TRAFFIC ATTRACTION OF SETTLEMENTS

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The possibility and quality of joining the social-economical circulation of the country is reflected by the traffic–geographical position of settlements. Traffic is considered to be the basic condition of social division of work, an indispensable factor of production-distribution-consumption, and it plays an important role in selecting place for industrial establishments as well.

Economical processes have a definite space, this is formed in the following way: power relations are concentrated at certain points of space, according to certain rules. The previously formed centres have an attractive effect on other points of space, and the points of economical space are being directed at a certain point of time according to this rule. The integration of economical processes taking place in the space, is fulfilled by traffic.

The consideration of traffic and public transport forms a significant part in structural investigations of space. Traffic relations (their direction and degree) are surveyed in this work; on their basis traffic attraction areas are outlined. Similarly to earlier investigations (KAJDÓCSY K.—MÉSZÁROS R.—CSATÁRI B. 1979) a multicentred research work was carried out by us.

In case of each Hungarian settlement traffic relations of different directions were taken into account. (It seemed to us reasonable to use the data of a 50 km area.) Our results proved the existence of a "hierarchal system" in traffic, which seems to be adjusting to the administrative hierarchy of the country, but which cannot be identified with it.

The examination of the network of road and railway transport dominated the earlier research works. E.g. András Vagács has worked out indices, concerning the degree of supply in transport, which meant values per territory or per person. Later on these studies have lost their importance, because the number of built-in roads has developed to such a degree, that almost every settlement has been linked to the transport network of the country. The railway transport has also lost a good deal of ats importance — first of all within a short distance — because of the growth of motor and bus traffic. Further investigations were included to determine the traffic attraction areas of towns. These traffic attraction areas were determined with the help of isocron and isodistant maps. Later on the differentiating effect of diverse line density was tiken into account by investigations. "Centre orientated" investigations like this were carried out at the *Department of Economic Geography of JATE* (MÉSZÁROS R.

KAJDÓCSY K. CSATÁRI B. 1969), in which complex transport-geographical position of villages was determined. The one-centred transport-geographical position was enriched to be a „multi-centred", i.e. territorial investigation by this method.

The investigation is based on hierarchal division of settlements. General transport-geographical position can be determined by this method, but transport-geographical orientation of the settlements cannot be revealed by it.

The "junction-hierarchy" investigations of Ferenc Erdősi emphasized the importance of town-like settlements as transportcentres.

The investigations of Imre Simon are directed to emphasize the importance of the network, connecting the transport of certain territories with their centres.

Applied method. Description

Transport points of a given territory are most generally represented by certain points of the network of settlements. Taking into account the branches of transport, this is the road transport, that carries the most of the network of settlement relations, but railway can play a similar role as well. Accordingly the transport-geographical relation of settlements and its power can be determined by indices characterizing railway and road transport. Every case was examined by us (between 2 settlements), where there is a railway or bus connection between them.

Applied indices:

k_1 = quality index of roads

$$k_1 = \sum_{i=1}^{n} c_j u_i \quad j = 1, 2, 3$$

u_i = number of roads leading into the given settlement

c_j = quality multiplier, with the meaning first class road $c_3 = 3$
second class road $c_2 = 2$
other roads $c_1 = 1$

k_2 = number of bus lines

k_3 = running-time of buses
(in case of quick or slow lines an average value was taken into account)

k_4 = distance of settlements
(distance according to the time-table of buses)

k_5 = quality index of railway roads

$$k_5 = \sum_{i=1}^{n} c_j u_i \quad j = 1, 2, 3$$

u_i = railway line number of the settlement

c_j = quality multiplier, with the meaning
lines with electric fast train $c_3 = 3$
other lines $c_2 = 2$
lines with narrow gauge $c_1 = 1$
(Where fast, and other trains can be found as well, the more favourable line was taken into account.)

k_6 = number of railway lines

k_7 = the running time of trains between settlements.

The transport-geographical fundamental (potential) and the actual transport-geographical position of the settlements can be measured with the help of these data. The usage of index k_4 was considered to be necessary by us, because indirectly it implies the potential possibilities (passenger transport and transport of goods) of road transport. The complicated system of transport relations made it necessary to make somehow groups from the data of bus transport, even at the data-collecting period.

Three groups were formed by us:

1. Bus lines between county seats and other settlements.
2. Bus lines between transport centres and settlements. The transport centres were outlined at datacollecting; at the same time it means, that the number of actual centres is less.
3. Other relations.
   Bus lines between two or more settlements being in connection with neither of the centres.

