THE MODEL OF THE ECONOMIC
DEVELOPMENT OF HUNGARY AND ITS COUNTIES

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Our age concentrates on socio-economic investigations, the laws dominating the ever broadening field of economic life, and its aim is to reveal the relations of cause and effect. The realization required the invention of new methods that needed an immense quantity of data which could mostly be applied with the help of computers. Many of the previously unsolved questions in different fields of economic sciences and so in economic geography could be answered with the use of freshly worked out models.

The purpose of this study is to present a type of system-centered economic geographical scheme that represents the level of economic development of an area as a system and its subdivisions in a ten year period. Within this the method demonstrate sthe diversity of the factors determining the stage of industrial development in relation of the system and its subdivisions. The method also intends to reveal the double movement of the industrial development of the subdivisions (their own individual and within the system).

Furthermore I also aimed to express the movement of the system in space and time with one single datum.

The General Description of the Elaborated Model

The study implies a so called system-centered model.

The system itself is the economy of Hungary, the economy of the counties can be interpreted as its subdivisions, and its constituents are all those settlements in Hungary that posess any kind of industry. Let us assume that our model is economically closed, that is perfectly isolated from its surroundings. Though the model is based on the data of a ten year period, on settlement level I was not able to collect the data required (for those being incomplete). In this respect the model only presents the connection of the system and its subdivisions and the state of their development.

The most important aim of the model is to try and reflect with one single datum the development of industry in the course of ten years both in time and space. Besides this, it also wishes to reveal the particular double movement of the subdivisions which originates partly in their individual development (if considered respectively as an independent whole) and partly in their progress within the system. The peculiarity of the settlement level research could have been the demonstration of the treble movement of the elements (development within the system, the subdivision and individual progress).

The elaboration of the model can be devided into the following sections:
1. The preparation of the selection
2. Selection
3. Reduction
    a) preparation of data
    b) weighting
    c) actual reduction
4. Determination of development-level

Preparation of the Selection

The preparation of the selection involves the selection of the factors that influence or determin the industrial production of the period under research. Selection also implies the economic-geographical analysis of the area under research.

Selection

Selection is done by means of correlation for multiple variables in a way that from the factors given in the course of the preparation of the selection correlation separates the indeces that exert the strongest influence on the change of industrial production. These are the so calles ß-indeces (5).

Reduction

a) *Preparation of Data*
Since indeces appear in different units of measurement they are not reducible. *I* solved this problem by dividing each index by the national average (both in case of the system and the subdivision). When analysing the individual development (that gives the individual movement) the divisor was the county average. The numbers without their unit of measurement obtained this way are already reducible. Its formula is:

$$a_{ij} = \frac{b_{ij}}{b_j} \qquad \begin{matrix} i = 1, \ldots, 10 \\ j = 1, \ldots, 5 \end{matrix}$$

where: b_{ij} = index obtained by selection
b_j = the national or county average of indeces
(Note: the value of j index may vary in the function of the values of β).
b) *Weighting*
Weights are determined by the percent values obtained by correlation. From among the independent variables given by the selection I chose the one having the least percent value and made its weight equipollent with 1 unit. The other variables were determined according to the ratio of their percent value, consequently each of them became more than one.
Denote: c_i = the percent values of the independent variables where $i = 1, \ldots, 5$
s_i = the weight values of independent variables where $i = 1, \ldots, 5$
Assuming that c_1 has the smallest value then
$s_1 = 1$
Furthermore

$$s_j = \frac{s_1 \cdot c_j}{c_1} \text{where } j = 2, \ldots, 5$$

Since $s_1 = 1$, this way

$$s_j = \frac{c_j}{c_1} \text{where } j = 2, ..., 5$$

c. *Actual Reduction*
Having completed the preparation of data and weighting, reduction comes from the following equation:

$$d_j = \sum_{j=1}^{10} a_{ji} \cdot s_i \text{ where } i = 1, ..., 5$$

Determining the Development Level

Many scientists have already attempted to establish a certain hierarchy of the economy or industrial development of countries or different regions of one single country. The main trend of research: is to express with one single datum the development level of the area under research. Before actually doing so, it is very important for us to clarify whether the industry of the different areas investigated in this study is commensurable with one another or not. The answer is: yes; i.e. there is an unambiguos qualitative difference in the industrial development level of a country and its individual areas. The starting point is the state of industrial development of the country where the individual regions posess either a lower or a higher level of industrial development. Consequently it can be considered as a pair of scales, of which one symbolizes the more the other the less developed regions, and the balance is kept by the state of development of the country.

