USE OF LORENTZ CURVE FOR ESTABLISHING DEMOGRAPHICAL EVOLUTION MODELS FOR THE RURAL SETTLEMENTS IN THE DANUBE VALLEY, THE GIURGIU – BRĂILA SECTOR

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ABSTRACT - We used two indicators in order to quantify population's concentration level in a certain area: Lorentz curve and Gini ratio. For our research we took into account two years - 1985 and 2002, in order to compare the period previous to 1990 and the one after it. We noticed that a demographical deconcentration process caused by population decrease and disappearance of certain settlements was characteristic of the Danube Valley, in the Giurgiu and Brăila sector. We could identify eight evolution models specific to the rural settlements of this area, with four increase and four decrease models.

Key words: the Lorentz curve, the Gini ratio, concentration level, demographical evolution level

The humanisation degree for a certain area was influenced by the number of people and by their spatial distribution. The spatial concentration of population was the result of the relation between these two indicators. Had population been perfectly distributed, then the weight of each settlement should have been identical to the one occupied by its surface out of the total surface of the researched area. In the Danube sector between Giurgiu and Brăila (figure 1) we noticed a population deconcentration phenomenon caused by demographical decrease.

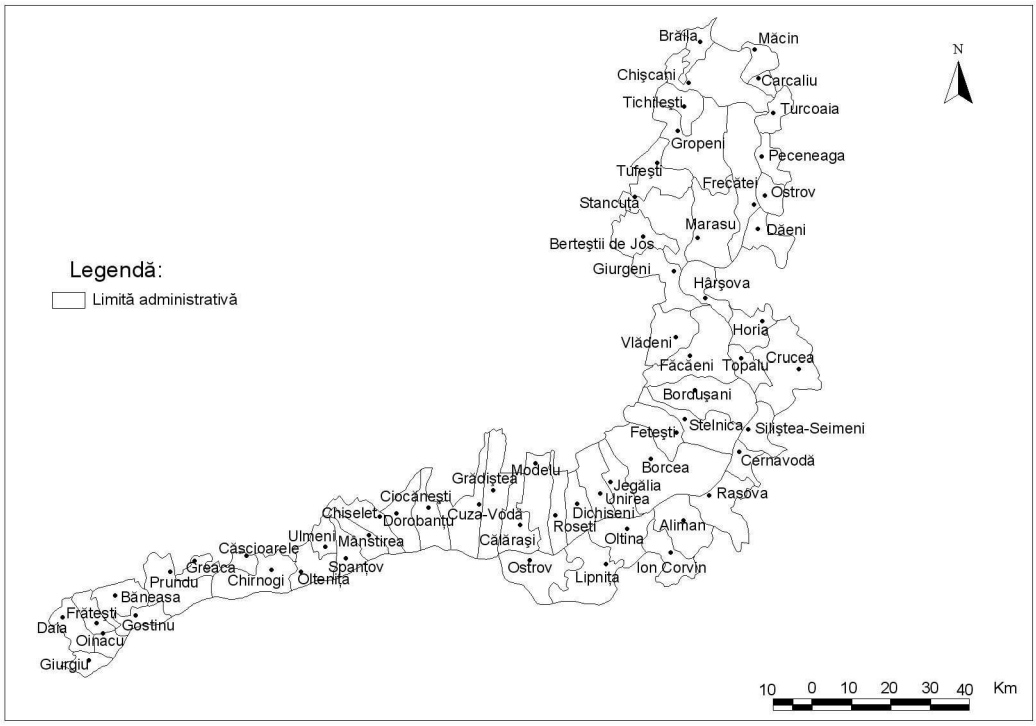

Figure 1. *Settlements in the Danube Valley, the Giurgiu – Brăila sector*

We could analyse quantitavely the population deconcentration phenomenon, reflected in time and space changes, through a series of methods. We used mainly four indices: the disimilarity index, the Lorentz curve, the Gini ratio, and "informational energy" index. In order to identify the population's concentration degree in Giurgiu – Brăila sector, we used two complementary indicators: the Lorentz curve

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and the Gini ratio (the concentration index) and we calculated them according to the geographers' method[1]. We calculated the Lorentz curve on the basis of the cummulated frequencies of two distributions: villages distribution according to their number (y_i) and according to their population (x_i). Had the ratios of the settlements and of the population the same, all points would have been situated on diagonal. We used statistical data for 1985 and 2002. In our case, the curves of the diagrams for the above-mentioned years were rather far from the diagonal and indicated a quite high rural concentration degree in the area.