The centres and the lines belonging to points 1. and 2. are marked on a map by us. *(Fig. 1)*

Similar grouping was not necessary to be done at railway transport, because railway lines have a determined direction and its network is more infrequent. The relations are marked in *Fig. 2.* So, all relations between settlements were examined by us, altogether 5400 cases. As a result, transport centres have become definitely outlined. *(Fig. 1)*

Our further aim was to determine the intensity of traffic attraction, from which actual traffic relations and attraction areas derive.

The power of transport relations derive from the summation of seven factors. Furthermore, it was necessary for us to examine the correlation of these factors.

The summation of the seven factors can be realized only in a modified way because of the difference of measurements and their different transport-geographical interpretations. (E.g. dealing with distance and time data it is more favourable to work with smaller quantities.) A system of categories was brought about by us aimed to solve the interpretational and measurement problems as well. *(Table 1.)* The connection between the factors of transport was determined with the help of factor-analysis. Our matrix of data consists of 7 columns and 5480 rows. It contains 38.360 pieces of information.

As a result 3 factors were got, being able to explain the scattering square of variables in 71.35%. *(Table 2.)*

Factor stresses contain the relation between original variables and the factors. The first factor, the so called "factor of railway transport", is in close connection with these variables. The indices of road quality and the number of buslines belong to the second factor, the factor of bus-transport. The third factor, the so called factor of "attainability" shows a strong correlation to time and distance values. The *eigenvalues* of the factors being equal with the second power of their own vector coordinates reflect, that in what % the single factors explain the scattering square of all variables. *(Table 3.)*