The fact that qualitatively deviating objects can be compared quantitatively (3) is proved. Accordingly comparison is possible in our case too.

Converting the values achieved by reduction into a time line and plotting them on a graph we chose the function that approaches it the most appropriately.

After this the *steepness* of the function shows the level that marks the industrial development of the ten year period.

Adopting the Method on the Country and the Counties

The Preparation of the Selection
The collection of data was based on the information of statistical annuals and private research. In the course of the investigations I did not have the possibility of applying the so called secondary indeces (e.g. urban background, rate of population, migration etc.) that indirectly affect the development of industry moreover their effect in some cases can even be decisive.

Regarding the possibilities I assembled the sequence of the ten year data of eleven indeces which are the following:
1 = per capita production-value
2 = number of the employed
3 = per capita electric power
4 = per capita machinery-capacity
5 = per capita value of fixed assets

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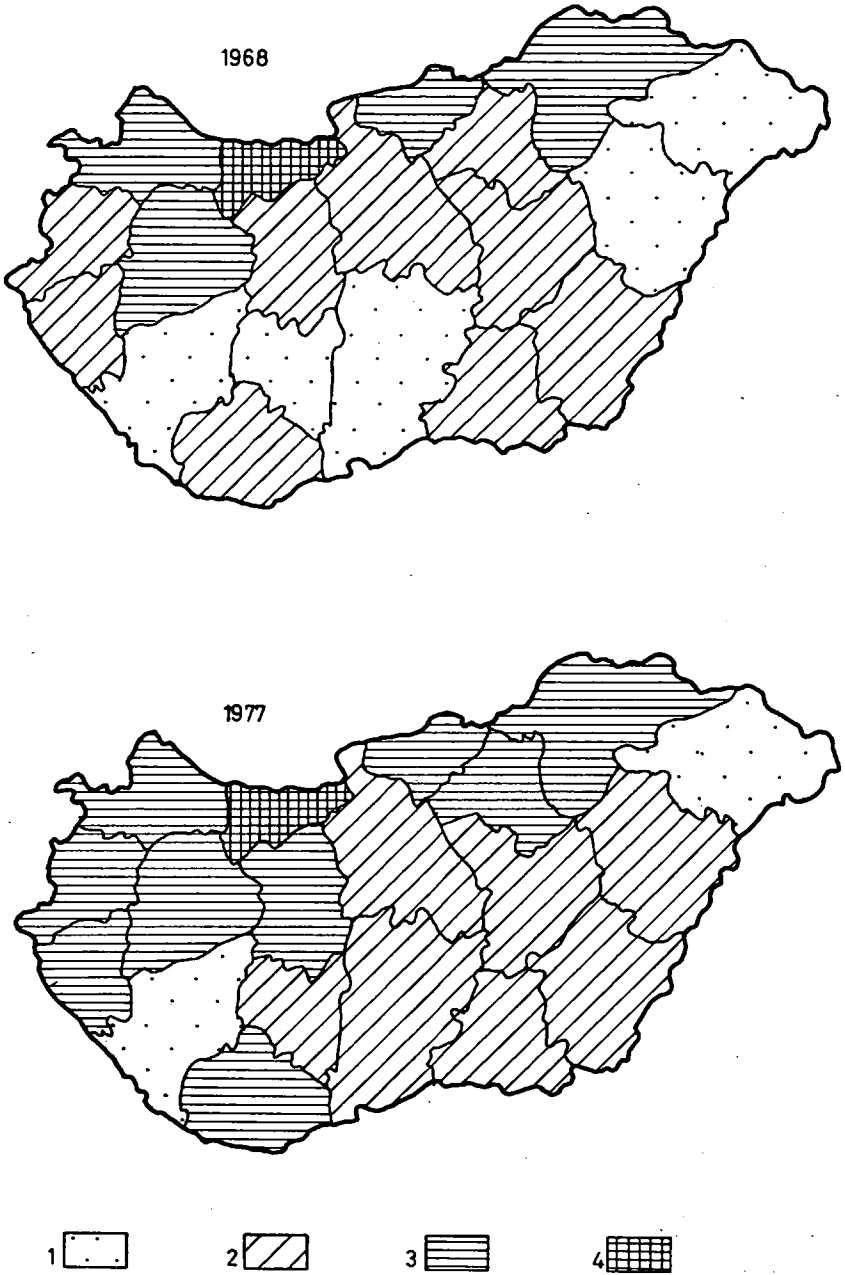
1968

