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Normative Economics or Improvement of Economic Life at Regional Level in the Czech Republic.

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Abstract

In the context of improvement of economic life, normative economics has to cope, if it is not only a theoretical construct, with various facts which are brought by the economic reality. Becoming aware of the mutual causality of economic phenomena and processes, the consideration of these facts should first define factually a particular area of interest and then identify formally a direction of its improvement. To reduce regional disparities, the key points are both the selection of disparities identification criterions and the specification of values of these criterions.

The paper deals with the area which is nowadays relatively common – regional disparities. The improvement in this sense focuses on the decreasing of differences between particular regions regarding the defined values, respectively levels of partial criterions which serve as a base for identification of regional differences. Data envelopment analysis (DEA) and cluster analysis are used to evaluation of the regions.

Key words

Normative economics, region, regional disparities, Data Envelopment Analysis, Cluster Analysis.

Anotace

Normativní ekonomie se v kontextu zdokonalování ekonomického života společnosti, pokud nemá jít výlučně o teoretický konstrukt, musí vypořádat s nejrůznějšími skutečnostmi, které ekonomická realita přináší. Zohlednění těchto skutečností by mělo, s vědomím vzájemné kauzality ekonomických jevů a procesů, jednak věcně vymezit konkrétní oblast zájmu a posléze formálně identifikovat směr onoho zdokonalení.

Uvedené pojednání se zaměřuje na oblast, která je v současnosti poměrně frekventovaná a to oblast regionálních disparit. Zdokonalení v tomto smyslu se zaměřuje na snížení rozdílů mezi jednotlivými regiony v návaznosti na definované hodnoty, resp. úrovně dílčích kritérií, na základě kterých jsou regionální rozdíly identifikovány. K hodnocení regionů byly použity metody DEA (Analýza obalu dat) a shluková analýza.

Klíčová slova

Normativní ekonomie, region, regionální disparity, analýza obalu dat, shluková analýza.

Introduction

The investigation was oriented on the chosen variables (particular criteria), which were not solitary considering the interest of the theoretic and strictly pragmatically oriented platform. Most contributions and papers pay attention more or less to the mutual relationships between these variables, not to their multilateral relationships. The paper declares an attempt to create a more complex approach in the investigation of particular variables and to seek for connections between them. The main focus is the investigation of connections between unemployment, incapacity to work, and criminality on one hand, and economically active population on the other.

The most important processes of social spatial differentiation leading to the regional disparities emergence can be split into several categories: social-economic and demographic processes, economic processes and the third category consisting of processes which are too specific to be

included into two main categories – other processes.

Regional disparities are closely connected with the quality of life in particular regions. The essential factors, we consider as the most influencing the quality of life, are above all availability of work, education, and public and private services. The differentiation in possibilities of approach to work, education, health care, and other services make regional differences in the quality of life of the Czech Republic. In certain cases, the regional differences can become an obstacle of cohesion and balanced development of society (Blažek 1996, Hampl 2005).

The Czech Republic has been gone through many social and economic changes after 1989. These changes gradually transform the structure and stratification of the Czech society (Večerník 1995). The increasing social differentiation successively projects to changes of spatial organisation of the Czech society. It can be illustrated, for example, by the increase of the imbalance in the regional development during the transformation period (Hampl, 1996, 2005). Social and economic disparities reflect the quality of life and different development rate of individual regions and municipalities. Different natural and socio-economic conditions make some regions advantageous and some make disadvantageous for function localisation as well. Many of these inequalities are confirmed in the Czech settlement system and could not be influenced significantly. It is mainly evident in the municipalities and regions in peripheral or otherwise disadvantageously localised positions (Jančák, 2001). Conversely, some manifestations of social differentiation are new and connected with economic and social processes after 1989 (Mareš, Rabušic 1994, Sirovátka 1997, Večerník 2004). These processes has been resulted in the increasing social spatial differentiation not only among peripheral and metropolitan regions but also social polarisation inside micro-regions or seats with similar economic or social characteristics and the position in the settlement hierarchy (Ouředníček 2003).