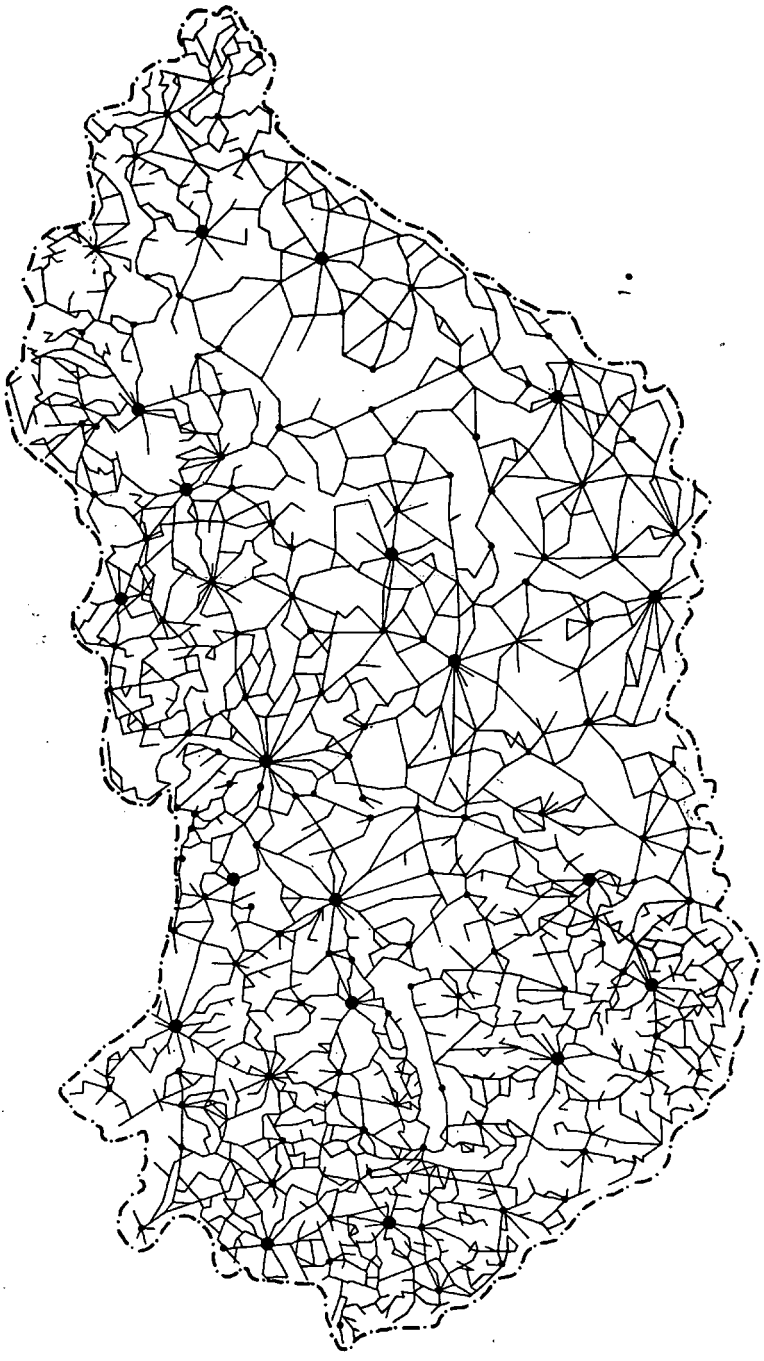

Fig. 1. Bus network of Hungary
1 = transport centres

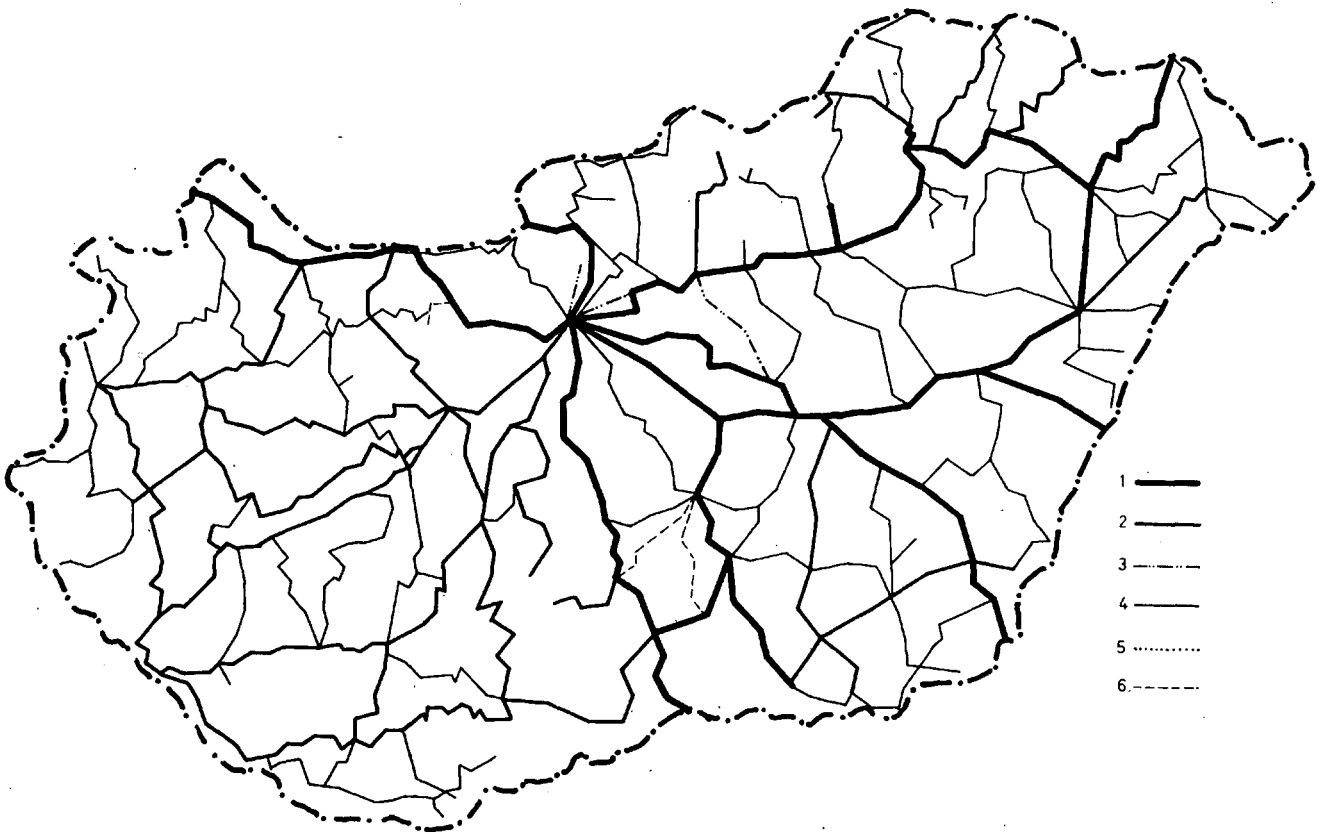

Fig. 2. Railway map of Hungary
1 = electrified railways, fast train 2 = fast train 3 = electrified other railways 4 = other railways
5 = railway Győr—Sopron—Ebenfurth 6 = lines with narrow gauge

It was taken into account at their summation, that on one hand what variables are contained by the factors and on the other hand the owu values of the factors were used by us as stress values.