We realised the Lorentz curve graphic on the basis of the distribution functions in the two tables (table 1 and table 2). We also obtained the rural concentration degree of this sector from the Gini ratio, an indicator that measured the proportion of the area under the Lorentz curve diagonal, according to the formula:

$$RG = \left(\sum_{i=1}^{n} x_i y_{i+1}\right) - \left(\sum_{i=1}^{n} x_{i+1} y_i\right)$$

While comparing its value for different villages categories, according to their demographical indicator established by the geographers, we noticed a decrease of the concentration degree characteristic for the population in the area in comparison to privious periods. This was caused by population decrease and the disappearance of several villages (figure 2 and figure 3).

Table 1. *The "Lorentz curve" and the "Gini ratio" for the villages in the Danube Valley in the Giurgiu – Brăila sector (1985)*

Group interval	Settlement number y_i	Population x_i	Ratio according to the number of:		Distribution function		$F(x_i)$ x $F(y_{i+1})$	$F(x_{i+1})$ x $F(y_i)$
			settlements	people	$F(y_i)$	$F(x_i)$		
Total	133	233,793	1	1	—	—	—	—
over 6,000	4	32,170	0.030075	0.143749	0.030075	0.143749	0.017293	0.011757
4,001-6,000	12	55,319	0.090226	0.247188	0.120301	0.390937	0.781915	0.092876
1,501-4,000	36	85,287	0.270677	0.381098	0.390977	0.772035	0.580477	0.376209
501-1,500	48	42,564	0.360902	0.190194	0.75188	0.962229	0.723480	0.746497
251-500	19	6,851	0.142857	0.030613	0.894737	0.992842	0.948052	0.893461
101-250	8	1,283	0.06015	0.005733	0.954887	0.998575	0.998574	0.954887
0-100	6	319	0.045113	0.001425	1	1	—	—
Produce sum	—	—	—	—	—	—	4.049791	3.075689

RG = 4.049791 - 3.075689 = 0.974102 (97.4102%)

The changes that the political, social, and economic conditions underwent led to many population changes reflected directly on settlements. Between 1985 and 2002, the analysed rural population decreased with 23,927 people, down to 209,886 inhabitants, in comparison to the 233,793 inhabitants (a 9.95% decrease) at the beginning of this period. According to *the number of people*, we noticed an increase for medium-sized villages, but the main settlement type in the area consisted of big, very big, and very small villages:

- The category of very large villages (over 6,000 inhabitants) – demographical decrease with 6,487 inhabitants (20%);
- The category of large villages (4,001 – 6,000 inhabitants) – the biggest decrease with 27,933 inhabitants (50.49%). One of the causes was the disappearance of seven villages (the biggest decrease of the number of settlements.

[1] V. Cucu, 1970, p. 49

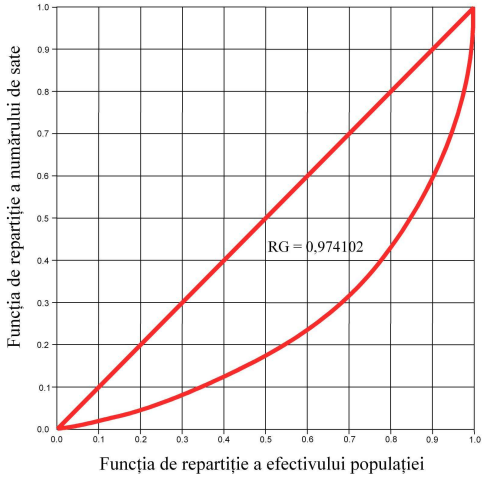

Figure 2. *The Lorentz curve for villages (1985)*

Table 2. *The "Lorentz curve" and the "Gini ratio" for the villages in the Danube Valley in the Giurgiu –Brăila sector (2002)*

Group interval	Settlement number y_i	Population x_i	Ratio according to the number of:		Distribution function		$F(x_i)$ x $F(y_{i+1})$	$F(x_{i+1})$ x $F(y_i)$
			settlements	people	$F(y_i)$	$F(x_i)$		
Total	136	209,866	1	1	—	—	—	—
over 6,000	3	25,683	0.022059	0.122378	0.022059	0.122378	0.007199	0.005578
4,001-6,000	5	27,386	0.036765	0.130493	0.058824	0.252871	0.091108	0.044102
1,501-4,000	41	104,275	0.301471	0.496865	0.360294	0.749735	0.534738	0.343851
501-1,500	48	42,944	0.352941	0.204626	0.713235	0.954361	0.828049	0.707125
251-500	21	7,780	0.154412	0.037071	0.867647	0.991433	0.925823	0.866452
101-250	9	1,509	0.066176	0.007190	0.933824	0.998623	0.998623	0.933824
0-100	9	289	0.066176	0.001377	1	1	—	—
Produce sum	—	—	—	—	—	—	3.38554	2.900932