1977

Fig. 1. The number of the workers employed in industry per ten thousand inhabitants
1: 500—1000, 2: 1000—1500, 3: 1500—2000, 4: 2000<

6 = wage of workers
7 = per capita number of workplaces equipped with machines
8 = rate of technicians
9 = number of employed per industrial unit
10 = per capita number of working hours
11 = per capita investment

The Hungarian Plain is an area of agricultural character, with a limited supply of minerals. However its new potential, the recently discovered oil and gas became an important factor in locating industry, only a distinct percentage of it is used up in the county since the interests of the national economy demand the processing of oil and gas in a different region. Accordingly the industry-locating factor of the utmost importance on the Hungarian Plain was the ample resource of labour force. The change-rate of the employed (fig. 1) in the counties of the Great Plain by far extended that of the national average. Similar conclusion can be drawn from the data of table 1. The rate of growth of the employed varies between 0.7—1.3% (with the exception of Pest and Csongrád counties) which in national standards is very remarkable.

Table 1.

The Typical Indeces of the Socialist Industry (%)

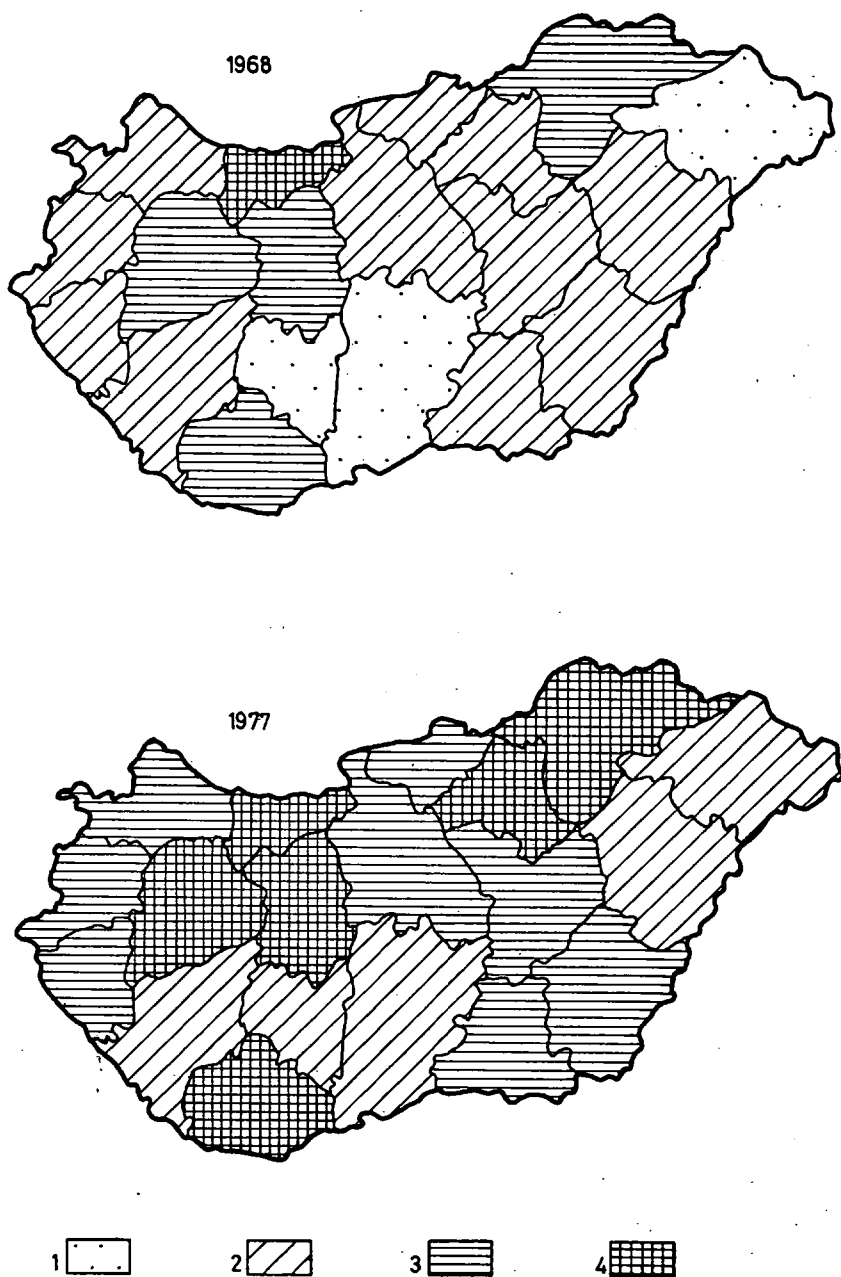| Counties	Employed		Number of the workplaces equipped with machines		Consumed electric power		Other motive power		Value of fixed assets	
