A TÁRSADALMI ÉS GAZDASÁGI STRUKTÚRÁK REGINÁLIS JELLEMZŐI A NYUGAT DUNÁNTÚLON

REGIONAL CHARACTERISTICS OF SOCIAL AND ECONOMIC STRUCTURES IN WESTERN TRANSDANUBIA

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A régiók közötti fejletttségbeli különbségek a társadalmi, politikai és gazdasági rendszerváltás óta tovább nőttek Magyarországon. A regionális különbségek kutatása ezért egyre nagyobb fontosságra tesz szert napjainkban. A regionális kutatások többsége az elmaratottság okainak meghatározását, és ezek hatásainak mérséklését tűzte ki céljául. A jelen cikkben bemutatott vizsgálatok célja egy olyan mutatószám kidolgozása volt, amely az egyes települések fejlettségi szintjének mérésére objektív, könnyen számszerűsíthető és értelmezhető eszközt nyújt. A jelen cikk öt részből épül fel. Az első részben a kutatások célkitűzéseit ismertetem. A második rész az alkalmazott adatbázist és módszertant mutatja be, és ennek alkalmazására utal a Nyugat-Dunántúli Tervezési és Statisztikai régióban. Ebben a szakaszban bemutatom a kutatás eredményeképpen kidolgozott Komplex Fejlettségi Mutató (KFM, angol megnevezéssel CDI) meghatározását és jelentőségét. A harmadik rész a kutatások fő eredményeit ismerteti. Levonható az a fő következtetés, hogy a régión belül is jelentős fejlettségbeli különbségek léteznek az egyes települések között. A KFM kiszámításához az egyes települések gazdasági és infrastrukturális fejlettségét leíró 18 változót használtam. Ezután faktoranalízis segítségével a 18 változót 7 olyan tényezőre sikerült redukálni, melyek döntő szerepet játszanak a fejlettség alakulásában. A redukált tényezők segítségével klaszteranalízissel csoportosítottam a településeket. Az összetett számítások eredményeképpen az a fő megállapítás tehető, hogy a mezőgazdasági jellegű régiók alulfejlettek, a mezőgazdaságból élő népesség magas aránya azokra a településekre jellemző, amelyek gazdasági és infrastrukturális jellemzőiket tekintve fejletleneknek tekinthetők. Az ilyen településekre jellemző a lakosság alacsony száma (többnyire 1000 főnél kevesebb), az országos átlagnál alacsonyabb népsűrűség, a kedvezőtlen kormegoszlás és a mezőgazdasági kibocsátás átlag alatti szintje.

ABSTRACT

The differences in the economic and social development levels of regions have become markedly visible since the change of the political and economic system in Hungary, and the research of regional differences has become increasingly important.The research presented in the paper was aimed at creating an indicator to measure the development level of settlements, which is objective, easily quantifiable and meaningful for each town or village. The researched area was the Western Transdanubian region, and the main tool of analysis was the Complex Development Indicator (CDI). CDI was computed using 18 variables related to the economic and infrastructural development status of the villages in question. The settlements of the region were classified into relatively homogeneous groups based on CDI results, then the main factors leading to underdevelopment were identified.

KEYWORDS: region, development, indicator, factor analysis, cluster analysis

DETAILED ABSTRACT

The differences between the regions regarding their development levels have become markedly visible since the change of the political and economic system in Hungary, and the research of regional differences has become increasingly important. The majority of regional studies has focused on identifying the reasons of the underdeveloped conditions, and on finding methods to diminish their harmful effects.The analysis presented in the paper was aimed at establishing an indicator for measuring the development level of settlements, which facilitates the calculation of an objective, easily quantifiable and meaningful development figure for each town or village. The paper comprises five parts. The first part describes the objectives of the research. The second part describes the database used and the methodology applied, and give a brief overview of the Western Transdanubian region, as it is defined according to the Hungarian planning and statistical survey system. This chapter also introduces the main tool of analysis, the Complex Development Indicator (CDI), and explains its significance. The third part describes the main research findings The main conclusion may be drawn, that the settlements in the region differ widely regarding their development levels. CDI was computed using 18 variables related to the economic and infrastructural development status of the villages in question. Then factor analysis was applied to decrease the number of relevant influencing attrubutes, and then, relying on these selected characteristics the settlements of the region were classified into groups identified by cluster analysis.The main result of these complex calculations based on several influencing attributes was that the agricultural regions (that is, the areas, where the proportion of the population earning their living from agriculture is high) are all underdeveloped regions, and the high percentage of the population living from agriculture is a typical feature of the villages which are underdeveloped considering their economic performance and infrastructural facilities. The number of inhabitants in these villages is low (usually less than 1000), the population density is lower than the average figure for the country, while the age structure of the population is also unfavourable, and agricultural output is below average.

