SUMMARY OF PhD THESIS

UNIVERSITY OF KAPOSVÁR

FACULTY OF ECONOMICS

MANAGEMENT AND ORGANIZATIONAL SCIENCES

DOCTORAL SCHOOL

Department of Accounting and Statistics

Leader of Doctoral School:

DR GYULA VARGA

Doctor of Hungarian Science Acedemy

Leader of project:

DR CSABA SARUDI

CSc in economic sciences

Associate Leader of project:

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Headmaster, Central Statistical Office, Pécs

METHODS FOR MEASURING THE REGIONAL COMPETITIVENESS IN HUNGARY

Written by:

KATALIN BARNA

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1. BACKGROUNDS AND OBJECTIVES OF THE SURVEY

European Union measures competitiveness of regions on the basis of gross domestic product (GDP) per capita which means goods and services produced in a year by one inhabitant of a given spatial unit. However, GDP is based on real, objective data, so it is purely driven by economics, therefore it hardly can integrate other factors just as the ones being important in determining the life standards of the inhabitants in that region. **Regional competitiveness is a more complex phrase than the sole economic competitiveness of the regions. A competitive region means social and economic welfare but also assumes vivid business activity, good public security, high life quality. Shortly, it means a place to live.**

As to our knowledge no model was introduced that can take both objective and subjective factors into consideration in being able to describe the changes in a complex way. Of course it is not the model maker to blame, but the question itself points out the basic problem that makes elaboration of a complex model or index rather difficult.

Basic aim is to determine, analyze the main factors – GDP per capita and inhabitants' evaluation – influencing the regional competitiveness and integrate these factors into one single model through applying mathematic-statistical methods.

In the scope of the obtained results it can be concluded that it is possible to set up a model of regional competitiveness where competitiveness is represented by one single index and that index is suitable for evaluating the regional competitiveness of Hungarian regions. Further aim is to elaborate a defined set if indices that is appropriate for other spatial levels. As an output of the designed model a rank list of Hungarian regions can be produced.

The aims of the dissertation the following:

1. Determining and analyzing the most excessive influencing factors of regional competitiveness based on mathematical - statistical methods and elaborating a complex regional competitiveness model.
2. Basic requirement of a widely applicable model is the integration of the opinions of the inhabitants. Further aim is to elaborate a set of indices that – apart from economic attributes – takes subjective (social) factors into consideration and can be used on other spatial levels for measuring competitiveness. A rank list of competitiveness can be formed for regions, counties micro regions and settlements.
3. Based on the regional competitiveness index it is possible to group the regions in being able to make suggestions for different region types when their development strategies are in concern.

In order to achieve the previously set goals the adequate answers have to be found for the following questions:

- What database can be used to determine the major influencing factors of regional competitiveness?
- What kind of variables should be involved into the competitiveness model and what criteria could filter the wide set of variables?
- How to solve the dimensional incompatibility of the involved variables? What are the factors of determining the relevant weights of distinct variables?
- How to measure and parameterize the opinion of inhabitants?
- Can the model be dynamized and if yes through which methods?
- What kind of criteria can be used to classify the regions?

2. MATERIALS AND METHODS

Research project was based on primary and secondary databases. When designing secondary database it was sharply taken into consideration that beneficiary micro-regions are determined by the Parliament (within the frames of regional development policies). **The beneficiary micro regions are listed in the Nr. 24/2004 Parliament Decision. Enlisting was based on economic, infrastructural, social and employment parameters.**

Numerical analysis was based on the T-STAR database kindly provided by Central Statistical Office (Pécs Regional Directorate, Kaposvár Bureau.) Data cover the period of 1997-2003 because actual survey began in 2004. However, when analyzing the variables included into the model the later changes of them are mentioned. Database contains the actual values of the variables for every settlements of the country. **Therefore the model involves settlement-level data in order to deliver more descriptive and detailed picture about the status and position of the regions.** Settlement-level surveys are not unique, the Local2 (NUTS5) level projects are common and accepted throughout the EU. Using spot level data – maintaining the original goal to modelize the competitiveness of the regions – gave the possibility of using the model on other (settlement, micro-region, county) spatial levels. Referring to the available initial database and considering the 24/2001 Decision 17 distinct parameters were chosen for the purposes of the model. T-STAR database delivers the numerical data separately per settlements so first step was converting and grouping them according to the spatial mapping. It means that the mentioned **17 variables had to be generated** from the initial dataset followed by an aggregation of them to county level.

Intensity and strength of the relationship between the chosen variables were performed by **correlation analysis**. It is also a key to determine the importance (weights) of the variables. Relationships between the chosen variables ($|r| > 0{,}7$;

$p \leq 5\%$) and the GDP per capita (thousand HUF/head) values were calculated by **regression analysis**.

Usefulness of the model assumes that the opinion of the affected **inhabitants have to be taken into consideration.** To achieve this goal elaboration of a primary database was needed. This database made it possible to set up a bisegmental pattern where the **objective (upon statistical data) line is accompanied by a subjective one (based on the individual judgments of the factors).** A questionnaire was designed that contains the variables from both the T-STAR database and the 24/2001 Decision. Task of the involved panel was to built a **rank list of the variables according to their own judgment**. Data recording happened on national level, as much as 1051 questionnaires were filled during personal interviews. In order to determine the importance of the variables the survey was designed to be representative on spatial pattern. It means that the questionnaires were distributed proportionally – upon the 2003 population data of CSO – among regions then counties. Settlements were chosen by random picking. Evaluation of the questionnaires was performed on the basis of the rank positions through a **scoring method** elaborated.

The involved variables could be compared only after the scales of them were unified, so first the initial incompatibility problems had to be solved. For this purpose the scale-harmonizing transformation was used.