	1968	1977	1968	1977	1968	1977	1968	1977	1968	1977
TRANSDANUBIA										
Baranya	3,7	4,0	3,1	3,8	3,9	4,1	6,1	6,1	5,0	4,4
Fejér	3,5	3,9	3,6	4,0	6,2	7,2	7,8	8,0	6,1	5,8
Győr-Sopron	4,6	4,6	4,8	4,3	3,3	3,8	3,0	2,9	3,9	4,6
Komárom	4,2	4,2	3,1	3,2	11,2	8,3	10,0	7,1	6,8	5,5
Somogy	1,8	2,0	1,9	2,2	0,7	0,8	0,9	0,9	2,2	1,4
Tolna	1,5	2,0	1,6	2,2	0,5	0,6	0,6	0,7	0,7	1,1
Vas	2,2	2,6	2,4	2,5	1,0	1,2	1,0	1,1	1,5	1,7
Veszprém	4,0	4,3	3,4	3,8	14,8	14,6	6,5	8,4	5,7	6,8
Zala	1,7	2,6	2,3	2,6	1,0	1,0	2,2	1,8	2,2	2,2
HUNGARIAN PLAIN										
Bács-Kiskun	3,3	4,0	3,6	4,9	1,0	1,3	1,3	1,6	1,8	2,1
Békés	2,7	3,4	3,1	3,8	1,2	1,7	1,4	2,1	2,2	2,4
Csongrád	3,9	3,9	4,3	4,8	1,2	2,7	2,2	2,6	2,5	3,9
Hajdú-Bihar	2,8	3,6	2,6	3,6	1,3	1,8	1,4	2,3	2,2	2,7
Pest	5,7	5,9	6,0	6,5	4,6	5,4	4,8	6,2	6,1	8,1
Szabolcs-Szatmár	1,8	3,1	2,0	3,8	0,5	1,3	0,8	1,4	1,5	2,1
Szolnok	2,8	3,7	2,5	4,0	1,6	1,9	2,6	2,7	2,5	2,6
NORTHERN HUNGARY										
Borsod-Abaúj-Zemplén	8,0	8,8	8,2	6,1	18,3	20,6	19,0	18,5	12,5	12,7
Heves	2,6	3,2	2,9	3,2	2,4	3,0	3,5	5,5	3,2	4,6
Nógrád	2,2	2,4	1,8	2,3	2,9	2,4	1,6	1,8	1,8	1,7
BUDAPEST	37,0	27,8	36,8	28,2	21,8	16,2	23,3	18,3	29,6	23,6
Alltogether	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0

Fig. 2. The rate of the per capita value of fixed assets (1000 Ft per person)
1: 10>, 2: 10—30, 3: 30—50, 4: 50<

Table 2.