KEYWORDS: region, development, indicator, factor analysis, cluster analysis

INTRODUCTION

Since the transition of the economic and political system in the early nineties substantial economic and social changes have taken place in Hungary. The already marked differences within the country have increased. The regions certainly differ regarding their social, economic and cultural development levels, as their ecological, economic and social potentials are different, too. The division between developed and less developed regions is a general feature of the society [4,5].

The uneven development of regions does not cause problems as long as it remains within certain limits, but care must be taken when these limits are crossed, because irreversible and socially harmful processes may be the result. Experiences show a strong tendency for young and qualified labour to migrate from underdeveloped regions to the more developed areas of the country, and this leaves behind a deformed economic, social, age and qualification structure [6].

The research of regional differences is not a new area in science, nor in practice. The emergence of the regional approach in Hungary is marked by the high number of publications and studies as well as government decisions and regulations issued recently [8]. The "cornerstone" was the codification of the Act No. XXI. on regional development and country planning in 1996, which established the foundations of regional planning in Hungary.

The research on the differences between regions deserves special attention now because the progress in the accession negotiations between the EU and Hungary may provide significant amounts of financial support for regional development from the EU budget. The accession negotiations between Hungary and the EU started on 31 March 1998. During these negotiations the partners specified the amount of financial support that may be available for Hungary from 2000 [1, 11].

Uneven development exists not only between regions, but it is also present within the regions themselves. Considering this fact the present study is focused on the following objectives:

1. Using the Western Transdanubian region (consisting of counties Győr-Moson-Sopron, Vas and Zala) as an example to study and analyse the differences within the region, regarding economic, social and infrastructural development and the main characteristics of agriculture.
2. To find a suitable method and a suitable indicator to express the decisive attributes determining the economic development of the settlements.
3. To identify the settlement level (county, sub-region, or village level) where the developmental differences emerge most markedly.
4. To identify the most significant factors responsible for development.
5. To use the above significant characteristics to create homogeneous settlement groups and to identify their common features and their geographical locations.
6. To analyse the relationship between the development levels of villages and their agricultural activities.

MATERIAL AND METHODS

The database used for the research

Altogether 21 economic and infrastructural indicators were used to carry out the analysis of the development of the settlements. To describe the agricultural activities in the villages the data were taken from the General Agricultural Survey completed in 2000 (the data used were: the number of live animals, the total capacity of tractors, the number of people earning their living from agriculture and the total value of agricultural production). In order to maintain a wide scope for the research all the settlements (altogether 648) of the Western Trandanubian region were taken into account in the study. A more detailed description of the area and the methodology is presented in [9].

The following databases were used:

1. Published statistical booklets and brochures about the region, such as yearbooks, pocketbooks, periodical publications of the Central Statistical Office of Hungary.
2. Homepages on the Internet containing county data about production, processing and services,

to facilitate the general analysis of the region. This database was used to analyse the changes in GDP, the share of various economic activities in the GDP, and the comparison of the above characteristics between the counties of the region.

3. The T-STAR database containing data for 31 December 1999 about all the 648 settlements of the Western Transdanubian Planning and Statistical Region. Altogether 21 indicators were used for the settlement analysis, describing the demographic characteristics, infrastructural development, schooling and qualifications and economic development of the settlements.
4. The sub-regional and settlement (town or village) data from the General Agricultural Survey for 2000 (closing date: 31 March 2000) were used to describe the differences between the sub-regions regarding agricultural structures, farm sizes and production intensity.

The Applied Statistical Methodology

The novelty of the present research is the definition and application of an indicator which expresses the economic, social and infrastructural development of the settlements. Similar methodological approaches have been used in earlier research (see e.g. [7]), here the general methodology was applied to settlement level, and the number of variables used for the calculations was also extended. This indicator is called *Complex Development Indicator (CDI)*.