During calculating national average of the picked variables weighted **arithmetic average** was used with a weight based on the population size. Spatial **compare quotients** were applied to compare similar data of the regions, while distribution quotients to analyze the structure of the chosen variables. **Dynamic quotients** were applied to describe the timely change of the variables. In measuring the uneven spatial pattern of GDP per capita distribution the **Hoover index** (Robin Hood index) seemed to be suitable since it is applied widely and commonly for describing inequalities. It clears up that what percent of a feature or social-economic value have to be reallocated between the

examined spatial units to achieve even distribution of them.

After evaluating the questionnaires the next problem was if the population can be grouped upon homogenous opinion on regional competitiveness. By **cluster analysis** it is possible to restructuring the objects into groups according to multiple features. For rendering objects to *k* different groups the k-means clustering was chosen

Sorting regions I used **quantiles**. Intensity and strength of the relationships between the objective, subjective, aggregated competitiveness indices and the regional and county level rank lists (based on GDP per capita values) were presented by Spearman's rank correlation coefficient as well as by Kendall's coefficient of concordance. These methods assist in comparing linked sets of ranked data.

Text processing was performed by actual versions of **MS Word,** graphs, tables, diagrams were prepared by using **MS Excel** and **SPSS 9.0.** Categorization upon aggregated competitiveness index was done by the assistance of **ESRI ARC VIEW** software kit.

3. RESULTS AND EVALUATION

3.1. Determination of the objective regional competitiveness

Beside GDP per capita values other variables – representing the position of a region in spatial competition - were involved into the survey. Variables were chosen on the basis of 24/2001 P.D. Importance of GDP – as a basic index of regional competitiveness – cannot be ignored, therefore intensity and direction of the relationship between GDP and the other 17 influencing factors were determined by multivariable correlation analysis[1]. Correlation coefficients – in absolute terms – with higher than 0.7 value and with a persistency at least 2 years were counted as representatives of tight relationship and only categories with such tight relationship were chosen among the **objectively heavy influencing factors**. It means, these factors had the closest connections to GDP. Primary factors influencing development level on the basis the intensity of correlation coefficients are as follows: operating enterprises per 1000 inhabitants, population density, drainage gap, cars per 1000 inhabitants, unemployment rate and population at the end of year. In being able to cumulate the variables of the objective segment of the model le harmonizing transformation is needed resulting in a unified platform for all the variables involved.

Resulting from the transformation the variables were turned to be aggregateable and the main influencing factors were weighted on the basis of correlation coefficients for the year 2003, so the objective regional competitiveness can be given through the following formula.

[1] Basic method for narrowing the circle of variables is factor analysis. In case of the survey it was not used because it results in hypothetic (fictive) factors and identifying or explaining such factors is ambivalent. Main influencing factors, however, were numerically taken into consideration.

$$ORC = 0{,}948 \cdot E + 0{,}893 \cdot PD + 0{,}803 \cdot DG + 0{,}780 \cdot C - 0{,}721 \cdot U + 0{,}712 \cdot P$$ [2]

Substituting the actual values of the six influencing factors in the formula competitiveness can be given in one single measure for each individual counties and through a simple average the same of a given region *(Table 1,2)*.

Table 1: Rank list of counties and Budapest on the basis of GDP and ORC index, 2003

Order	County	GDP, tsd HUF/head	Order	County	ORC
1.	Budapest	3598,82	1.	Budapest	2,143
2.	Győr-Moson-Sopron	1996,14	2.	Győr-Moson-Sopron	0,895
3.	Vas	1674,78	3.	Komárom-Esztergom	0,879
4.	Fejér	1597,53	4.	Pest	0,810
5.	Komárom-Esztergom	1570,75	5.	Zala	0,689
6.	Pest	1495,56	6.	Fejér	0,662
7.	Zala	1470,84	7.	Heves	0,635
8.	Veszprém	1346,21	8.	Vas	0,588
9.	Tolna	1329,73	9.	Veszprém	0,584
10.	Csongrád	1307,07	10.	Borsod-Abaúj-Zemplén	0,582
11.	Baranya	1261,75	11.	Jász-Nagykun-Szolnok	0,577
12.	Heves	1245,27	12.	Szabolcs-Szatmár-Bereg	0,567
13.	Hajdú-Bihar	1242,18	13.	Tolna	0,562
14.	Bács-Kiskun	1149,48	14.	Baranya	0,523
15.	Somogy	1148,45	15.	Nógrád	0,516
16.	Jász-Nagykun-Szolnok	1145,36	16.	Csongrád	0,500
17.	Borsod-Abaúj-Zemplén	1055,75	17.	Hajdú-Bihar	0,486
18.	Békés	1051,63	18.	Somogy	0,458
19.	Nógrád	923,91	19.	Bács-Kiskun	0,450
20.	Szabolcs-Szatmár-Bereg	917,73	20.	Békés	0,440

Source: own calculation based on T-STAR, 2003

Through investigation of the factors causing differences between GDP-based and ORC-based (Objective regional competitiveness index) rank lists the counties were put into one of the three development groups (poorly, moderately and highly developed ones).

[2] ORC: objective regional competitiveness, E: operating enterprises, PD: population density, DG: drainage gap, C: cars per tsd inhabitants, U: unemployment rate, P: population at the end of year

Table 2: Classification of countries and Budapest on the basis of GDP and ORC index[3]

GDP			ORC		
poorly (-1100 tsdHUF/head t)	**moderate (1100-1700 tsdHUF/head)**	**highly (1700 t sdHUF/head-)**	**poorly (0,5 alatt)**	**moderate (0,5-0,7)**	**highly (0,7 felett)**
Szabolcs-Szatmár-Bereg	Jász-Nagykun-Szolnok	Győr-Moson-Sopron	Békés	Csongrád	Pest
Nógrád	Somogy	Budapest	Bács-Kiskun	Nógrád	Komárom-Esztergom
Békés	Bács-Kiskun		Somogy	Baranya	Győr-Moson-Sopron
Borsod-Abaúj-Zemplén	Hajdú-Bihar		Hajdú-Bihar	Tolna	Budapest
	Heves			Szabolcs-Szatmár-Bereg	
	Baranya			Jász-Nagykun-Szolnok	
	Csongrád			Borsod-Abaúj-Zemplén	
	Tolna			Veszprém	
	Veszprém			Vas	
	Zala			Heves	
	Pest			Fejér	
	Komárom-Esztergom			Zala	
	Fejér				
	Vas				

Source: own calculation based on T-STAR, 2003

Parameters with higher than a weight of 0.8 had the strongest influence on directing the counties into distinct groups. **It means that if a county earns at least moderate rank for two out of the three highest weight parameters – number of enterprises, population density, public supply gap – then it will jump for sure into a higher category within the ORC-based ranking.**

In the ORC-based list Komárom-Estergom and Pest counties jumped up from moderate to highly developed group. **It was caused by the fact that they earned high ranks for two strongly weighted parameters.**

[3] The table contains the countries in order.

