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**Article**

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# Multicriterial Hierarchy Methods Applied in Consumption Demand Analysis. The Case of Romania

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## Summary

*The basic information for computing the quantitative statistical indicators, that characterize the demand of industrial products and services are collected by the national statistics organizations, through a series of statistical surveys (most of them periodical and partial). The source for data we used in the present paper is an statistical investigation organized by the National Institute of Statistics, "Family budgets survey" – that allows to collect information regarding the households composition, income, expenditure, consumption and other aspects of population living standard. In 2005, in Romania, a person spent monthly in average 391,2 RON, meaning about 115,1 Euros) for purchasing the consumed food products and beverage, as well as non-foods products, services, investments and other taxes. 23% of this sum was spent for purchasing the consumed food products and beverages, 21.6% of the total sum was spent for purchasing non-food goods and 18,1% – for payment of different services. There is a discrepancy between the different development regions in Romania, regarding total households expenditure composition. For this reason, in the present paper we applied statistical methods for ranking the various development regions in Romania, using the share of households' expenditure on categories of products and services – as ranking criteria.*

## 1. Total Consumption Expenditure by Regions

The basic information for computing the quantitative statistical indicators, that characterize the demand of industrial products and services are collected by the national statistics organizations, through a series of statistical surveys (most of them periodical and selective). Such a survey is organized by the National

Institute of Statistics, "Family budgets survey" – that allows to collect information regarding the households composition, income, expenditure, consumption and other aspects of population living standard. The survey is organized as a quarterly continuous research for a period of three successive months, on a sample of 9360 permanent dwellings, distributed in monthly independent sub-samples of 3120 permanent dwellings.

The survey has been carried out in 780 survey centers, distributed in all counties of the country and in Bucharest Municipality sectors (427 in urban area and 353 in rural area).

A household was included in a certain socio-economic category based on the main occupational status of the household reference person. Households were grouped by income deciles based on total income per persons, deflated by population consumer price index with January 2005 as base. The deciles divide the household series structured ascending according to the level of monthly average income per person into 10 equal parts (deciles groups).

For characterizing the demand of industrial products and services, we used the following statistical indicators:

- Total expenditure include:
  - Money expenditure, irrespective of their destination (consumption, taxes and compulsory payments, purchases of animals and poultry, real estate and lands, other investment expenditure a.s.o) including equivalent value of free or at lower prices provisions (goods and services), evaluated at selling price of offering unit);
  - Equivalent value of consumption of food and non-food products from own resources (production, stock a.s.o.) determined based on monthly average prices of respective products.
- Total consumption expenditure include:
  - Money expenditure for buying consumed food products, non-foods goods and for payment of services, including equivalent value of free or at lower prices provisions (goods and services).
  - Equivalent value of food and non-food products consumption from own resources.
- Yearly average consumption of food products per inhabitant expressed in physical units, represents the quantities of food products intended for human consumption regardless the consumption type (natural or processed), the supply source (food stores, free market, consumption from own resources a.s.o.) or the consumption place (individual households, restaurants, canteens, institutionalized households a.s.o.).
- Yearly average consumption of beverages, per inhabitant represents quantities of such products, consumed as average, per inhabitant in the reference year no matter of supply source (food stores, free market and own production of agricultural producers only for wine consumption) and of consumption place (population individual households, restaurants, canteens a.s.o.).