The increasing polarisation between important regional centres on one hand and relatively rural spaces on the other hand is characteristic feature of the changing spatial differentiation (Hampl 2005). One of important results of economic transformation is a noticeable shift in the spatial distribution of work opportunities. The number of work opportunities decreased in peripheral areas during last 15 years. New jobs are mainly concentrated in larger regional centres. Similarly, the spatial differentiation of services increases as a result of the market principles application. Retail business and basic services disappear in geographically disadvantaged localities, the level of transport accessibility decreases. All these factors lead to a lessening of the quality of life in smaller municipalities with peripheral location. Younger and more educated people cannot find a fulfilment here and leave to larger seats. An intensive outflow of inhabitants from disadvantaged seats worsens their social, demographic and economic situation and leads to "catching" of remaining, often old or less educated inhabitants. Thus, social capital, participation on public life and social solidarity of these villages and regions decreases.

Similar "catching" of mainly older or poorer population is known from inner parts of the largest cites as well. The processes of commercialisation and gentrification contribute to it (Sýkora 1996, 1999). An influx of young, free and richer people into central parts of towns is in a sharp contrast to ageing inhabitants of controlled tenement houses. The influx of the new people with different life requests and style causes a gradually change of goods and services supply, rental level and character of entire gentrified areas. Thus, the relatively less mobile older population is caught in the trap of city centres and is forced to use much more expensive goods and services or to commute for them to farther localities. This fact supports the decreasing quality of life of some population groups and thus social cohesiveness of localities.

Increasing differences among social-economic status of inhabitants can be seen in surrounding of the large Czech cities as a result of the residential suburbanisation process (Ouředníček 2001, 2003). This process represents the strongest migration flow at present (Čermák 2001). Although the influx of younger and richer people in suburbia can be perceived as a fortifying of the social structure of villages, serious problems occur between denizens and new residents which stem from different economic situation, life style and in some cases also from different views on a further development of

the village. Suburbanisation is sometimes felt as a threat for social cohesiveness of the whole society (Putnam 2000).

One of the main components of the regional potential is social capital. The importance of social capital for local and regional development has been widely acknowledged during last decades. Localities, regions, nations and communities are more likely to achieve higher levels of development and to mitigate negative external influences if they have higher level of embedded social capital. Social capital is one of several factors influencing regional development. However, its role is growing due to increasing importance of mutual interactions in society and the impact of international division of labour on lives of people and communities (Castells, 1996). Territoriality of social networks and to horizontal and vertical relations between social networks at various scales, reflecting the distinction between bonding, bridging and linking types of social capital was discussed for example by Matoušek and Sýkora (2008).

Human resources can be assessed among others for example using age, social and educational structure of the regional population. A significant problem, which is faced by regions of develop countries, is the demographic aging, which started to be very intensively discussed in 1960s.The demographic aging means that the absolute as well as the relative number of the given population. In other words, there is a change of the pre-reproductive and post-reproductive section of the population. This aging is heavily influenced mainly by the improving mortality conditions causing a decreasing mortality rate in higher age, as people live longer. This phenomenon is accompanied in modern societies by other phenomena which is the decrease of fertility. The result is that the natural renewal of the population is not reached. This behaviour is rooted in history (Dimitrová 2010).

The process of demographic ageing becomes also of a big importance in the Czech Republic as a result of radical social changes after 1989. One of the components of transforming changes is also an acceptance of the west-European model of demographic behaviour – the decreasing fertility, increasing mortality conditions. The demographic ageing has many serious economic and social consequences which can provoke problems of various intensity in regions (for example in relation to the income level, unemployment rate etc.).

The age of a population can be expressed by various demographic indices: index of ageing (the ratio of inhabitants above 65 years to the inhabitants under 15), average age, median age, life expectancy. Economic relations to demographic ageing are usually assessed by for example index of economic burden (it compares number of persons in economically inactive age to the number of persons in economically active one).

In the Czech Republic as well as in the most post-socialist countries, the second demographic transition has been in progress at the beginning of nineties. The centre of demographic transition is not only in the preservation of a low level of mortality and its shift to higher age but also in the decreasing level of natality.