There are downward movements in the GDP vs. ORC-based lists. Hajdú-Bihar, Somogy and Bács-Kiskun were dropped back into the poorly developed group **because at least two of the highly weighted parameters showed the lowest values.**

Changing the ranks of the counties changes the same of the regions *(Table 3).*

Table 3: Rank list of regions on the basis of GDP and ORC index, 2003

Order	Region	GDP, tsdHUF/head	Order	Region	ORC
1.	Central Hungary	2763,081	1.	Central Hungary	1,476
2.	West Transdanubia	1755,456	2.	West Transdanubia	0,723
3.	Central Transdanubia	1506,715	3.	Central Transdanubi	0,708
4.	South Transdanubia	1240,361	4.	North Hungary	0,578
5.	South Great Plains	1170,550	5.	North Great Plains	0,544
6.	North Great Plains	1093,931	6.	South Transdanubia	0,514
7.	North Hungary	1081,490	7.	South Geat Plains	0,463

Source: own calculations based on T-STAR, 2003

Comparable to counties I put the regions into one of the three development groups (poorly, moderately and highly developed ones; *Table 4*).

Table 4: Classification of regions on the basis of GDP and ORC index [4]

GDP			ORC		
poorly (-1100 tsdHUF/head)	**moderate (1100-1700 tsdHUF/head)**	**highly (1700 tsdHUF/head -)**	**poorly (-0,5)**	**moderate (0,5-0,7)**	**highly (0,7-)**
North Hungary	South Geat Plains	West Transdanubia	South Geat Plains	South Transdanubia	Central Transdanubia
North Great Plains	South Transdanubia	Central Hungary		North Great Plains	West Transdanubia
	Central Transdanubia			North Hungary	Central Hungary

Source: own calculations based on T-STAR, 2003

[4] The table contains the region in order.

The poorly competitive regions basis of GDP (North Hungary, North Great Plains) can rank into the moderate development group in view of population density and public utilities gap which are the two most important factors of the regional competitiveness model.

Central Transdanubia is a highly competitive region basis of ORC, because the number of operating enterprises and cars it put into the moderated group, while according to the others indicators the region put it into the higly group.

The South Great Plains is a poorly competitive region because it put into the poorly group in view of the two most important factors (population density, public utilities gap).

3.1. Determination of the subjective regional competitiveness

Evaluation of collected questionnaires was performed by MS Excel where positions of all 17 variables were recorded. Subjectivity cannot be fully met this way but in order to ensure comparability answering chances had to be directed according to a directed random pattern. Final sequence of the 17 variables depended, however, only on the answering persons. In being able to identify most important variables the values of them had to be weighted. Weights were determined by a **scoring** system. Final value of a variable was modified according to its positions in the 1051 questionnaires. Hence, a variable was put at first position in an individual list received a score of 17, if second then 16 etc. Dividing total scores of a variable by the range resulted in a dimensionless number between 0 and 1. Using this latter as weight was appropriate to represent the importance of the variable. As in the case of correlation coefficients a variable with above 0.7 value was taken as **essential influencing factor of subjective competitiveness**: Operating enterprises per 1000 inhab, Flats built, Live birth per 1000 inhab, Retail units per 1000 inhab, Long term unemployment rate, Flats on water pipeline. As in the case of the objective segment the variables turned to be aggregatable following a scale harmonizing transformation. For weighting

the corrected scores were used and it resulted the below formula of **subjective regional competitiveness** (SRC).

$$SRC = 0{,}916 \cdot OE + 0{,}769 \cdot FB + 0{,}745 \cdot LB + 0{,}740 \cdot RU - 0{,}717 \cdot LU + 0{,}712 \cdot FW$$ [5]

Substituting the actual values of the six influencing factors in the formula competitiveness can be given in one single measure for each individual counties and through a simple average the same of a given region. *Tables 6* and *7* show a comparison between the two ways of measuring regional competitiveness, one list on the basis of GDP per capita and one for the objective regional competitiveness index described by the author. On the basis of the subjective regional competitiveness index – similarly to the objective one – Budapest and Győr-Moson-Sopron county are at the top (*Table 5*).

Table 5: Rank list of counties and Budapest on the basis of GDP and SRC index, 2003

Order	County	GDP, tsd HUF/head	Order	County	SRC
1.	Budapest	3598,82	1.	Budapest	1,808
2.	Győr-Moson-Sopron	1996,14	2.	Győr-Moson-Sopron	1,535
3.	Vas	1674,78	3.	Zala	1,491
4.	Fejér	1597,53	4.	Veszprém	1,482
5.	Komárom-Esztergom	1570,75	5.	Pest	1,476
6.	Pest	1495,56	6.	Komárom-Esztergom	1,444
7.	Zala	1470,84	7.	Somogy	1,422
8.	Veszprém	1346,21	8.	Vas	1,413
9.	Tolna	1329,73	9.	Baranya	1,393
10.	Csongrád	1307,07	10.	Fejér	1,374
11.	Baranya	1261,75	11.	Csongrád	1,370
12.	Heves	1245,27	12.	Tolna	1,354
13.	Hajdú-Bihar	1242,18	13.	Hajdú-Bihar	1,346
14.	Bács-Kiskun	1149,48	14.	Heves	1,319
15.	Somogy	1148,45	15.	Bács-Kiskun	1,298
16.	Jász-Nagykun-Szolnok	1145,36	16.	Szabolcs-Szatmár-Bereg	1,292
17.	Borsod-Abaúj-Zemplén	1055,75	17.	Jász-Nagykun-Szolnok	1,278
18.	Békés	1051,63	18.	Békés	1,238
19.	Nógrád	923,91	19.	Nógrád	1,155
20.	Szabolcs-Szatmár-Bereg	917,73	20.	Borsod-Abaúj-Zemplén	1,110