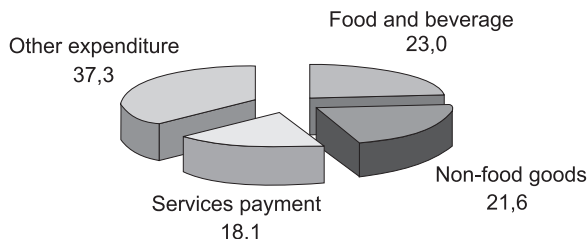


Figure 1. Total households expenditure composition in 2005 in Romania

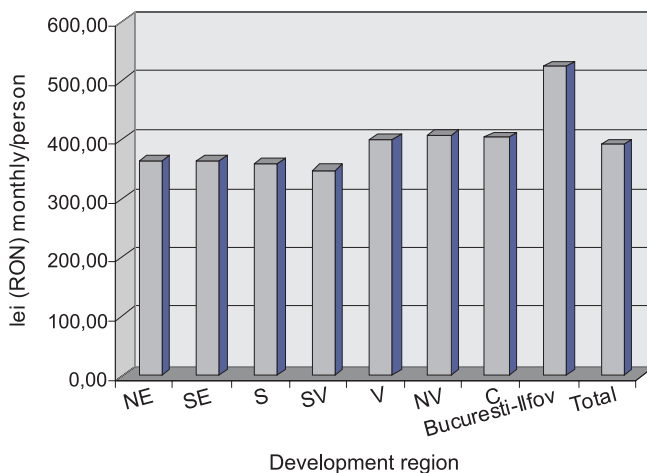


Figure 2. Total households expenditure in 2005, for Romanian development regions

In 2005, in Romania, a person spent monthly in average 523,35 RON, for purchasing the consumed food products and beverages, as well as non-foods products, services, investments and other taxes. 23% of this sum was spent for purchasing the consumed food products and beverages, 21,6% of the total sum was spent for purchasing non-food goods and 18,1% – for payment of different services (figure 1).

Analyzing total households expenditure from Romania, in 2005, at territorial level, we conclude that in Bucharest-Ilfov Region the indicator registered its highest limit (with a total expenditure of 523.35 RON/pers., while in South-West Region it registered a minimum value (of 347,85 RON per person). Also, the Western Region, as well as the North-West and Central Region situated below the country average, but in the North-East, South-East and South Regions, one person spent in average a smaller amount of money than the country-average level (figure 2, table 1).

There can be sensed a discrepancy between the different development regions in Romania, regarding total households expenditure composition. The

share of expenditure for purchasing food products and beverage in total expenditure reached the maximum value in the Western Region (25,6%), followed by the Bucharest-Ilfov Region (25,3%); the lowest share registered in the South-West Region (21,1%). Referring to the share of expenditure for purchasing non-food products (clothes, shoes, durable goods a.s.o.) in total expenditure, the highest value registered in the North-West Region 23.1%, followed by the Bucharest-Ilfov Region: 22,8%. The minimum share of this category expenditure registered in the South-West Region (19,6%). In 2005, it had been spent for services payment at most 24,5% of total monthly expenditure (per person) (in Bucharest) and at least 14,6% (in South-West Region) (figure 3, table 2).

Analyzing dynamic behavior of monthly households consumption expenditure, we can conclude that during the 2001–2005 period, at macroeconomic level, the statistical indicator registered an increasing trend, the increase being more significant in Bucharest-Ilfov Region (with 176,07 RON in 2005 compared to 2001, respectively with an annual average of 44,02 RON , at constant prices 2001). The evolution –positive, but slowly – of monthly households consumption expenditure – was registered in South-West Region, where the indicator increased (in 2005, compared to 2001) by 81,79 RON (respectively by an annual average of 20,45 RON) (Table 3, figure 4).

Table 1

Development region	Total	North-East	South-East	South	South-West	West	North-West	Center	Bucharest-Ilfov
	lei (RON), monthly on a person								
Total expenditure (2005)	391.2	365.36	363.90	358.32	347.85	400.67	407.10	403.78	523.35