So, the power of attraction can be given as follows:

Table 1

Category-values of Applied Indices

Category-values	Index of road quality	Number of buslines	Running time of buses (min)	Distance between settlements (km)	Index of railway quality	Number of railway lines	Railway running time (min)
1	1	1— 3	90≦	45<	1	8≧	90≦
2	2	4— 6	80—89	41—45	2	9—10	80—89
3	3	7— 9	70—79	36—40	3	11—12	70—79
4	4	10—12	60—69	31—35	4	13—14	60—69
5	5	13—15	50—59	26—30	5	15—16	50—59
6	6	16—18	40—49	21—25	6	17—18	40—49
7	7	19—21	30—39	16—20	7	19—20	30—39
8	8	22—24	20—29	11—15	8	21—22	20—29
9	9	25—27	10—19	6—10	9	23—24	10—19
10	10≦	28≦	1— 9	1— 5	10≦	25≦	1— 9

Table 2

Factor-stress matrix

	Variables	Factors	
	1	2	3
1	—0.03378	*0.76097*	0.43716
2	—0.03849	*0.81552*	—0.33865
3	0.04539	—0.04606	*0.59561*
4	—0.32329	0.05045	*0.74241*
5	*0.92775*	—0.00553	—0.10261
6	*0.88982*	0.05858	—0.12862
7	*0.84896*	—0.14418	—0.00002

Table 3

Eigenvalues of Factors

	eigenvalues	% values	cummulative %
1.	2.633	37.61	37.61
2.	1.255	17.93	55.54
3.	1.107	15.81	71.35

$$E = 2.633(k_5+k_6+k_7)+1.255(k_1+k_2)+1.107(k_3+k_4)$$

This way every transport relation got an attraction value, with the help of which the actual transport centres and borders of attraction can be given.