Source: own calculations based on T-STAR, 2003

[5] SRC: subjective regional competitiveness, OE: operating enterprises, FB: flats built, LB: live birth, RU: retail units, LU: long term unemployment, FW: flats on waterpipeline

In SRC-based (Subjective regional competitiveness index) ranking the biggest upward repositioning could be observed in case of Somogy county, while the biggest downward move in case of Fejér and Vas counties. In being able to clear the motives of the changes – as it was shown above – three groups of counties were formed on the basis of their poor, moderate and highly developed status *(Table 6).*

Table 6: Classification of counties and Budapest on the basis of GDP and SRC index [6]

GDP			SRC		
poorly (-1100 tsdHUF/head)	**moderate (1100-1700 tsdHUF/head)**	**highly (1700 tsdHUF/head -)**	**poorly (1,21 -)**	**moderate (1,21-1,51)**	**highly (1,51-)**
Szabolcs-Szatmár-Bereg	Jász-Nagykun-Szolnok	Győr-Moson-Sopron	Borsod-Abaúj-Zemplén	Békés	Győr-Moson-Sopron
Nógrád	Somogy	Budapest	Nógrád	Jász-Nagykun-Szolnok	Budapest
Békés	Bács-Kiskun			Szabolcs-Szatmár-Bereg	
Borsod-Abaúj-Zemplén	Hajdú-Bihar			Bács-Kiskun	
	Heves			Hajdú-Bihar	
	Baranya			Heves	
	Csongrád			Tolna	
	Tolna			Csongrád	
	Veszprém			Fejér	
	Zala			Baranya	
	Pest			Vas	
	Komárom-Esztergom			Somogy	
	Fejér			Komárom-Esztergom	
	Vas			Pest	
				Veszprém	
				Zala	

Source: own calculations based on T-STAR, 2003

[6] The table contains the counties in order.

As it is shown there were only upward movements. These are shown in red. Szabolcs-Szatmár-Bereg county pulled up a level into the group of the moderately competitive counties.

Changes shown in Table 6 explain the subjectivity of SRC. **Basically it is also objective since it is built upon real, measured parameters but the involvement of these parameters depended on the opinion of the inhabitants.** Cumulated reactions of the answerers formed the actual ranking.

For a deeper analysis of the changes the counties were grouped into poor, moderate and highly developed categories on the basis of 6 main influencing factors.

Analysis showed that parameters cannot be grouped into strongly and weakly influencing categories as it was done in case of ORC. It is because of the fact that apart from the 'number of enterprises' the other parameters are quite close to each other. So it means that in this case it is enough if **two parameters earn higher ranks and the county is expected to be placed into a higher category**.

Changing the ranks of the counties changes the same of the regions *(Table 7)*.

Table 7: Rank list of regions on the basis of GDP and SRC index, 2003

Order	Region	GDP, tsd HUF/head	Order	Region	SRC
1.	Central Hungary	2763,081	1.	Central Hungary	1,676
2.	West Transdanubia	1755,456	2.	West Transdanubia	1,490
3.	Central Transdanubia	1506,715	3.	Central Transdanubia	1,423
4.	South Transdanubia	1240,361	4.	South Transdanubia	1,401
5.	South Great Plains	1170,550	5.	North Great Plains	1,307
6.	North Great Plains	1093,931	6.	South Great Plains	1,303
7.	North Hungary	1081,490	7.	North Hungary	1,171

Source: own calculations based on T-STAR 2003

As a result of rank changes of counties the Northern Great Plain and Southern Great Plain regions changed positions with each other, the positions of other regions remained the same. Northern Hungary and Central Transdanubia pulled up into higher classes caused by the regional values of SRC parameters. *(Table 8).*

Table 8: Classification of regions basis of GDP and SRC[7]

GDP			SRC		
poorly (-1100 tsdHUF/head)	**moderate (1100-1700 tsdHUF/head)**	**highly (1700 tsdHUF/head -)**	**poorly (1,21 -)**	**moderate (1,21-1,51)**	**highly (1,51-)**
North Hungary	South Great Plains	West Transdanubia	North Hungary	South Great Plains	Central Hungary
North Great Plains	South Transdanubia	Central Hungary		North Great Plains	
	Central Transdanubia			South Transdanubia	
				Central Transdanubia	
				West Transdanubia	

Source: own calculations based on T-STAR 2003

3.2. Determination of the model of regional competitiveness, the Combined regional competitiveness index

Using the described two regional competitiveness indices assumes that the two segments can be aggregated (simply added together) resulting in **Combined regional competitiveness** (CRC) index which again is suitable for positioning counties and regions (*Table 9).*

[7] The table contains the regions in order.