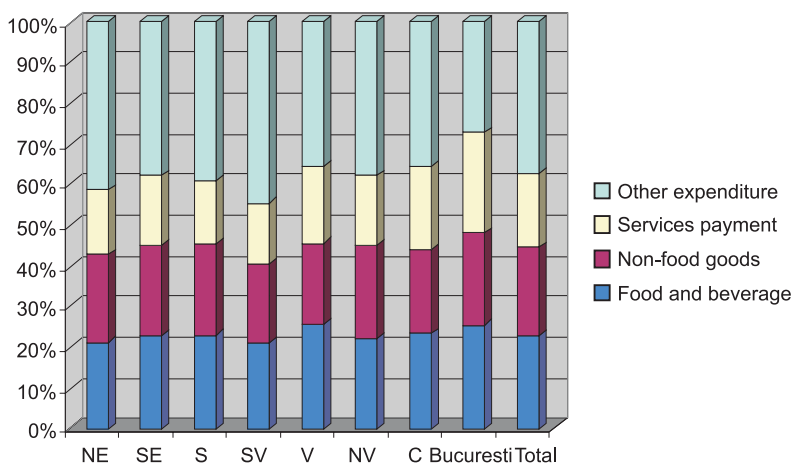


Figure 3. Total households expenditure composition in 2005 (%)

Table 2

Development region	Purchasing consumed food products and beverage	Purchasing non-food products	Services payment	Other expenditure categories	Total expenditure (%)
North-East	21.3	21.3	16.1	41.3	100
South-East	23.0	22.1	17.2	37.7	100
South	23.1	22.2	15.7	39.0	100
South-West	21.1	19.6	14.6	44.7	100
West	25.6	20.0	18.6	35.8	100
North-West	21.8	23.1	17.2	37.9	100
Central	23.4	20.6	20.4	35.6	100
Bucharest	25.3	22.8	24.5	27.4	100
Total	23.0	21.6	18.1	37.3	100

Table 3. Monthly households consumption expenditure

RON on a month, on a household – constant prices 2001					
Development region	2001	2002	2003	2004	2005
ROMANIA	376.51	387.32	401.35	475.95	501.47
North-East	336.25	354.66	373.57	456.99	479.72
South-East	383.48	390.96	399.36	449.22	466.35
South	359.14	354.91	364.08	443.41	457.82
South-West	365.76	351.86	356.03	432.34	447.55
West	366.23	371.64	391.98	496.63	512.14
North-West	382.49	404.93	434.89	499.81	527.57
Central	393.63	412.89	422.42	483.79	521.88
Bucharest-Ilfov	449.96	476.60	490.07	569.34	626.03

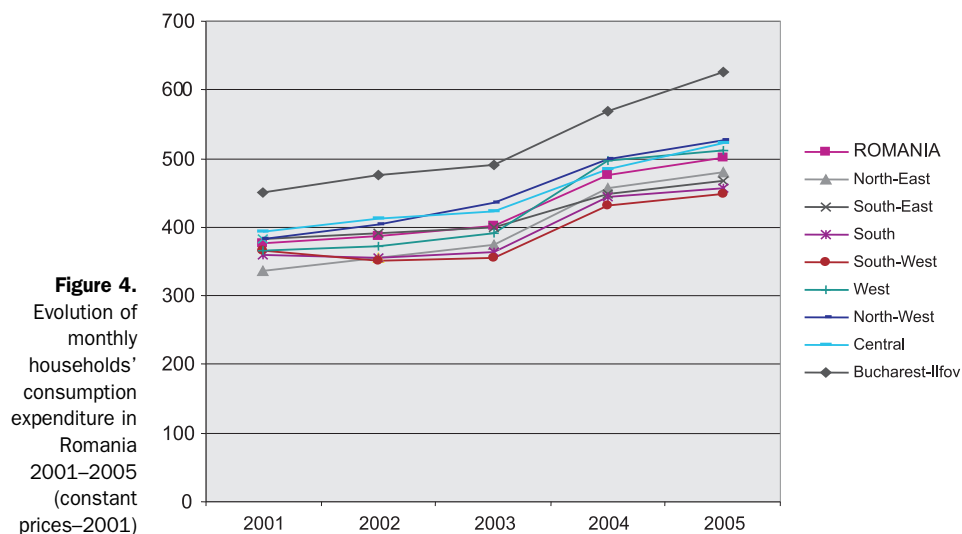


Table 4

Development region	Absolute difference in 2005 compared to 2001 (RON – const. prices)	Annual average absolute difference (RON– const. prices/year)
ROMANIA	124.96	31.24
North-East	143.47	35.87
South-East	82.87	20.72
South	98.68	24.67
South-West	81.79	20.45
West	145.91	36.48
North-West	145.08	36.27
Central	128.25	32.06
Bucharest-Ilfov	176.07	44.02

