, we manage to create a common index, as shown by the results of formulas (1), (2) or (5) and (6), (7) or (10) for plant and animal ingredients, and (16) or (17) for biological.

4. Results: Tables and Charts

In order to describe all features (natural, technical, biological) of an alimentary consumption pattern, a simple function can be generated.

$$Q_{\text{alimentary pattern}} = (Q_{\text{natural}}, Q_{\text{technical}}, Q_{\text{biological ingr.}}) \quad (18)$$

or more precisely

$$Q_{\text{alimentary pattern}} = (Q_{\text{nat.}}, Q_{\text{animal}}, Q_{\text{agric.}}, Q_{\text{indust.}}, Q_{\text{biological ingr.}}) \quad (19)$$

According to data from H.B.S. 1957/58 (see I. Sotiropoulos – M. Demousis, 2002, p. 456), the above relationship (19) receives the following values:

$$Q_{\text{alimentary pattern}} = (Q_{1.20}, Q_{0.80}, Q_{0.87}, Q_{1.13}, Q_{1.08}).$$

With data from H.B.S. 2004/05, the same relation (19) takes the values:

$$Q_{\text{alimentary pattern}} = (Q_{1.06}, Q_{0.94}, Q_{0.60}, Q_{1.40}, Q_{1.42}).$$

Thus, alimentary patterns can be described by tables and diagrams as shown in Table 1 and Figure 1, which depict in summary, that the alimentary pattern of 1957/58 consists of the following characteristics

a) Plant features

b) It begins to become more industrialized and

c) It is just above the minimum levels of biological (energy) efficiency.

However, the alimentary pattern of H.B.S. 2004/05 is:

a) Plant-based also (but significantly reduced after a period of preponderance of animal ingredients over the past two decades)

b) Presenting growing industrial features and

c) Has significantly exceeded the levels of energy efficiency (see Table 2 and Figure 2).

Table 1: Description of the alimentary consumption pattern of 1957/58 based on natural, technical, and biological features.

NATURAL FEATURES		TECHNICAL FEATURES		BIOLOGICAL FEATURES	
Plant ingredients	1.20	Agricultural ingredients	0.87	Energy efficiency	1.08
Animal ingredients	0.80	Industrial ingredients	1.13		

Figure 1: Description of the alimentary consumption pattern of 1957/58 based on natural, technical, and biological features.

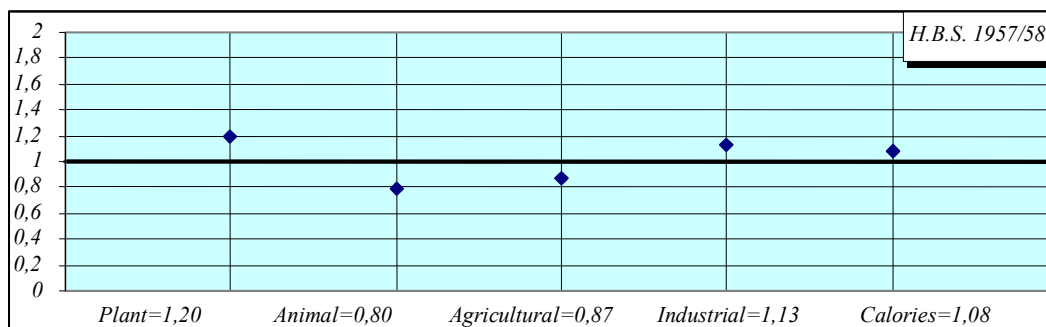
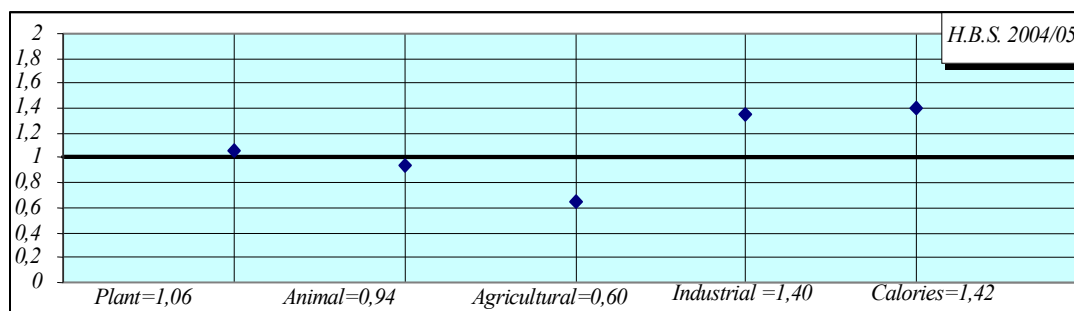


