

GAINS AND WITHDRAWS OF USING SEVERAL METHODS TO VALUE THE DEGREE OF LAND CONCENTRATION

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The paper presents a comparative analysis of three ways to value the degree of modernization of agrarian structures. Three different methods of numeric valuation of agrarian structures are utilized: the average size of agricultural exploitation, the Gini concentration coefficient and the concentration coefficient of the surface in large size exploitations. It is proved that the first two methods may be complementary and only the third characterizes the modernization degree of agrarian structures in an impartial mode.

Key words: average size, Gini concentration coefficient, concentration coefficient of surfaces in large size agricultural exploitations

The clear extension tendencies of organizational forms of land exploitation are motivated by the support offered through the industrialization process in agriculture, of promoting modern production technologies and of providing several services. The ordinary consequence of such modernizations is represented by the increase of technical and economic performances and thus, of the competitiveness in the competitive economy. The agrarian structures represent a reality that needs to be measured in order to develop useful strategies to optimize the organizational framework, respectively to optimize the size of the agricultural exploitation.

MATERIAL AND METHOD

Several methods are to be found in the literature review [1, 2, 3, 4, 5], however each has different uses. The following methods are:

1. The method of arithmetic weighted average;

$$\bar{S} = \frac{\sum s_j \cdot n_j}{s_j}, \text{ where;}$$

$\bar{S}$ - average surface of agricultural exploitation;

s_j - surface on agriculture size classes;

n_j - number of exploitation on agriculture size classe;

2. The method of Gini concentration coefficient

The Gini coefficient may be obtained by dividing the actual concentration area to the maximum concentration area, as follow:

$$C(x) = \frac{1/2 - \sum_{j=1}^k \frac{F'_{j-1} + F'_j}{2} \cdot (F_j - F_{j-1})}{1/2}; \quad 0 \leq C(x) \leq 1; \quad \text{where:}$$

$$F'_j - \text{cumulative frequency of the relative frequency of } f'_j = \frac{x_j \cdot n_j}{\sum x_j \cdot n_j}$$

$$F_j - \text{cumulative frequency of the relative frequency of } f_j = \frac{n_j}{n}$$

3. The method of concentration coefficient of surfaces in large size exploitations

The numeric valuation of the concentration of surfaces in the case of large size exploitations may be done using the concentration coefficients (E. Merce, 1992). The estimate of the concentration phenomena of large agriculture exploitation is:

$$CCS(x) = \frac{\bar{x}(E) - \bar{x}(m)}{\bar{x}(M) - \bar{x}(m)} \cdot 100$$

$\sum x_i f_i$ - mean value of size classes in the analyzed country

$\bar{x}(m)$ - mean value under the hypothesis of total concentration in the exploitation of minimum size

$\bar{x}(M)$ - mean value under the hypothesis of total concentration in the exploitation of maximum size

Data are provided by EUROSTAT official website and refer to the agrarian structures of European Union countries.

Table 1

Statistics on the number of farms and surfaces by size groups (2007)

Agriculture size classes (ha)	Number of farms				Surface			
	France	Czech Republic	Denmark	Romania	France	Czech Republic	Denmark	Romania
0-2	63870	12550	510	2485570	62180	10200	410	1807510
2-5	61180	6380	750	965590	202180	19260	2780	3021900
5-10	48460	4500	8780	300000	344440	31290	63260	2017540
10-20	52180	4030	8430	70130	747580	56390	121420	924230
20-30	36860	2130	4840	9550	909030	51500	118860	230100
30-50	62360	2330	5630	6560	2466130	89460	218330	251160
50-100	106650	2310	7090	4740	7682140	161150	509530	328250
More than 100	90410	4260	8180	9660	15063250	3098830	1628010	5172370
Total	521970	38490	44210	3851800	27476930	3518080	2662600	13753060

Source: Eurostat; Date of extraction: Sat, 14 Feb 09 09:28:31

RESULTS AND DISCUSSIONS

The average surface, on size classes as well as the total, may be determined based on the collected data about the number of farms and owned surfaces on size classes, by dividing the surfaces to the number of farms. The comparative situation for the four analyzed countries is presented in the table below.