Analyzing the composition of total households' expenditure at territorial level, we proceed to a multicriterial hierarchy of development regions. The ranging criteria were the various expenditure categories: ***purchasing the consumed food-products and beverage, purchasing the non-food products and services payment***.

These ranking criteria were expressed in a relative form, as structural (relative) indicators. They are computed in a  $\frac{\text{part}}{\text{whole}}$  way, illustrating the statistical population composition by the studied variable. They are also named as weights, and computed according to the following relation:

$$g_i^x = \frac{x_i}{\sum_{i=1}^n x_i} \quad (\text{expressed in coefficients})$$

or:

$$g_{i\%}^x = \frac{x_i}{\sum_{i=1}^n x_i} \cdot 100. \quad (\text{expressed in per cents})$$

Weights show the share of one variables' level (X) registered at a statistical unit or group of units "i" ( $x_i$ ) in the total level of the variable ( $\sum_{i=1}^n x_i$ ). This relation can be computed only if the individual variables' levels can be summed.

The sum of all weights computed for the same statistical population equals to 1 (if they are expressed in coefficients) or 100 (if they are expressed in per cents).

$$\sum_{i=1}^n g_i^x = 1 \quad \text{or} \quad \sum_{i=1}^n g_{i\%}^x = 100.$$

If the whole population is divided into groups of units, and it had been computed the global variables' levels for each group, then the weight will be computed according to the formula:

$$g_i^x = \frac{\sum_{j=1}^{n_i} x_{ij}}{\sum_{i=1}^r \sum_{j=1}^{n_i} x_{ij}} \quad (\text{expressed in coefficients})$$

or:

$$g_{i\%}^x = \frac{\sum_{j=1}^{n_i} x_{ij}}{\sum_{i=1}^r \sum_{j=1}^{n_i} x_{ij}} \cdot 100, \quad (\text{expressed in per cents})$$

where:

$n_i$  is the number of statistical units in a group "i" of the population ( $i = \overline{1, r}$ );  
 $x_{ij}$  is the variable' level X for the unit j of a group i;

$\sum_{j=1}^{n_i} x_{ij}$  is the aggregated (total) variable level X for i group;

$\sum_{i=1}^r \sum_{j=1}^{n_i} x_{ij}$  is the aggregated (total) variable level X for the whole population.

In this way we computed the total households expenditure composition, on different types of products and services.

In our analysis, we used a multicriterial hierarchy method: ***the ranking method***.

## 2. The Ranking Method and Some Empirical Results

The ranking method consists of associating successively order numbers to every statistical territorial unit, according to the variable value or to the statistical indicators' value, registered at the respective unit. These variables represent the ranking criteria. The ranks are given as it follows: the territorial unit



with the best performance will receive rank 1, the unit with the following performance (in an descending order) – will receive rank 2, then 3, 4, ...  $n$  (where  $n$  is the total number of units, or the sample volume, and also represents the rank assigned to the worse performance unit). If the statistical variable tends to get higher values, then the unit with the maximum variables' value gets rank 1, while the one with the minimum variables' value – get rank  $n$ . In our paperwork, the ranking criteria are: the share of households' expenditure with purchasing food products and beverage in total households' expenditure, the share of households' expenditure with purchasing non-food products in total households' expenditure, the share of households' expenditure with services payment in total households' expenditure). If the most favorable level is represented by the lowest (minimum) variable value, then the unit with the minimum value gets the first rank, ..., the unit with the maximum value gets the "n" rank. The ranks will be noted:

$$\{R_i^{X_j}\}, \quad i = \overline{1, n}; \quad j = \overline{1, m};$$

will represent the rank assigned to "i" unit, according to the  $X_j$  variable value; in our case, the territorial units consists of the development regions in Romania ( $n=8$ ), and  $X_j$  represents the ranking criteria – shares of households expenditure, on different types of products and services ( $m = 3$ ).