Table 9: Rank list of counties and Budapest on the basis of GDP and CRC index, 2003

Order	County	GDP, tsd HUF/head	Order	County	ARC
1.	Budapest	3598,82	1.	Budapest	3,951
2.	Győr-Moson-Sopron	1996,14	2.	Győr-Moson-Sopron	2,430
3.	Vas	1674,78	3.	Komárom-Esztergom	2,301
4.	Fejér	1597,53	4.	Pest	2,285
5.	Komárom-Esztergom	1570,75	5.	Zala	2,178
6.	Pest	1495,56	6.	Veszprém	2,065
7.	Zala	1470,84	7.	Fejér	2,036
8.	Veszprém	1346,21	8.	Vas	2,001
9.	Tolna	1329,73	9.	Heves	1,953
10.	Csongrád	1307,07	10.	Tolna	1,916
11.	Baranya	1261,75	11.	Baranya	1,916
12.	Heves	1245,27	12.	Somogy	1,901
13.	Hajdú-Bihar	1242,18	13.	Csongrád	1,870
14.	Bács-Kiskun	1149,48	14.	Szabolcs-Szatmár-Bereg	1,862
15.	Somogy	1148,45	15.	Jász-Nagykun-Szolnok	1,855
16.	Jász-Nagykun-Szolnok	1145,36	16.	Hajdú-Bihar	1,832
17.	Borsod-Abaúj-Zemplén	1055,75	17.	Bács-Kiskun	1,748
18.	Békés	1051,63	18.	Borsod-Abaúj-Zemplén	1,692
19.	Nógrád	923,91	19.	Békés	1,677
20.	Szabolcs-Szatmár-Bereg	917,73	20.	Nógrád	1,670

Sources:own calculations based on T-STAR, 2003

Categorization upon two indices showed that moderately developed regions of the GDP-based ranking changed their positions. Downward move could be observed in case of Bács-Kiskun, Hajdú-Bihar, Jász-Nagykun-Szolnok and Csongrád counties, while Pest and Komárom-Esztergom counties jumped to higher level *(table 10)*.

Table 8: Classification of regions basis of GDP and CRC[8]

GDP			CRC		
poorly (-1100 tsdHUF/head)	**moderate (1100-1700 tsdHUF/head)**	**highly (1700 tsdHUF/head -)**	**poorly (1,9 -)**	**moderate (1,9-2,1)**	**highly (2,1-)**
Szabolcs-Szatmár-Bereg	Jász-Nagykun-Szolnok	Győr-Moson-Sopron	Nógrád	Somogy	Pest
Nógrád	Somogy	Budapest	Békés	Baranya	Komárom-Esztergom
Békés	Bács-Kiskun		Borsod-Abaúj-Zemplén	Tolna	Győr-Moson-Sopron
Borsod-Abaúj-Zemplén	Hajdú-Bihar		Bács-Kiskun	Heves	Budapest
	Heves		Hajdú-Bihar	Vas	
	Baranya		Jász-Nagykun-Szolnok	Fejér	
	Csongrád		Szabolcs-Szatmár-Bereg	Veszprém	
	Tolna		Csongrád	Zala	
	Veszprém				
	Zala				
	Pest				
	Komárom-Esztergom				
	Fejér				
	Vas				

Forrás: T-STAR, 2003. alapján saját számítás

As for CRC (Combined regional competitiveness index) a moderately developed country of the GDP-based ranking is moving upward only if it can be put to the highest groups in case of at least four distinct parameters and the number of parameters with poor rank cannot be more than two.

Taking the ARC it can be seen that Jász-Nagykun-Szolnok, Bács-Kiskun, Hajdú-Bihar and Csongrád counties belong to the poorly developed group. Motive of downward movement is that there were few (2-3) highly ranked and

[8] The table contains the regions in order.

more (4-5) poorly ranked parameters.

Changing the ranks of the counties changes the same of the regions (*Table 11*).

Table 11: Rank list of regions on the basis of GDP and CRC index, 2003

Order	Region	GDP, tsd HUF/head	Order	Region	CRC
1.	Central Hungary	2763,081	1.	Central Hungary	3,152
2.	West Transdanubia	1755,456	2.	West Transdanubia	2,213
3.	Central Transdanubia	1506,715	3.	Central Transdanubia	2,131
4.	South Transdanubia	1240,361	4.	South Transdanubia	1,915
5.	South Great Plains	1170,550	5.	North Great Plains	1,851
6.	North Great Plains	1093,931	6.	South Great Plains	1,766
7.	North Hungary	1081,490	7.	North Hungary	1,749

Sources: own calculations based on T-STAR, 2003

Two regions put into other regional competitive group *(table 12).*

Table 12: Classification of regions basis of and CRC szerint[9]

GDP			CRC		
poorly (-1100 tsdHUF/head)	**moderate (1100-1700 tsdHUF/head)**	**highly (1700 tsdHUF/head -)**	**poorly (1,9 -)**	**moderate (1,9-2,1)**	**highly (2,1-)**
North Hungary	South Great Plains	West Transdanubia	North Hungary	South Transdanubia	Central Transdanubia
North Great Plains	South Transdanubia	Central Hungary	South Great Plains		West Transdanubia
	Central Transdanubia		North Great Plains		Central Hungary

Sources: own calculations based on T-STAR, 2003

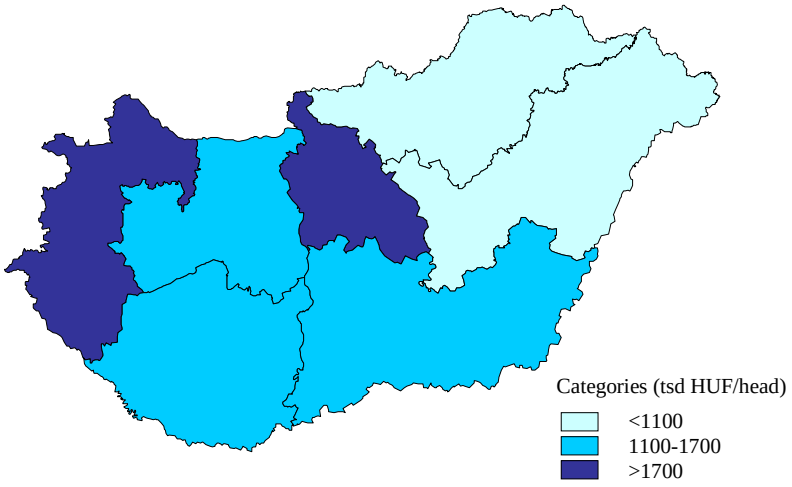
South Great Plains is a poorly competitve region basis of CRC. The reason is the region put into the highly group in view of only one factor. On the other hand, Central-Transdanubia is a highly competitive region, because three of the highly weighted parameters showed the highest values.