Table 2: Description of the alimentary consumption pattern of 2004/05 based on natural, technical, and biological features.

NATURAL FEATURES		TECHNICAL FEATURES		BIOLOGICAL FEATURES	
Plant ingredients	1.06	Agricultural ingredients	0.60	Energy efficiency	1.42
Animal ingredients	0.94	Industrial ingredients	1.40		

Figure 2: Description of the alimentary consumption pattern of 2004/05 based on natural, technical, and biological features.



5. Conclusions

Using the formulas:

$$Q_{\text{index of alimentary ingredients X}} = \frac{\text{rate \% of alimentary ingredients X}}{50} \quad (5)$$

$$Q_{\text{index of alimentary ingredients X}} = \frac{\text{Cost of alimentary ingredients X}}{\left(\frac{\text{Total category cost}}{2} \right)} \quad (10)$$

$$Q_{\text{index of alimentary ingredients X}} = \frac{\text{Quantity of alimentary ingredients X}}{\left(\frac{\text{Total category quantity}}{2} \right)} \quad (15)$$

$$Q_{\text{index of alimentary ingredients X}} = \frac{\text{Quantity of biological ingredients X}}{\text{Standard base of biomedical sciences}} \quad (17)$$

it is possible to formulate a common basis for characterizing alimentary patterns from a natural, technical and biological aspect:

$$Q_{\text{alimentary pattern}} = (Q_{\text{natural}}, Q_{\text{technical}}, Q_{\text{biological ingr.}}) \quad (18)$$

or more precisely

$$Q_{\text{alimentary pattern}} = (Q_{\text{nat}}, Q_{\text{animal}}, Q_{\text{rural}}, Q_{\text{indust.}}, Q_{\text{biological ingr.}}) \quad (19)$$

Thus, we have achieved giving a fuller description of alimentary consumption patterns, since using these indices, respective tables and charts can be constructed (see Tables 1, 2, and Figures 1, 2). Finally, it is easier understanding, classifying (eg, «agricultural», «industrial», «Mediterranean», etc.), analyzing their properties and evolution, and creating the conditions under which specific processing techniques can be employed.

Finally, the method of creating these indicators, tables and diagrams can be applied as well within each category (eg meat, cereals, etc.), in other categories of consumption (eg clothing, housing, etc.) but also for the interpretation of their patterns and evolution.

In its general form, the basic formula may receive the form (when describing consumption patterns):

a) $CM_d = (Ch_n, Ch_t)$

where:

CM_d = Description of the consumption pattern

Ch_n = natural features

Ch_t = technical features

In the case of alimentary patterns the biological variable has been added, while in each different category of consumption corresponding variables are added.

Regarding the interpretation of consumption patterns, the formula may receive the form:

b) $CM_e = (Ch_e, Ch_s)$

where:

CM_e = Interpretation of the consumption pattern

Ch_e = economic features

Ch_s = social features

Each variable can be broken down into parts, such as $Ch_e = P \cdot I$ (where P = price, and I = income) and a third variable may be added as well, according to formulas (18) or (19). This was applied with alimentary consumption, where we added the variable of biological ingredients in foods.

It would be interesting to study these data considering more features and processing them with a more complex methodology, in association with other indices (eg. GDP), a field of research which we are currently examining.

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