By summing all ranks assigned to a territorial unit, according to all variables values, we get a score. The score for "i" development region is computed according to the relation:

$$S_i = \sum_{j=1}^m R_i^{X_j}, \quad i = \overline{1, n}.$$

The territorial unit with the lowest score ( $\min \{S_i, i = \overline{1, n}\}$ ) will be considered the most performant unit, from the ranking criteria point of view, and gets the final rank 1. As the score get higher, the final rank will get higher, too, up to the „n" rank, assigned to the territorial unit with a maximum score.

Based on three ranking criteria (described above), and on ranking method application, we conclude that Bucharest-Ilfov is the highest situated – rank 1; the following regions are Central Region and Western region (both – rank 2.5). The worst placed region is the South-West region (rank 8), preceded by the North-Eastern region: rank 7).

The advantages of this method are a facile and a quick application, but it has a disadvantage, too: a double-leveling of the differences between the regions, by replacing them with an arithmetic progression with ratio 1. A certain amount of qualitative information is – therefore – lost, the various distances between the territorial units being replaced by 1 (1 represents the distance between two successive ranks).

**Table 5.** Development region hierarchy – ranking method

Development region	Ranks for			Score	Final rank
	Purchasing consumed food products and beverage	Purchasing non-food products	Services payment		
North-East	7	5	6	18.0	7
South-East	5	3	4,5	12.5	5
South	4	4	7	15.0	6
South-West	8	8	8	24.0	8
West	1	7	3	11.0	2.5
North-West	6	1	4,5	11.5	4
Central	3	6	2	11.0	2.5
Bucharest	2	2	1	5.0	1

Analyzing the households' consumption expenditure composition, on different types of products and services, both at macroeconomic and regional level (development regions), for 2005 year, we conclude the following:

- in Romania, in 2005 44,2% of consumption expenditure of one household represented expenditure with purchasing food-products and nonalcoholic drinks. The country average was outraged by South-West Region (48,7%), by West Region (47,3%), by North-East Region (45,8%), South Region (45,8%) and South-East Region (44,5%),
- in Bucharest, 36,6% of total expenditure were spent on purchasing food-products and nonalcoholic drinks (the lowest share), representing almost 395 RON on a month, on a household,
- in South-West Region there were spent 7,9% of total consumption expenditure for purchasing alcoholic drinks and tobacco (the greatest share), while in West Region – the lower share: 4,8%,
- Bucharest inhabitants spent in average 53,925 RON (in a month, for a household) for purchasing clothes and shoes, representing 5% of total expenditure sum (the minimum percent, compared to other regions); in North-East and in North-West Region it was spent a greater share (7,4%) of total sum (61,15 RON in a month, for a household – in North-East Region, respectively 67,25 RON in a month, for a household),
- Bucharest inhabitants spent a greater share of total expenditure sum on different types of services: dwelling, electricity, water, gas (19,1%); for health services (5,7%); for communications (6,9%); for recreation and culture (5%) and for education (1,2%),
- Central Region inhabitants spent a maximum percent of total sum expenditure on purchasing furniture, house endowment and up keeping (4,4%) and for transportation (7,6%).