[9] A táblázat nagyság szerint növekvő sorrendben tartalmazza a régiókat.

3.3. Classification of regions basis of CRC

Indices having been applied to measure competitiveness of the regions (GDP, ORC, SRC, CRC) indicate that that by setting appropriate numerical borders the regions themselves could be classified or categorized. For all indices three distinct competitiveness groups were determined just as low, middle and high groups. On the basis of GDP the pattern is as follows (*Map 1*).

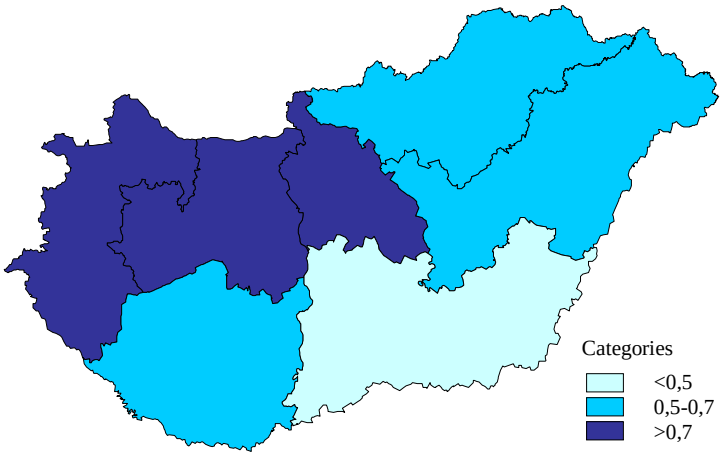
Map 1: Rank list of regions as per GDP, 2003



Source: own design

According to GDP-based categorization leading regions are Central Hungary and West Transdanubia, middle ones are Central and South Transdanubia as well as South Great Plains, while North Hungary and North Great Plains are at the tail-off. When the same is turned over to ORC-base as it is shown on *Map 2*, the difference can be clearly seen.

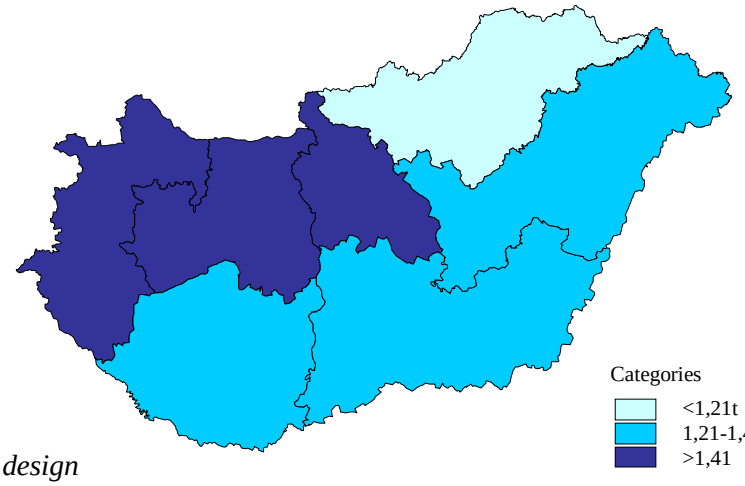
Map 2: Rank list of regions based on ORC, 2003



Source: own design

Central Transdanubian region came up to top-runners, North Hungary and North Great Plains took up to mid section, while South Great Plains dropped back to the joggers. *Map 3* shows the rank list calculated on the subjective regional competitiveness index (SRC). Compared to the ORC-based map it points out a restructuring in the Eastern part of the country, North Hungary is slipping down, while South Great Plains is steaming up to the middle and if compared to GDP-based Map 1, North Great Plains is climbing up to the mid section

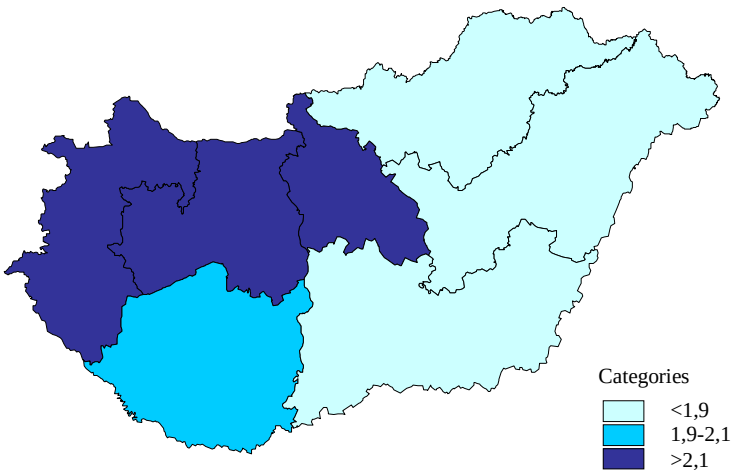
Map 3: Rank list of regions based on SRC, 2003



Source: own design

Map 4 represents the categorization based on the aggregated regional competitiveness index (ARC) and it remarkably differs from the patterns delivered by the previous (GDP, ORC. SRC) ones. In this case Central Hungary, Central and West Transdanubia are the leaders, South Transdanubia is the follower while the 3 Eastern regions are at the lower end.

Map 4: Rank list of regions based on CRC in 2003



Source: own design

On the basis of aggregated regional competitiveness index the following region classes can be determined:

Roadrunner regions ($ARC > 2{,}1$): They have the highest income potential, they run the highest number of enterprises and they suffer the least of unemployment. These regions are the places where most flats are built, live birth rate is above while mortality is below the average. Main strategic goal of these regions is to **strengthen the connections among operating enterprises** and to involve NGOs and civil institutions into the existing connection network. Central Hungary, West and Central Transdanubia belong to this group.