The Indeces of Correlation (%)

Counties (Subdivisions)	Employed	Wage	Number of the employed per industrial unit	Rate of working hour	Qualification	Electric power	Other motive power	Rate of workplaces equipped with machines	Value of fixed assets	Investment	Index of Activity	Technical Index
Baranya	0,65	15,47	8,40	3,91	6,15	8,88	23,90	22,61	6,50	3,52	28,44	71,56
Fejér	12,51	50,89	2,96	3,47	8,56	0,02	2,38	1,45	14,56	3,20	69,83	30,17
Győr-Sopron	1,05	10,52	5,14	6,51	2,76	27,08	5,26	0,62	37,63	3,43	23,22	76,78
Komárom	5,15	13,62	1,92	5,32	2,68	12,49	1,56	12,44	37,68	7,14	26,01	73,99
Somogy	9,59	24,95	12,04	1,09	8,44	20,24	5,00	1,87	10,94	5,84	47,67	52,33
Tolna	0,18	39,59	3,75	0,38	1,12	7,99	6,95	5,96	31,55	2,53	43,90	56,10
Vas	9,01	13,92	12,44	4,21	3,11	15,93	0,28	6,27	33,83	1,00	39,58	60,42
Veszprém	5,17	0,54	10,98	1,44	3,50	23,43	29,56	3,62	16,69	5,11	18,04	81,96
Zala	15,45	14,35	47,12	0,27	7,14	2,85	6,40	0,50	4,05	1,87	77,19	22,81
Bács-Kiskun	7,85	4,71	8,75	1,53	3,24	30,80	5,26	4,15	19,24	14,47	22,84	77,16
Békés	0,80	32,95	13,05	3,47	7,46	1,35	4,56	1,74	29,36	5,26	50,27	49,73
Csongrád	8,01	9,59	6,86	9,99	2,16	18,02	2,74	11,92	14,13	16,58	34,45	65,55
Hajdú-Bihar	17,80	5,03	21,63	5,14	0,96	6,79	18,47	8,66	8,29	7,26	49,57	50,43
Pest	4,42	22,65	3,96	2,29	1,28	26,71	4,70	0,26	30,15	3,58	33,32	66,68
Szabolcs-Szatmár	23,40	32,12	28,30	1,71	3,27	6,14	0,58	1,66¹	0,40	2,42	85,53	14,47
Szolnok	18,63	32,13	16,10	1,17	7,77	5,37	8,71	5,40	0,86	3,86	68,03	31,97
Borsod-Abaúj-Zemplén	2,30	13,99	31,74	2,37	2,10	10,96	5,56	0,96	27,31	2,71	50,40	49,60
Heves	10,37	41,10	15,04	0,64	1,31	1,22	6,00	7,00	12,04	5,28	67,15	32,85
Nógrád	1,19	32,13	4,49	1,36	4,65	4,38	1,03	4,29	44,40	2,08	39,17	60,83
Country (System)	3,22	17,32	10,15	0,70	6,02	7,93	13,48	2,14	31,32	7,72	31,39	68,61

The *Index of Activity* is obtained by the reduction of 1, 2, 3, 4.
The *Technical index* is achieved by reducing 5, 6, 7, 8, 9, 10.

In case of the Transdanubian counties (except for Zala county) the change rate of the number of the employed (table 1.) was considerably low (0—0.5%) during the period of investigation. The rate of the employed altered significantly in numerous counties (Vas, Zala, Fejér and Baranya counties).

Outstanding modification appears in the counties of the Great Plain concerning the number of working places equipped with machines. This rate of growth was the most vigorous in Bács-Kiskun, Szabolcs-Szatmár and Szolnok counties.