**Table 6.** Households' consumption expenditure composition, on different types of products and services (%)

Development Regions	Food-products and nonalcoholic drinks	Alcoholic drinks and tobacco	Clothes and shoes	Furniture, house endowment and up keeping	Dwelling, electricity, water, gas
North-East	45,8	5,4	7,4	3,9	14,2
South-East	44,5	5,6	6,1	3,6	15,2
South	45,8	6,6	5,8	3,8	15,0
South-West	48,7	7,9	6,6	2,8	14,0
West	47,3	4,8	5,8	2,9	17,2
North-West	43,6	5,5	7,4	4,0	14,7
Central	43,0	5,6	5,6	4,4	15,9
Bucharest	36,6	5,5	5,0	4,2	19,1
Total	44,2	5,8	6,2	3,8	15,6

**Table 7.** Households' consumption expenditure composition, on different types of products and services (%)

Development Regions	Health	Transportation	Communications	Recreation and culture	Education
North-East	4,2	5,5	4,1	4,2	0,9
South-East	3,8	7,3	4,7	3,8	1,0
South	4,3	6,5	4,1	4,0	0,6
South-West	2,4	5,5	4,1	3,6	0,7
West	2,6	6,0	4,8	4,1	0,6
North-West	3,4	7,2	4,9	4,3	0,9
Central	3,4	7,6	5,0	4,4	0,8
Bucharest	5,7	6,0	6,9	5,0	1,2
Total	3,8	6,5	4,9	4,2	0,9

### 3. Industrial Policy Implications

According to the European Commission, in Romania there can be noticed some progress in creating a functional market economy, but in spite of this, EU is reserved in Romania's capability (on medium term) to face the competition pressure and labor forces within the Union. There are several weak-points of manufacturing industry in Romania:

- the dependence on "forced exports";
- the absence of enforcing the technological specialization in production and exports;

- the persistency of „negative added value” syndrome in certain industries;
- insignificant influence (until now) of direct foreign investments;
- slow progress in ensuring the job security, of export certification, of ISO certification.

For the Romanian Government, the strategic objective of the industrial policy is the increase of competitiveness and the performances of the Romanian industry within the European and world context. Romania's industrial policy will be elaborated taking into account the national interest, to the public benefit and in comply with the citizen's security. The overall objectives of the industrial policy are:

- Increase of competitiveness;
- Increase of the role of research and development;
- Promotion of a durable management of resources and environment protection;
- Improvement of the professional training and labor employment.

These objectives can be achieved only if Romania's industrial policy observes the rules of the knowledge economy adopted at Lisbon in 2000. At the same time, we have to mention that further to EU enlargement and election of a new European Commission there has been created a new structure in charge with elaborating a new European industrial policy, in the context in which there are only two directives with compulsoriness character in the field. According to the Government, the instruments for the implementation of Romania's new industrial policy are: sector assistance, privatization and restructuring, assistance for export, supporting regional development, access to information and treating the externalities.

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## Zastosowanie wielokryterialnych metod analizy popytu konsumpcyjnego. Przykład Rumunii

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### **Streszczenie**

*Podstawowe, cykliczne i okresowe dane dotyczące kształtowania się popytu na produkty i usługi podawane są przez narodowe urzędy statystyczne. Umożliwia to kalkulację licznych wskaźników statystycznych. Artykuł jest oparty na tego typu danych, przedstawionych przez rumuński Narodowy Urząd Statystyczny w raporcie pt. „Przegląd budżetu gospodarstw domowych”. Na podstawie tego raportu można ocenić m.in. dochody, wydatki, poziom konsumpcji rumuńskich gospodarstw domowych oraz zmiany, jakie zaszły w ostatnim czasie w tym zakresie. W 2005 r. przeciętna wartość miesięcznych wydatków jednej osoby, zarówno na żywność, jak i inne dobra konsumpcyjne, usługi, podatki i inwestycje wynosiła 391,2 RON (115,1 EUR). 23% tej kwoty gospodarstwa domowe przeznaczały na dobra konsumpcyjne pierwszej potrzeby (głównie żywność), 21,6% – na inne dobra konsumpcyjne, a 18,1% na opłacenie różnego typu usług. W statystykach tych występuje zróżnicowanie między regionami kraju. W związku z tym, w artykule zaproponowano metody statystyczne analizy wielokryterialnej uszeregowania wydatków gospodarstw domowych według regionów kraju tak, aby wyniki analiz mogły być ze sobą bardziej porównywalne.*