Opportunity seeking regions $(1{,}9 < ARC \leq 2{,}1)$ assume lower but still relatively high incomes, high number of operating enterprises and low unemployment. Rate of aged people is decreasing, mortality is getting lower. These – relatively developed – regions can be able to attract ventures and enterperises supplying and serving the existing operations of the given area. Beside the attractive capacities of large enterprises, i.e. beside existing strategies, development of small and medium sized enterprises should be more emphasized. On the basis of the reported analysis this group is represented by the South Transdanubian region.

Slowly emerging regions ($ARC \leq 1{,}9$) have the lowest income potential caused – among others – by high rate of aged people and the resulting high mortality level. Number of operating enterprises is low, number of flats built is below the average, unemployment rate is higher. Main task of such regions is to **attract enterprises** (large, medium and small), creating industrial parks with high quality logistic (and other) services. **Supporting** the existing and newly opened enterprises by advisory and training should get special attention – eventually through knowledge transfer networks. Shortly the main strategic aim is to offer specialized support for enterprises. Slowly emerging regions are North Hungary, North and South Great Plains.

4. CONCLUSIONS, PROPOLSAS

Regional competitiveness came into foreground as an effect of globalization trends of past decades. It became a key issue throughout the EU especially after the Maastricht Treaty. The idea itself is explained by different definitions but all of these definitions focus on successful strategies of the regions through which they can react in an adequate way to the challenges raised by global competition.

The European terminology explains competitiveness in a uniform way: the ability of the region to achieve and maintain relatively high income and employment levels within the frames of the global competition. regional competitiveness therefore reflects the GDP, the employment or unemployment rates as well as the „export" potential of goods and services produced in the given region.

Competitiveness of a region, however, cannot be defined in a comprehensive way, internal features of the regions can be compared. Favorable and unfavorable traits are aggregated and they form together the competition potential of the inhomogeneous region.

Therefore term of regional competitiveness has to be reviewed. The OECD definition deals only with the basic factors of successful response to conditions formed by the competition.

Analyzing the competitiveness of a region is far not equal to investigations of pure economic potential it has to deal with the 'livability' of the region, so the studies – and also the term itself – should be extrapolated to local levels as well.

No real consensus of authors can be observed when speaking about measuring the regional competitiveness since it is not obvious which factors and parameters to use in the calculus.

In the second part of the thesis a survey is shown using the data of 1997-

2003 period. Main objective and subjective factors influencing the competitiveness of the regions were defined upon the basis of tight and significant relationships between some socio-economic parameters and the GDP data. The following conclusions were made:

Main influencing factors are good supplements to GDP-based competitiveness studies. It is proved by the results of regression analysis.

Since a region is far not homogeneous it has to be take lower levels – at least county level – into consideration. Without the latter it would be difficult to make conclusion about the development or the competitiveness of the whole region. This extrapolation can even be an aid in strategic planning.

Objective, subjective and aggregated regional competitiveness indices – and of course the GDP data – are suitable not only for ranking the regions but also for clusterizing them. On the basis of the complex indices it is possible to define poorly, moderately and highly competitive regions but also counties, micro regions or even settlements as well.

Results show that rank lists of counties and regions based on GDP, objective, subjective and aggregated regional competitiveness indices can remarkably differ from each other. It indicates that analyzed spatial units (county, region) have different characteristics and these features influence their positions in the spatial competition.

Position, however is influenced also by the variables involved and by the actual values of the involved variables. Measuring regional competitiveness is still far from consensus, definite and accepted set of parameters is missing. The survey reported here tried to highlight the fact that beside the different social and economic parameters of statistical databases the local specialties must also be taken into account. It means that measuring process should be sensitive for what people think of the factors influencing the competitiveness of their own region, what parameters they think to be improved in order to raise life standards and economic growth. When speaking about the development of a

region the local level has an essential role because finding and maintaining persistent advantages can only be based on local cultural and industrial traditions.

In the thesis special attention is paid to the approach assuming that beyond incorporating social, economic and infrastructural parameters one has to keep an eye on the sense for localism, it means, that it has to be cleared how the inhabitants of a spatial unit see their own environment, which parameters they think to be important in further development of their homeland.

Development strategies of a region can be verbalized only on local level, so it assumes a kind of decentralization. Task of the regions in this process is to find those special fields of development which can lead them directly to improving their competitiveness (R&D, establishing innovation centers and other institutions, meeting the requirements for specially skilled labor through re-trainings etc.) Role of government in this aspect does not exceed the field of economy and business development through developing infrastructure and opening the ways to access central resources.

Because of the short distance of the research, analysis of time series cannot be used. **Consequently, a reiterated correlation research can results, that factors can be taken in and out the regional competitiveness model. However, a new method useable if it simple and has spectacular results. The research has not finished, that is the model after a long distance can be made better and final.**

As a summary it can be concluded that indices described in the report are suitable for measuring the competitiveness of the spatial units involved and further they can be projected to any other spatial levels (micro region and settlement levels). This transferability feature is a real advantage to conventional GDP-based measurement.

5. NEW AND PROSPECTIVE SCIENTIFIC RESULTS

Model for measuring regional competitiveness as shown in the thesis delivers the following new scientific features:

1. Measuring regional competitiveness based on a two armed model:

   a) Indices in the objective segment of the model are taken as main influencing factors: operating enterprises (pcs/tsd head), population density (head/km^2), public utilities gap (%), number of cars (pcs/tsd head), unemployment rate (%), population at the end of year (head). Addition of main influencing factors resulted in an index called objective regional competitiveness (ORC) index.

   b) Indices in the subjective segment of the model are also taken as main influencing factors: operating enterprises (pcs/tsd head), built flats (head/km^2), live birth (head/tsd head), retail units (pcs/tsd head), long term unemployment rate (%), flats on water pipe (%). Addition of main influencing factors resulted in an index called subjective regional competitiveness (SRC) index.

   c) Adding objective and subjective regional competitiveness indices formed the aggregated regional competitiveness (ARC) index.

2. The elaborated model is suitable to analyze the competitiveness of spatial units other than the regions (counties, micro-regions, settlements) due to its main feature that it is based on settlement level surveys.