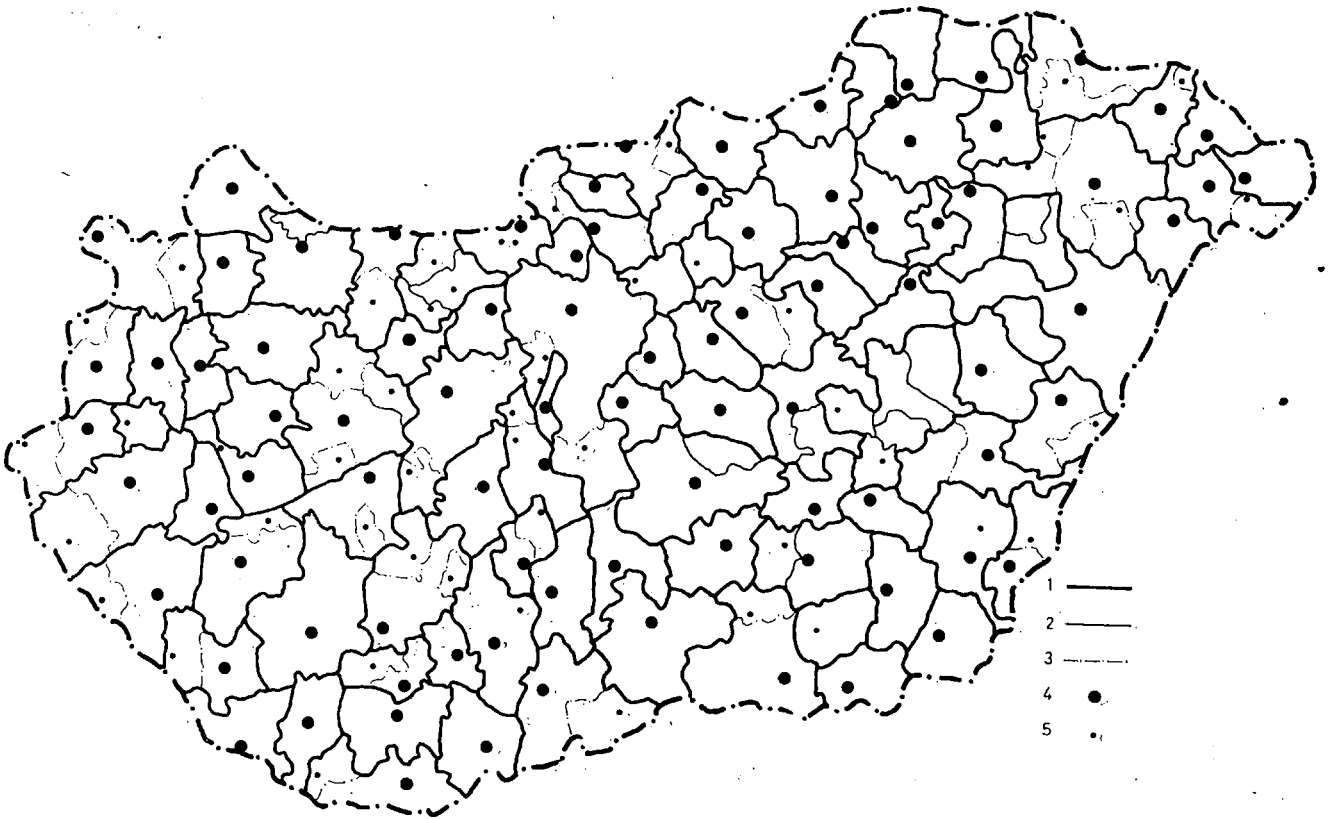

Fig. 3. Attraction areas
1=border of an attraction area 2=transport environs of a town, and the town itself 3=secondary attraction area 4=attraction centre 5=secondary attraction centre

Valuation of calculation

The following conclusions can be drawn from the results of our transport attraction centre and attraction area examinations:

1) There were some centres in our investigations that did not play the role of independent attraction centres (further on they were not mentioned as attraction centres), because they were situated in close neighbourhood of more important centres with more important attraction. E. g. Solt, Kisterenye, Pétervására, Pécsvárad, Jánosháza, Bátaszék. *(Fig. 3)* Minor settlements were also disregarded, the attraction area of which consisted only of one or two settlements. E. g. Őriszentpéter, Mágocs, Simontornya *(Fig. 3)*
2) In addition to attraction centres, secondary attraction centres were distinguished as well, having practically independent small size attraction areas. Peripherically situated minor centres are strung and connected to the larger centres by them. One part of their attraction area belongs to the attraction district of the larger centre as well, and even their size does not approve their being considered to be independent centres. So, their functioning as transport centres has a secondary role. E.g. Bácsalmás, Csenger, Sásd, Csurgó, Letenye *(Fig. 3)*
3) The centres having the disposal of more or less circumscribed and wide attraction area were considered as attraction centres. They are playing an important role in social, economical, political and cultural life as well. Mostly they are towns, district or county seats. The areas can be well circumscribed according to the intensity of attraction.
   Actually, every settlement in Hungary indirectly or generally directly is included in one or another attraction area having been outlined by us. *(Fig 3.)*
4) The towns, relating one or two neighbouring settlements to themselves much rather can be considered to be transport environs.
   The large, situated on the Great Plain close to each other towns are included in this group (Karcag, Kisújszállás, Csongrád), and those, that can be found in the shadow of a strong attraction centre, e.g. Hajdúböszörmény, Hajdúszoboszló, Békés, Nagykőrös, Hódmezővásárhely *(Fig. 3)*
   In addition to this we have Great Plain towns not having the disposal of an attraction centre. (Hajdúnánás, Túrkeve, Mezőtúr *Fig. 3.*)
5) We found some so called "multi-centred attraction areas" during our investigations. It means, that the same settlement of the given area is strongly attracted by more than one centre; and the relation between the centres themselves is very intensive as well. Such towns are Esztergom and Dorog.

Hierarchical system of transport

Furthermore we are looking for an answer whether there is a "hierarchal system" existing in the system of transport relations. Our investigations threw light on the outstanding role of county centres, they surpass other attraction centres on one hand in their size, on the other hand in their intensity of attraction. So, the system of their relations is ramifying into different directions, and their attraction area includes the attraction area of other centres as well (with less intensity, but covers them with a network). In addition to this our results have proved that county centres have a close connection with other centres around them, while other centres have a considerable