A multivariate method, factor analysis was used to decrease the number of explanatory variables (originally 18 of them), in order to identify the main attributes responsible for the level of development of the settlements [7, 10]. Then the selected characteristics were used to group the settlements of the regions. The grouping was carried out by cluster analysis, using various numbers of groups. The objective was to describe the main developmental features of the settlements, identify similar settlements and their geographical locations, and to typify the possible directions for progress for the settlements belonging to the same group. Finally connections were looked for between the economic and infrastructural development levels and the agricultural activities in the settlements.

In order to determine the level of development for each settlement 18 variables were used, while the variables measured on various scales had to be transformed to be of comparable range. The scaling transformation was the following:

$DI(X,i) = (X_i - X_{min})/ (X_{max} - X_{min})$, where

$DI(X,i)$ = the partial development indicator describing the development level of settlement *i,*

X_{min} = the minimum value for the chosen variable X, for all the settlements

X_{max} = the maximum value for the chosen variable X, for all the settlements

X_i = the value of the variable for the actual settlement

Using the above method all the variables were transformed to the same scale, thus their values became comparable to each other. The $DI(X,i)$ indicators were computed for each settlement and each variable, and then their simple arithmetic average gave the *Complex Development Indicator (CDI)* for the 648 settlements in the Western Transdanubian region.

The application of this methodology has not been widely applied to assess the development of settlements, and though it has been used for similar purposes, the set of variables used (18) is much wider in the present study than in earlier studies.

The large number of settlements in the region showed a high level of heterogenity considering their development levels. As the analysis was carried out using many variables the question naturally arose, what attributes are mainly responsible for these differences. In order to answer the question a multivariate mathematical statistical method was applied, which groups the large number of variables into fewer latent variables, so called factors. This method is *factor analysis*. In the present study this method was used to select the relevant attributes from the many variables analysed.

After selecting the relevant variables *cluster analysis* was used to group the settlements into homogeneous groups. The purpose of cluster analysis is to group the observed objects by observed variables. The grouping of the objects is based on their locations in the "n"-dimensional space. The observed variables are the coordinate directions and the observed values for the respective variables are the coordinates of the

objects. The objects (in the present case the 648 settlements of the Western Transdanubian region) are the points in the n-dimensional space, and their positions are measured by the distances between them [7,10].

The method is aimed at grouping the objects according to their similarities and common features. Thus the groups are created according to the distances of the points in the n-dimensional space, that is, always the nearest points are attached to the same group.

The development level of the settlements

The main conclusion of the analysis done by the Complex Development Indicator is that the settlements of the region widely differ considering their development levels. This means that the regional approach is largely superficial. Homogeneously developed areas are not possible to identify neither in regional, nor countly level nor even sub-regional level, and this leads us to the conclusion that the exact measurement of development is only possible on the level of settlements (NUTS level V, [2,3]) (see Table 1).

RESULTS

Table 1.: The proportion (%) of settlements belonging to the most developed and least developed settlement deciles, by county, December 1999

Counties:	Győr-Moson-Sopron	Vas	Zala	Total
No. of settlements in the most developed decile	28	31	41	100
No. of settlements in the least developed decile	14	31	55	100

Source: author's own calculations

The above statement is supported by the analysis of the deciles of the less developed and the most developed settlements, because both deciles contain settlements from nearly all the sub-regions in the area under analysis.

Further analysis (factor analysis) has led to the reduction of the original variables to 7 explanatory characeristics, which were capable of explaining almost 65 % of the total variance. These main variables were found to be the following:

1. The permanent population
2. The proportion of elderly inhabitants
3. The number of enterprises
4. The length of the sewerage pipelines
5. The proportion of unemployed people, being jobless for more than 180 days
6. The number of cooperatives
7. The number of flats built

The main characteristic concepts generally used for defining the rural settlements nearly completely coincide with the results of the present research based on factor analysis [2, 3]. The common features are the following:

1. Typical settlement structure of many tiny villages in the area
2. Low level of infrastructural facilities
3. Unfavourable age structure (high proportion of elderly people, migration of young population)
4. High unemployment rate

Then the above reduced variables were used to group the settlements in the region. The grouping was carried out by cluster analysis. The analysis was done in several versions. The first version used 21 clusters, which is the same as the number of the sub-regions in the region. In this clustering the number of the elements in the clusters varied widely (between 1 and 151), and several (5) clusters included only one settlement.