3. Two and multiple variable regression analysis – based on relative errors – showed validated connections between the GDP per capita and :

a) operating enterprises;
b) population density;
c) public utilities gap;
d) number of cars;
e) unemployment rate;
f) population;
g) public utilities gap and unemployment rate;
h) operating enterprises; long term unemployment rate as well as
i) retail units, flats on water pipe and a operating enterprises.

4. On the basis of the ARC the regions were categorized and suggestions were made to increase their competitiveness:

- Roadrunning, highly competitive regions,
- Opportunity seeking, moderately competitive regions
- Slowlyemerging; poorly competitive regions.

LIST OF PUBLICATIONS RELATED TO THE PHD RESEARCH

Books

Molnár T.-**Barna K**: Területi statisztikai elemzési módszerek. Agroinform Kiadó és Nyomda Kft, Budapest 2005.

Refereed papers in foregn-language published in science journals

A. Dolgos-**K. Barna**: Several macroeconomic indexes and the economical competiteveness. *In: Acta Scientarium Socialium* XXIII. sz. (megjelenés alatt)

Cs. Sarudi-**K. Barna:** Multifunctional Agriculture and Rural Development. *In: Acta Agraria Kaposváriensis* 2005. Vol 9. No 1. p. 87-99.

K. Barna: Measuring Regional Competitiveness *In: Journal of Central European Agriculture (JCEA)* (Megjelenés alatt)

Refereed papers in Hungarian laguage published in science journals

Barna K: A regionális versenyképességet befolyásoló objektív és szubjektív tényezők. *I. Terület- és Vidékfejlesztési Konferencia – Kaposvár*. 2007. március 2-3. CD-ROM

Dolgos A-**Barna K**: A GDP és a gazdasági versenyképesség *I. Terület- és Vidékfejlesztési Konferencia – Kaposvár*. 2007. március 2-3. CD-ROM

Barna K: A regionális versenyképesség szubjektív tényezői. *In: „Agrárgazdaság, vidék, régiók multifunkcionális feladatok és lehetőségek" XLVIII. Georgikon Napok.* Keszthely, 2006. szeptember 21-22. CD-ROM

Barna K.-Dr. Molnár T.-Juhász R. T: Megújuló területpolitika: előtérben a regionális versenyképesség. *In: Területi statisztika* 8. (45.) évf. 8 (2005) 6. szám p. 542-555.

Barna K: A regionális versenyképességet befolyásoló tényezők vizsgálata a Dél-Dunántúli Régióban. *Európa-napi konferencia, Mosonmagyaróvár,* 2005. május 5-6. CD-ROM

Barna K: A területi versenyképesség és mérésének lehetőségei Magyarországon. *XI. Ifjúsági Fórum*, Keszthely 2005. március 24. CD-ROM

Dr. Molnár T.-**Barna K.**: A regionális versenyképességet befolyásoló tényezők vizsgálata a Dél Dunántúli régióban *XLVI. Georgikon Napok, Keszthely* 2004. szeptember 16-17. CD-ROM

Molnár T.-**Barna K.**-Nyáriné Budvig A.-Marton I.-Tütő E.: A települések fejlettségének vizsgálata. *In: Acta Scientarium Socialium* 2003. XIV. szám p. 53-61.

Molnár T.-**Barna K.**-Kovács B.: A Dél-dunántúli Régió településeinek

fejlettségi vizsgálata. *In: Acta Scientarium Socialium* 2003. XIV. szám p. 61-75.

Molnár T.-**Barna K.**-Nyáriné Budvig A.-Marton I.-Tütő E.: A gazdasági-társadalmi fejlettség településszintű vizsgálata. *XLV. Georgikon Napok,* Keszthely, 2003. szeptember 25.-26. CD-ROM

Molnár T.- **Barna K.**-Nyáriné B.A.-Marton I.-Tütö E.. A települések fejlettségének vizsgálata *In:Acta Scientarium Socialium* 2003. 14. p.53-61.

A. B. Nyáriné-Cs. Sarudi-I. Marton-T. Molnár-**K. Barna**-E. Tütő: Determinative factors of regional development. Agrárgazdaság, *Vidékfejlesztés és Agrárinformatika az évezred küszöbén (AVA) nemzetközi konferencia.* 2003. április 1-2. Debrecen. p. 339. CD-ROM

Nyáriné Budvig A.-Sarudi Cs.-Marton I.-Molnár T.-**Barna K.**-Tütő E.: Hazánk vidékfejlesztésének támogatása az EU integráció tükrében. *Agrárgazdaság, Vidékfejlesztés és Agrárinformatika az évezred küszöbén (AVA) nemzetközi konferencia.* 2003. április 1-2. Debrecen. p. 340.

Nyáriné Budvig A.-Sarudi Cs.-Marton I.-Molnár T.-**Barna K**.-Tütő E.: Hazánk vidékfejlesztési lehetőségei a csatlakozás előtti és utáni időszakban. Agrárgazdaság, *Vidékfejlesztés és Agrárinformatika az évezred küszöbén (AVA) nemzetközi konferencia.* 2003. április 1-2. Debrecen. p. 163.

Tütő E.-Sarudi Cs.-Nyáriné Budvig A.-Marton I.-Molnár T.-**Barna K.:** regionális szintek, valamint érdekérvényesítésük az EU-ban. Agrárgazdaság,

Vidékfejlesztés és Agrárinformatika az évezred küszöbén (AVA) nemzetközi konferencia. 2003. április 1-2. Debrecen. pp.346.

Discourses

Barna K: Regionális versenyképességi vizsgálatok Magyarországon. *Doktoranduszok Tudományos Kerekasztala*. 2006. szeptember 25.

Dr. Molnár T.-**Barna K**.: Objektív és szubjektív versenyképesség. *Területfejlesztés-Térségi versenyképesség konferencia* (Magyar Statisztikai Társaság Területi Statisztikai szakosztálya). Visegrád, 2005. december 14.