Table 2

Average size on agriculture size classes and total

Agriculture size classes (ha)	Country			
	France	Czech Republic	Denmark	Romania
0-2	0,97	0,81	0,80	0,73
2-5	3,30	3,02	3,71	3,13
5-10	7,11	6,95	7,21	6,73
10-20	14,33	13,99	14,40	13,18
20-30	24,66	24,18	24,56	24,09
30-50	39,55	38,39	38,78	38,29
50-100	72,03	69,76	71,87	69,25
More than 100	166,61	727,42	199,02	535,44
Total	52,64	91,40	60,23	3,57

The Gini concentration coefficient, calculated for Czech Republic and France, is presented in the table below:

Table 3

Gini coefficient for Czech Republic

Agriculture size classes ha	Mean value of the class	Number of farms	No. of farms cumulative	No. of farms cumulative (%)	xi*ni	xi*ni cumulative	xi*ni cumulative (%)
	xi						
0-2	0,81	12550	12550	32,6	10200	10200	0,29
2~5	3,02	6380	18930	49,2	19260	29460	0,84
5~10	6,95	4500	23430	60,9	31290	60750	1,73
10~20	13,99	4030	27460	71,3	56390	117140	3,33
20-30	24,18	2130	29590	76,9	51500	168640	4,79
30-50	38,39	2330	31920	82,9	89460	258100	7,34
50-100	69,76	2310	34230	88,9	161150	419250	11,92
More than 100	727,42	4260	38490	100,0	3098830	3518080	100,00

Source: Eurostat; Date of extraction: Sat, 14 Feb 09 09:28:31

$$C(x) = \frac{\frac{100 * 100}{2} - \sum_{j=1}^k \frac{F'_{j-1} + F'_j}{2} \cdot (F_j - F_{j-1})}{\frac{100 * 100}{2}}$$

$$\begin{aligned}
 \text{Polygon area} &= \sum_{j=1}^k \frac{F'_{j-1} + F'_j}{2} (F_j - F_{j-1}) = \frac{0+0,29}{2} (32,6-0) + \frac{0,29+0,84}{2} (49,2-32,6) + \\
 &+ \frac{0,84+1,73}{2} (60,9-49,2) + \frac{1,73+3,33}{2} (71,3-60,9) + \frac{3,33+4,79}{2} (76,9-71,3) + \\
 &+ \frac{4,79+7,34}{2} (82,9-76,9) + \frac{7,34+11,92}{2} (88,9-82,9) + \frac{11,92+100}{2} (100-88,9) = 794 \\
 C(x) &= \frac{5000 - 794}{5000} \cdot 100 = 84,2\%
 \end{aligned}$$

Table 4

Gini coefficient for France

Agriculture size classes ha	Mean value of the class	Number of farms ni	No. of farms cumulative Ni	No. of farms cumulative (%) F_j	xi*ni	xi*ni cumulative	xi*ni cumulative (%)
	xi						F'_j
0-2	0,97	63870	63870	12,2	62180	62180	0,23
2~5	3,30	61180	125050	24,0	202180	264360	0,96
5~10	7,11	48460	173510	33,2	344440	608800	2,22
10~20	14,33	52180	225690	43,2	747580	1356380	4,94
20-30	24,66	36860	262550	50,3	909030	2265410	8,24
30-50	39,55	62360	324910	62,2	2466130	4731540	17,22
50-100	72,03	106650	431560	82,7	7682140	12413680	45,18
peste 100	166,61	90410	521970	100,0	15063250	27476930	100,00

Source: Eurostat; Date of extraction: Sat, 14 Feb 09 09:28:31

$$\begin{aligned}
 \text{Polygon area} &= \sum_{j=1}^k \frac{F'_{j-1} + F'_j}{2} (F_j - F_{j-1}) = \frac{0+0,23}{2} (12,2-0) + \frac{0,23+0,96}{2} (24,0-12,2) + \\
 &+ \frac{0,96+2,22}{2} (33,2-24,0) + \frac{2,22+4,94}{2} (43,2-33,2) + \frac{4,94+8,24}{2} (50,3-43,2) + \\
 &+ \frac{8,24+17,22}{2} (62,2-50,3) + \frac{17,22+45,18}{2} (82,7-62,2) + \frac{45,18+100}{2} (100-82,7) = 2153 \\
 C(x) &= \frac{5000 - 2153}{5000} \cdot 100 = 56,9\%
 \end{aligned}$$

The concentration coefficient of the surfaces in large size exploitation is obtained by dividing the amplitude between the average size of the surfaces and the size of the smallest group to the maximum amplitude (between the average size of the largest group and the average size of the smallest group). In the case of France, necessary data are organized in the table below:

Table 5

Mean values used to obtain the concentration coefficient of the surfaces for exploitation of large sizes