As a result of the industrial development in the past ten years, from the point of view of fixed assets, Transdanubian counties (with the exception of Veszprém county) seem to suffer from regression whereas positive trend manifests itself in the counties of the Great Plain. This relationship is experienced considering the data of electric and other motive power as well. At the same time the per capita value of fixed assets grew (fig. 2) in Northern Hungary, Transdanubia (except for Tolna and Somogy counties) and in the Southern region of the Great Plain.

Consequently the development of the industry was more dynamic in the counties of the Great Plain throughout the period of investigation.

Selection

Our aim furthermore is to select from among the natural indeces introduced in the previous chapter those ones that determine the most the fluctuation of production value in the period under research. The most effective means to this is the correlation for multiple variables; the dependent variable of which (in this case) is the index of the production value, all the other indeces are the independent variables. The result of correlation shows in percent rate of how much the independent variables influence the formation of the dependent variable. These are the so called ß-values (see table 2). Reducing the technical indeces and those of activity we gain information about the qualitative side of development too. It is proved by way of measuring that the industrial development of the system and its subdivisions in the past ten years were defined by heterogeneous factors. There are some counties where mainly technical indeces (e.g. Baranya county), in some other cases indeces of activity (Szabolcs-Szatmár county) predominate but in several counties the effect of both is visible (Vas county).

Accordingly the characteristics of the development of industrial production can becla ssified in the following way:

Categories	Indeces of Activity (%)	Technical Indeces (%)
Intensive	20>	80<
Intensive with extensive marks	20—40	60—80
Extensive-intensive	40—60	40—60
Extensive with intensive marks	60—80	20—40
Extensive	80<	20>

On the basis of the investigations the industrial development of our country during the period of research can be labelled as "intensive with extensive marks", that is, intensive development predominated accompanied by extensive features.

In the country there were only five counties (fig. 3) in which industrial development was extensive, yet the effect of intensive development begins to appear. Pure extensive industrial development in the past ten years appeared only in Szabolcs-Szatmár county. The most important industry inducing factor in the county was the free labour power.

The dominating feature in Hungary tends to be the intensive industrial development (intensive with extensive marks). This was demonstrable in eight counties though the effect of extensive marks was also traceable (fig. 3). Pure intensive development appeared only in Veszprém county. The *development level* is determined after the reduction. The best approach was provided by the linear trend. More or less development is experienced everywhere with equal intensity (see fig. 4).

In all cases the "within-system movement" of the industrially more developed counties is visibly more significant than their own individual movement (fig. 4). That is the line symbolizing the "within-system" trend is steeper and situated above the one showing the individual development.

The opposite of this is detectable in industrially less developed counties. The trend presenting their own individual development is steeper and runs above the one reflecting the within-system progress.

As a consequence of the above statements we may say that in industrially less peveloped counties individual development is more intensive whereas in the more developed counties the rate of national development is more notable.

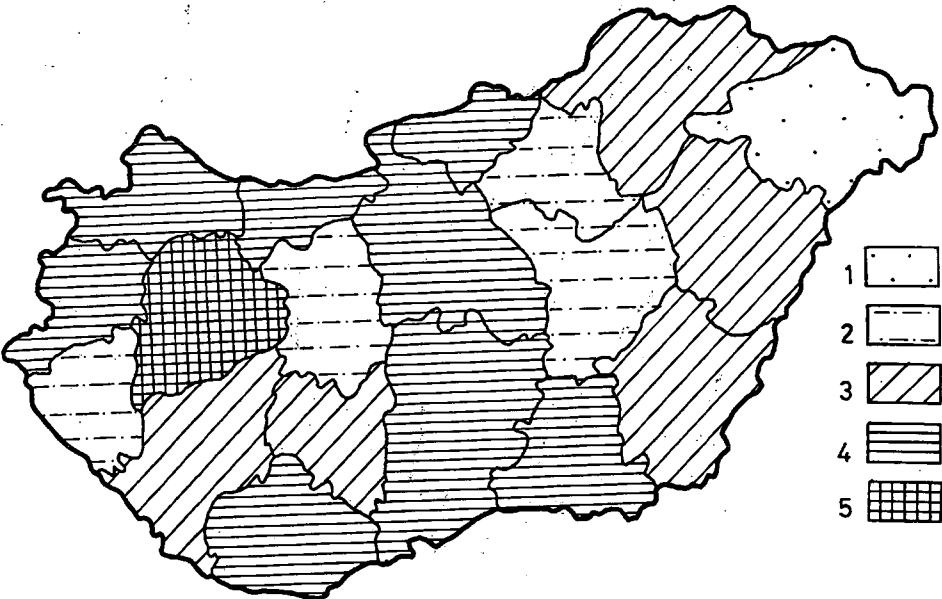The development level is the following:

Fig. 3. The character of the economic development of the subdivisions (1968—1977) 1: extensive, 2: extensive with intensive marks, 3: extensive-intensive, 4: intensive with extensive marks, 5: intensive
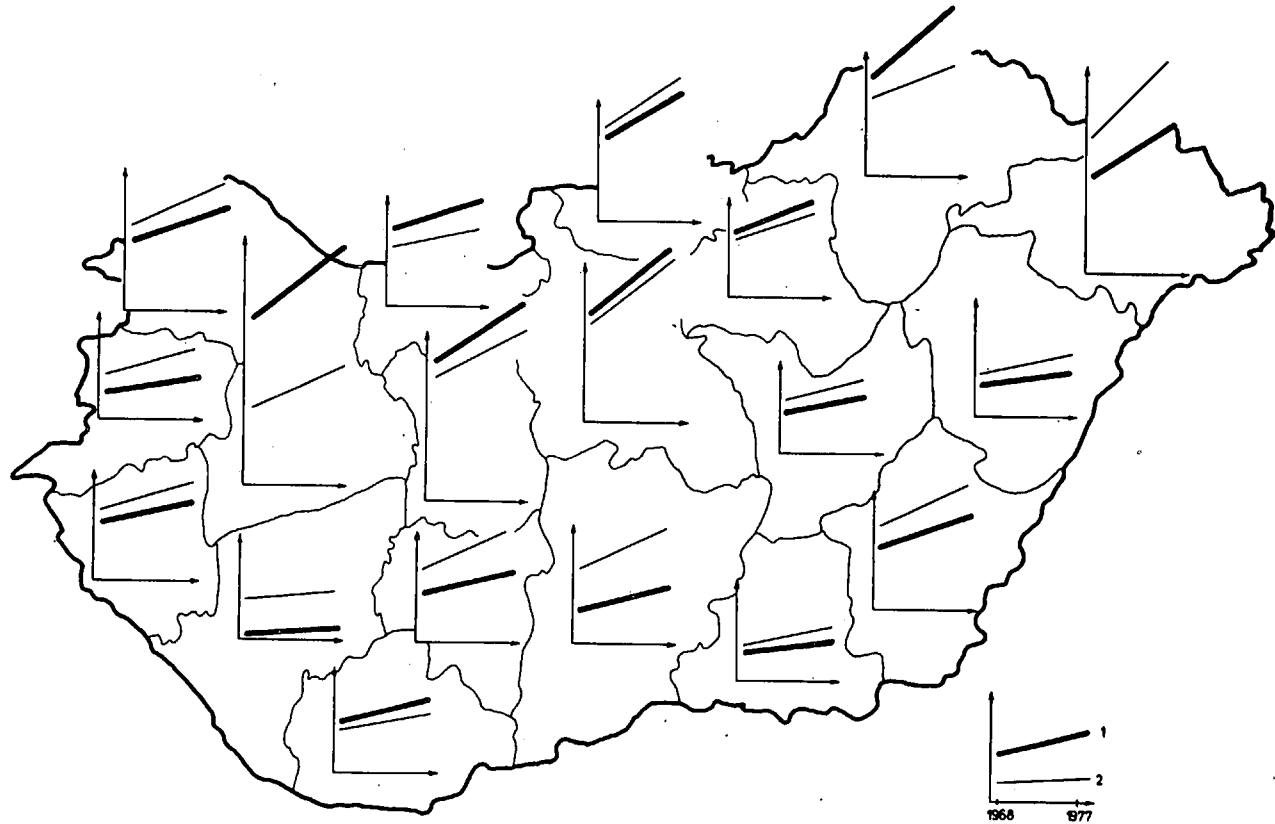
Fig. 4. The trends decisive to the state of development of the socialist industry 1: in the system of the country, 2: individual movement