RG = 3.38554 - 2.900932 = 0.484608 (48.4608%)

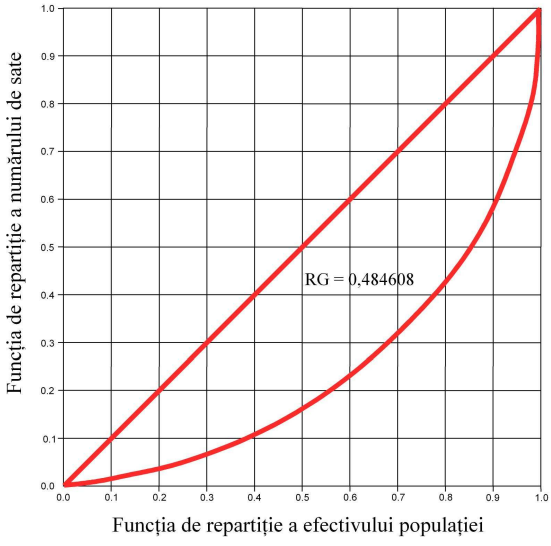

Figure 3. *The Lorentz curve for villages (2002)*

- The category of upper medium-sized villages (1,501 – 4,000 inhabitants) – the highest demographical increase, with 18,988 inhabitants (22.26%). This was caused by an increase in the number of settlements from 36 (in 1985) up to 41 (in 2002) (the highest increase of the number of settlements);
- The category of medium-sized villages (501 – 1,500 inhabitants) – a small increase with 380 inhabitants (0.89%) while the number of settlements did not change. This was a proof that the highest viability and balance were characteristic of this village category in the researched area;
- The category lower medium-sized villages (251 – 500 inhabitants) – these were characterised by an increase in their number and an increase of population with 929 inhabitants (13.56%);
- The category of small villages (101 – 250 inhabitants) – quite an important increase of the number of inhabitants (226, representing 17.61%);
- The category of very small villages (0 – 100 inhabitants) – these coped with depopulation while some other villages appeared (this was the case of the villages that were included in other ones and of those that disappeared for various reasons). The number of villages increased with three while there were 30 inhabitants more (9.40%).

After analysing the situation of population concentration, we identified eight evolution models characteristic of the rural settlements in the area, with four increase and four decrease models, according to the villages transition from an inferior demographic category to a higher one, or on theopposite.

Transition models from a higher category to a lower one were characteristic of the following situations:

1) from the category of very large villages to the category of the upper medium-sized ones: Tufeşti (Brăila County);
2) from the category of large villages to the category of the upper medium-sized ones: Gropeni (Brăila County), Chişcani (Brăila County), Borduşani (Ialomiţa County), Băneasa (Giurgiu County), Prundu (Giurgiu County), Carcaliu (Tulcea County), Turcoaia (Tulcea County);
3) from the category of upper medium-sized villages to the category of the medium-sized ones: Spanţov (Călăraşi County), Crucea (Constanţa County), Cegani (commune Borduşani, Ialomiţa County);
4) from the category of medium-sized villages to the category of the lower medium-sized ones: Băndoiu (commune Măraşu, Brăila County), Dichiseni (Călăraşi County), Tichileşti (Horia, Constanţa County), Stelnica (Ialomiţa County), Sf. Gheorghe (commune Băneasa, Giurgiu County), Puţu Greci (commune Greaca, Giurgiu County).

Similarly, we noticed several transition models from a lower category to a higher one:

1) from the category of very small villages to the category of small ones: Capidava (commune Capidava, Constanţa County);
2) from the category of small villages to the category of the lower medium-sized ones: Vărsătura (commune Chişcani, Brăila County);
3) from the category of lower medium-sized villages to the category of the medium-sized ones: Băltăgeşti (commune Crucea, Constanţa County);
4) from the category of medium-sized villages to the category of the upper medium-sized ones: Spiru Haret (commune Berteştii de Jos, Brăila County).

In 2002 there were four villages more than in 1985: Gura Gârluţei and Nicoleşti included in commune Berteştii de Jos (Brăila County), Radu Negru (commune Modelu, Călăraşi County), and Piatra (commune Ostrov, Tulcea County). Retezatu villages that belonged to commune Stelnica (Călăraşi County) in 1985, in 2002 it was on no longer mentioned as it disappeared because of depopulation. The other villages remained in their demographical category, irrespective of any of their population in the researched period.

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