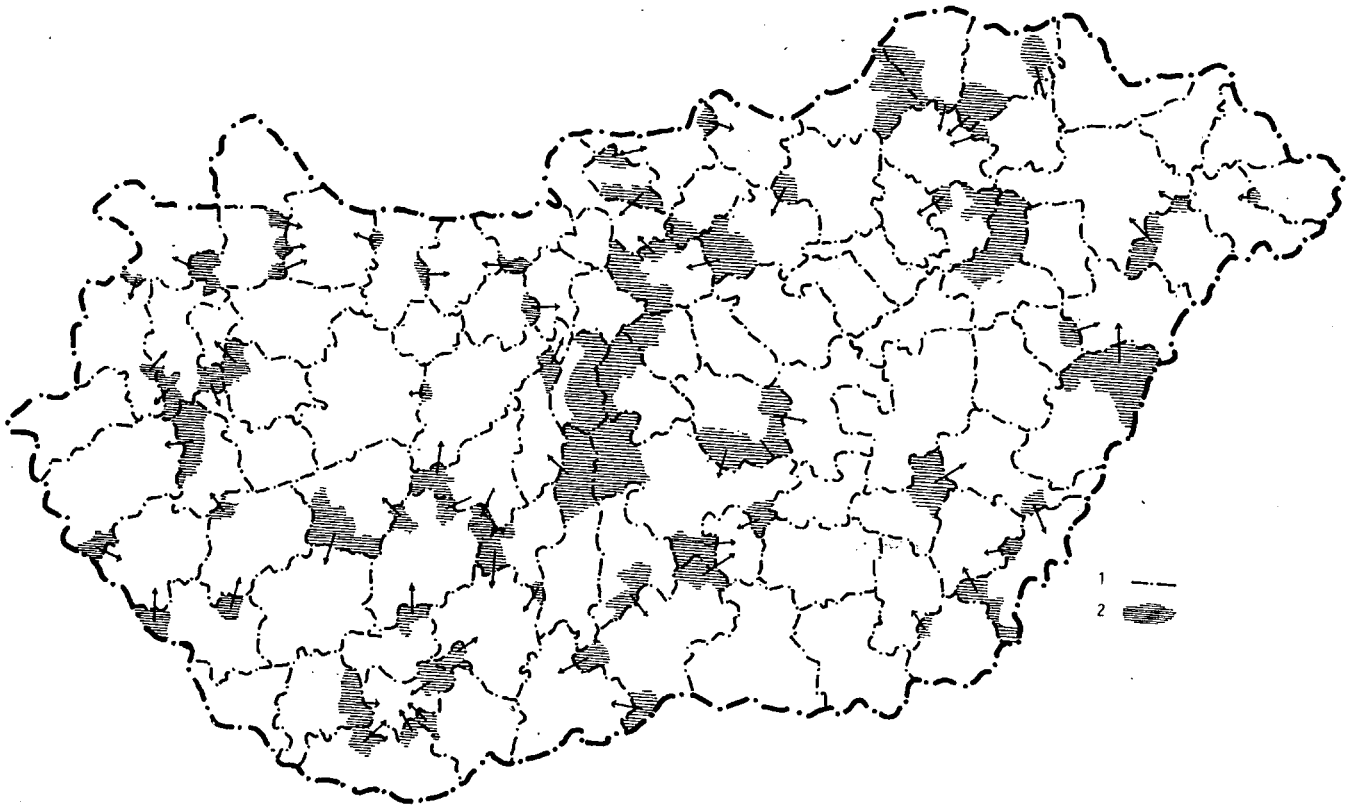

Fig. 4. Attraction centre and district border relations
1 = district border 2 = territory, belonging to the attraction area, lying outside the district border.