Investigating the individual progress of Szabolcs-Szatmár county (relatively the most underdeveloped county, its industry follows the extensive development line) the development level is the highest; however on national level the rate of development is enough only to win the fourth place. Similar relationship is shown in case of two other industrially less developed counties (Bács-Kiskun and Tolna counties) where individual development is twice as great as the development within the system.

Industrially more developed counties (e.g. Veszprém, Pest, Fejér counties) showed a more significant within-system progress.

Comparing the character and development level of industrial development, it is obvious that within the same quality category the within-system development level of the industrially more developed counties is of a higher value than their own individual movement. In underdeveloped counties individual movement is stronger. This statement is visible and justified in all categories of industrial development.

Summary

Economic processes take place in space and time, consequently space and time are two important factors of economic activity. The model tries to systemize and give rules to the processes of industrial development taking place at the same time in different areas (country and counties).

Accepted standpoint (3) is that the diverse development level of certain regions should be considered as if they followed each other on some general, common line of development. This rule seems to be acceptable in the case of the system and the

Table 3.

The development level of the Subdivisions

Counties	Individual Movement	Counties	Within-System Movement
Szabolcs-Szatmár	1,53	Veszprém	1,48
Pest	1,28	Pest	1,36
Fejér	1,05	Fejér	1,16
Nógrád	1,00	Szabolcs-Szatmár	1,08
Győr-Sopron	0,87	B-Abaúj-Zemplén	1,01
Bács-Kiskun	0,84	Győr-Sopron	0,83
Tolna	0,83	Nógrád	0,82
Békés	0,82	Békés	0,65
Veszprém	0,77	Komárom	0,59
B-Abaúj-Zemplén	0,66	Heves	0,56
Zala	0,61	Tolna	0,54
Heves	0,50	Zala	0,50
Ország	0,48	Ország	0,48
Vas	0,46	Bács-Kiskun	0,39
Komárom	0,43	Baranya	0,35
Csongrád	0,39	Csongrád	0,33
Szolnok	0,38	Szolnok	0,32
Hajdú-Bihar	0,37	Vas	0,29
Baranya	0,29	Hajdú-Bihar	0,26
Somogy	0,20	Somogy	0,16

subdivisions as well. It is also supported by the values obtained as the result of correlation, that reveal the qualitative side of development.

The following qualitative categories (in the development sequence) present themselves in the process of the industrial development of the system (fig. 3): Intensive (1 subdivision); Intensive with extensive marks (8 subdivisions); Extensive-intensive (5 subdivisions); Extensive (1 subdivision). The system itself can be placed in the category of "Intensive with extensive marks".

Results showed that if we investigate subdivisions as involved in the system, or consider them as independent individuals (table 3.), their development level is different. In the subdivisions of lower development level individual development is stronger than the movement within the system. In case of more developed subdivisions the within system development is of a higher value than the individual. This statement can be proved to those subdivisions as well that belong to the same quality category of development.

By consequence during the investigated period of time Hungary's industrial development was intensive underlined by extensive marks. Similar development was provable in eight counties. Extensive development was typical of five counties- still its effect could as well be felt in some other areas.

It is widely known that intensive period denotes the rapid transformation of the technical level and sectoral structure of production, and means a change in the product pattern. These features, rather complicated to measure, could not be investigated by the model. Industrial development of a higher level is accompanied by the fast improvement of professional accomplishment and skill. In this respect there is a certain backwardness in Hungarian industrial life (table 2.).

Economic characteristics derived from the results of the model refer to the period of investigation, since the change of any of the indeces in the future modifies the final outcome. At the same time we can deduce the future state of industrial development of the system and its subdivisions on the basis of the above ascertainments. In the future more and more counties will enter the intensive period of development, and extensive effects will gradually decrease inthe industry of less developed ones.

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