In the second version the number of clusters was defined so as to ensure that no cluster contains only one settlement. A further requirement was to omit the settlements having more than 10 thousand inhabitants, that is, the analysis was focused on the

true rural settlements. (This meant the omission of altogether 13 towns, which were all sub-regional centres). Naturally, with the reduced number of settlements the relevant attributes had to be selected anew, again by factor analysis. The number of relevant factors was found to be 7 again, and the relevant variables turned out to be the same as in the first case. A further clustering was carried out with 5 clusters, which made it easier to identify the typical features for the clusters.

The results of the analysis with 5 clusters showed that the number of the inhabitants in the settlements belonging to the same group is approximately the same, and the average of the development indicator is typical for the groups, showing higher values for the clusters containing settlements with larger populations (see Table 2).

Table 2.: The distribution of the settlements of the region in the 5 clusters, December, 31, 1999

Cluster	Number of settlements	Proportion of settlements (%)
1	34	5,4
2	163	25,7
3	3	0,5
4	6	0,9
5	429	67,5
Total:	635	100,0

Source: Author's own calculations

The analysis also showed that while the developmental differences throughout Hungary are more marked in the East to West direction [2, 3], the same differences are notable in the Western Transdanubian region from South to North.

The most underdeveloped settlements are typically concentrated in the areas where the tiny villages are the general settlement type (this is county Zala in the region), but another important feature is the limited accessibility of the settlements, because these villages lie out of the way of the main traffic lines. A further distinguishing feature is the long distance of these settlements from the county and the sub-regional centres.

Taking the settlements with Complex Development Indicator values belonging to the lowest third of the indicator range, and comparing them to the settlements classified to be underdeveloped according to the present system of categorisation the following conclusion can be drawn: the majority (90 %) of settlements belonging to both groups in the region has population less than 1000, and higher proportion of the elderly (older than 60) people.

These problems aggravate the troubles of the small villages already suffering from many maladies. The financial support offered for regional development purposes cannot be accessed without a certain proportion of own resources (which is at least 20 % of the total amount required), and another requirement is the presence of local initiatives (in accordance with the principle of subsidiarity), which is also a serious barrier for a tiny village with aged population.

The importance, resources, production structure and level of agriculture

A typical feature of the Western Transdanubian region is the fact, that about half of the population has some connections to agriculture (as farmers, family members or employees). Thus whenever the economic status of the region is analysed agriculture has to be taken into consideration.

The economic policy of the country, which favours private property, the codification of the Act on Recompensation and the Act on the Transformation of Cooperatives resulted in the fragmentation of the former agricultural cooperatives and the number of farmers considerably increased. The natural resources of the region are generally unfavourable for agriculture, with the only exception of the high

quality lands of Kisalföld in the north. Agriculture has a small, and decreasing share in the production of GDP, while the shares of industrial production and especially the services sector keep increasing.

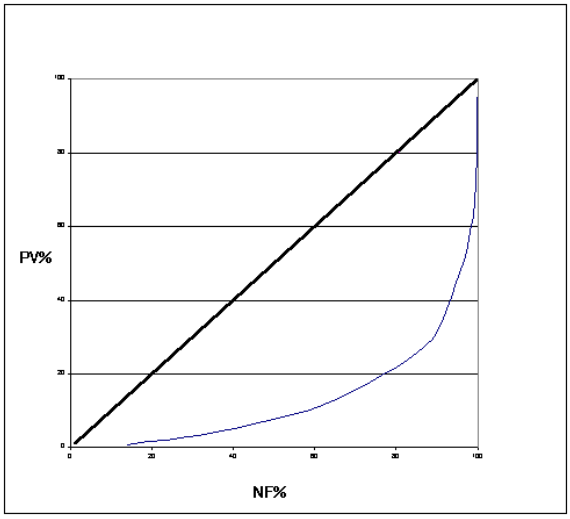
The research proved that the high proportion of population earning their living in agriculture is a typical feature of the small villages (having less than 500 permanent inhabitants).

The proportion of agricultural investment (similarly to its share in the GDP) is low in comparison to all the investments in the region, although there are differences among the counties in this respect.

The analysis of the average land size of one private farm showed that the national tendency towards fragmentation, which has been obvious in the country since 1990, is also present in the region, however, by 2000 the concentration of lands has also become explicit both for private farms and farming companies. (Figure 1, Lorenz-curve.)

Animal husbandry showed tendencies similar to the national average, considering the change of the animal stock. The decrease in the number of cattle started in the 1980s, and the number of pigs also underwent a serious decrease in the 1990s in Hungary, though the latter tendency has slowed down recently. Within the Western Transdanubian region cattle and pigs are concentrated mainly in county Győr-Moson-Sopron, half of the total stock of the region are kept here.