Size classes	France		Average agricultural size (xi)	Frequency of the surface (fi)	$x_i \cdot f_i$
	No. of farms	Surface			
0-2 ha	63870	62180	0,97	0,00226	0,002203
2-5 ha	61180	202180	3,30	0,00736	0,024316
5-10 ha	48460	344440	7,11	0,01254	0,089100
10-20 ha	52180	747580	14,33	0,02721	0,389801
20-30 ha	36860	909030	24,66	0,03308	0,815892
30-50 ha	62360	2466130	39,55	0,08975	3,549422
50-100 ha	106650	7682140	72,03	0,27959	20,13888
More than 100 ha	90410	15063250	166,61	0,54821	91,33825
Average size of the surface					116,3479

$$CCS(x) = \frac{\bar{x}(E) - \bar{x}(m)}{\bar{x}(M) - \bar{x}(m)} \cdot 100 = \frac{116,35 - 0,97}{166,61 - 0,97} \cdot 100 = 69,7\%$$

The comparison of the values obtained for the three valuation indicators of the modernization degree of agrarian structures for the 27 European Union countries leads to the following results:

Table 6

Top European countries by size for the concentration coefficients

ID	Country	Average size of the exploitation	ID	Country	Degree of surface concentration in large exploitations (%)	ID	Country	Degree of concentration after Gini coefficient (%)
1	Czech Republic	91,40	1	Slovakia	90,6	1.	Slovakia	94,0
2	United Kingdom	64,79	2	Czech Republic	88,7	2.	Hungary	91,8
3	Denmark	60,23	3	Bulgaria	76,1	3.	Bulgaria	88,4
4	Luxemburg	56,91	4	United Kingdom	75,1	4.	Czech Republic	84,2
5	France	52,64	5	Estonia	71,5	5.	Portugal	81,7
6	Germany	45,86	6	Denmark	70,5	6.	Estonia	78,2
7	Sweden	43,21	7	France	69,7	7.	Spain	77,6
8	Estonia	39,00	8	Luxemburg	69,4	8.	Italy	73,3
9	Finland	33,76	9	Hungary	67,9	9.	Cyprus	70,5
10	Ireland	32,33	10	Spain	61,7	10.	ROMÂNIA	69,8
11	Belgium	29,16	11	Sweden	61,1	11.	United Kingdom	68,5
12	Slovakia	29,11	12	Germany	60,2	12.	Latvia	68,4
13	Nederland	25,54	13	Portugal	59,0	13.	Lithuania	67,6
14	Spain	24,17	14	Belgium	45,0	14.	Poland	66,8
15	Austria	19,38	15	Finland	44,3	15.	Germany	65,9
16	Latvia	16,50	16	Latvia	43,2	16.	Austria	60,8
17	Portugal	12,67	17	Lithuania	40,1	17.	Sweden	60,2
18	Lithuania	11,51	18	Ireland	39,2	18.	France	57,0
19	Italia	7,60	19	ROMANIA	38,5	19.	Denmark	56,6
20	Hungary	7,47	20	Nederland	38,4	20.	Greece	55,4
21	Poland	6,50	21	Austria	34,1	21.	Belgium	55,0
22	Slovenia	6,49	22	Italia	32,6	22.	Nederland	55,0
23	Bulgaria	5,24	23	Cyprus	25,7	23.	Slovenia	51,1
24	Greece	5,17	24	Poland	21,6	24.	Luxemburg	48,2
25	Cyprus	3,66	25	Greece	14,2	25.	Finland	46,6
26	ROMANIA	3,57	26	Malta	12,6	26.	Ireland	43,7
27	Malta	0,95	27	Slovenia	10,5	27.	Malta	33,8
28	EU - 27	12,80	28	EU - 27	53,1	28.	Total EU-27	80,9

CONCLUSIONS

The methodology used at national level and those used by EUROSTAT, characterizes the modernization degree of agrarian structures through the average size of agricultural exploitations. This indicator gives some information about the organizational framework of land use without being sufficiently precise and wide-ranging because the individual values from which the same mean value is obtained may be different. Thus, in our view, this indicator is not the best instrument to value the modernization degree of agrarian structures and may be used, in some cases, as complementary method.

The Gini concentration coefficient characterizes the concentration of exploitations of different sizes (small, medium, large). It provides information about the concentration degree, but not about the type of exploitation. In this case, we appreciate that the degree of concentration has only an informative value and may be used as a complementary method as well.

The concentration coefficient of surfaces from exploitations of large sizes, even its name leads to the degrees of concentration of land use in large and extra large exploitations. Thus, we consider that it is the best methodological instrument and we appreciate that it should be applied by national statistics institutes, as well as by EUROSTAT.

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