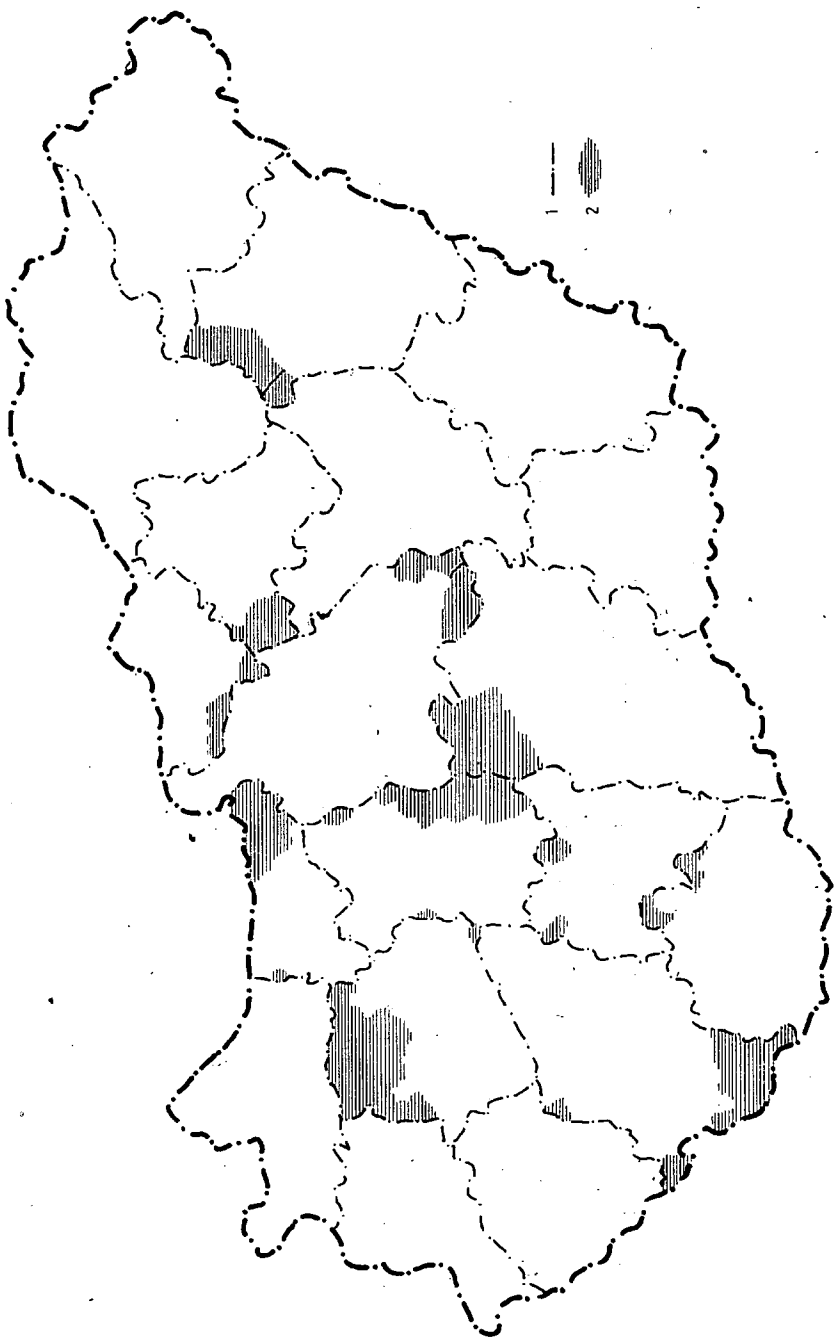

Fig. 5. Transport attraction areas and county border relations.
1 = county border 2 = 1 erritory, belonging to the attraction area lying outside the county bprden.

attraction only on a directly neighbouring centre or centres. All these characteristics are disposed by each county centre, with the help of their transport attraction they unithe other centres and their attraction areas into a larger territorial unit. (The transport orientation of the centres and their areas were also taken into account at forming these larger territorial units.) This system of relations makes up a "hierarchical system" in transport reflecting a similarity to that of the administrative system, originating in organization of transport processes on a county level. It is worth comparing the two systems, and this comparison serves as a contribution to the research work, having been done in the field of spatial structure of administration. Transport attraction centres are mostly district and county seats or centres of town environs. Our dinamically developing socialist towns, although having a district-like attraction area are excluded, e.g. Leninváros, Kazincbarcika. *(Fig. 4)* On the other hand we have district centres (e.g. Tamási); these can be considered only to be secondary transport centres, because the major part of their district, and its centre itself is strongly connected to other centres. (In our example e.g. to Dombóvár.)

On district level the differences between the administrative border and the border of attraction areas *(Fig. 4)* can be explained as follows:

— the district is situated in the neighbourhood of a county seat, so the attractive influence of the bigger centre plays more important role, e.g. Debrecen, Szolnok, Miskolc, Pécs, Kaposvár etc. *(Fig 4)*

— territorial differences, born as a result of the peripherical situation of the district centre, e.g. Kalocsa, Komló, Siófok etc.

On a higher level in the transport hierarchical system *(Fig. 5)* the differences are less important. Transport attraction centres and county seats correspond to each other, difference can be seen only concerning their borders. This difference proves to be the most important in the case of Budapest, our most significant transport centre.

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