Figure 1: The number of private farms and the concentration of production values in the region, March 2000



PV% - the cumulative frequency of the production values by production value categories; NF% - the cumulative frequency of the number of farms by production value categories

The connections between the development level and agricultural activities of the settlements

The assessment of various indicators showed that there is a moderately strong, negative correlation between the complex development indicator,(which describes the economic and infrastructural development,) and the proportion of agricultural population of the settlements.

The proportion of agricultural population was found to be higher in the villages of small population and low population density.

As the higher share of agriculture in the economic activities also means the higher proportion of agricultural population, and because these features go together with lower development levels, it may be stated, that the areas with low population densities are socially and economically less developed that those with higher population densities.

Considering the connection between the production value per one farm and the proportion of agricultural population the research showed the growth of production value corresponds to the decreasing proportion of agricultural population (moderate, negative correlation, r = -0.42, P = 0.01).

The productivity and quality of agricultural production is greatly influenced by the availability of production tools. In this respect the research focused mainly on the supply of power machines, namely tractor capacity, per one arable land unit.

The availability of tractor capacities was also grouped by capacity categories. Altogether 6 categories were defined based on the averages of the settlements. The distribution of capacities was naturally related to the average arable field sizes. The strongest correlation in this respect was found in the categories of above average capacities (41- 60 KW and 61-100 KW). This is not surprising, and this was not the real purpose of the analyis, but the main aim was to find connections between the typical tractor capacities and the economic development levels of the settlements.

For this purpose the capacity data were aggregated for the settlements, and both the capacities and the complex development indicators were grouped into two categories (those below and those above average). The results showed that the two characteristics (tractor capacity and economic-infrastructural development level) are not independent of each other, the higher the level of economic and infrastructural development the higher the machinery capacity used in agricultural production.

The importance of agriculture in the settlement was indicated by two ratios, namely the ratio of agricultural population per arable land unit, and the ratio of cattle units (animal equivalent) per arable land unit. These, as indicators of the level of agricultural production, can be transformed to a comparable scale, and a single indicator can be defined in the same way as it was done in the case of the Complex Development Indicator. This indicator measures the agricultural characteristics of the settlements in a scale ranging from 0 to 1. The analysis was then continued by comparing the complex development indicator and the above agricultural resource availability indicator, creating a cross-combination table and computing the correlation coefficient.

The results of the analysis showed that the low level of economic and infrastructural development corresponds to the more definite agricultural characteristics of the settlements.

The analysis of the connections between agricultural output and economic development was limited to sub-regional level, because production value data were only available on this level. So the existing complex development indicators for the settlements were aggregated to create the relevant sub-regional indicators. Correlation analysis was then carried out, and the results showed that sub-regions with higher values of agricultural output show higher levels of economic development. While the coefficient is small (0.314), the positive relationship is significant (P = 0.01).

DISCUSSION

The application of the method for settlements to measure the level of economic and infrastructural development, and the enlargement of the used system of variables are novel aspects of the present research, which is fully justified by the results. The results of the analysis showed clearly that the use of the regional approach (NUTS levels II - IV) is superficial, the correct description of developmental differences requires the use of the settlement level. In spite of the typical East-to-West polarisation of Hungary the Western Transdanubian region may be better characterised by a South-to-North polarisation considering the differences in the economic development. The agricultural sector may be characterised by the fragmented land sizes, wide differentiation, and emerging tendencies to strong concentration of land property and production value. The research analysed the connections between economic and infrastructural development and the agricultural characteristics of the settlements, and showed that: economically underdeveloped settlements are concentrated in the areas where the tiny villages are the typical settlement type, unfavourable age structure is persistent, the proportion of agricultural population is higher than average, population density is low, unemployment is high, and the value of agricultural output is low.

The research findings may prove useful for the policy decision makers and the administrative bodies of the settlements. In order to make sensible decisions regarding regional development the precise knowledge of the situation is absolutely necessary for them. The annual computation of the CDI might be used as an objective measurement of the development level of settlements. The analyses may be extended using further variables, or the indicator may be computed attaching weights to the variables. This, however, requires further research.

The integrated approach to the identification of the connection between the economic and infrastructural development and the resource availability for agriculture in the settlements can be used as a starting point for the better understanding of the problems of rural and regional development, for the clearer identification of the influencing characteristics, and can be used as an objective reference point in assessing proposals for financial support.

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