The distinct population ageing is obvious in the European Union in the last decades. It is caused by the permanently increasing life of expectancy on one hand and by very low crude rate of natality on the other hand. It is supposed that this trend will continue (MPSV 2006). A population with the ratio of old people above 65 years of 8% or more is marked as an ageing population. This limit exceeded in most European countries at the end of last century. The process of ageing proceeds quicker in more developed countries (Jarošová 2006).

Various methods are used for the analysis of regional disparities, among them also DEA (Data Envelopment Analysis) models. DEA models come out from the Farrel model for the unit´s effectiveness assessment with one input and one output (Farrel, 1957) which was extended by Charnes, Cooper a Rhodes (CCR) (1978) and Banker, Charnes a Cooper (BCC) (1984). We suppose a constant return to scale. BCC models suppose variable returns to scale. Many authors still try to improve basic models to better meet real conditions. We used an extended CCR model which caters a possibility to influence inputs. This model calls Non-discretionary and was designed by Banker and Morey in 1986.

DEA models were applied in many areas. For example Herman applied DEA models in the health service in 1984, Bessent at al. for the schools

assessment in 1982, Gaspar at al. in agriculture, 2009, etc.

Martic and Savic (2001) assessed performance of regions in Serbia where discriminant analysis was also used. They used Andersen-Petersens model for the comparison of effective units. Xiong, Liu and Tang (2008) showed the problematic of criteria selection for DEA assessment in the area of regional development and the results comparison with statistical comparative analysis. Li and Cheng (2010) analysed a social-economic development in the Sichuan province. Relationships among DEA and some of traditional economic theories for an assessment of sustainable regional development are also discussed by Ma and Liu (2008).

The following text focuses on an investigation and seeking of relations among the rate of unemployment, incapacity for work and criminality on one hand and economically active population on the other hand which enables to analyze characteristics influencing qualitatively and quantitatively not only economic growth but also economic development.

Approaches to incapacity of work, as a phenomenon with both individual and social dimension, can be monitored from several points of view. Muskin and Collings (1959) has concerned with a mutual link between the price of health and illnesses costs in the middle of last century.

The investigation at national level (Doherty, 1979, Bonato, 2004, Khan, 2004, Cai, 2005) focuses on the relationship between public expenditures in the context of the system of health insurance and invalidity. Also from the viewpoint of corporate interests and goals (profit maximization), the incapacity of work is evaluated by the optic of workers deciding to labour-leisure and by the optic of producers influenced by insurance provisions and labour market institutions, all in the context of costs, respectively opportunity costs of an absence in work caused by a disease (Bonato, 2004) which represents a partial link with the problematic of criminality and its consequences in health, not only by the population in productive age. There has demonstrated an interest in an investigation of social harms connected with crimes in succession to their punishment and a reduction of their results in history (Becker, 1968, Hagan, 1993).

Concerning a mutual relationship between criminality and unemployment, contributions concentrate on an analysis of relations among unemployment and various kinds of crimes, respectively suicides (Chiricos, 1987, Yang, 1994, Raphael, 2001).

Material and Methods

The cornerstone of the choice of the chosen variables was primarily their verbal, partially intuitive formulated causality, but without relevant economically and mathematically tors formulated, exactly expressed range and extent, or with its expression based only on a partial relationship between two variables.

Districts of the Czech Republic (76 NUTS-4, resp. LAU-1, where the capital of Prague, due to its specificity, was not assessed.) were taken as the basic units chosen for the assessment As indicators were taken: unemployment rate (number of unemployed in %), criminality (number of crimes per 10 thousand inhabitants), average length of incapacity to work (number of calendar days of incapacity to work per one registered event), index of aging (ratio of inhabitants aged more than 65 to the number of people under 15), and proportion of economically active inhabitants (proportion of inhabitants aged from 15 to 64 to the whole population). The last indicator (the proportion of economically active inhabitants) was considered as an output, as from the sustainable regional development's point of view, higher values of this indicator are desirable. The other indicators are considered to be inputs – their lower values are desirable. The analysed data are from the year 2008.

The aim of Data envelopment analysis (DEA) method is to divide evaluated subjects (Decision Making Units - DMUs) according to expended inputs and produced outputs into two groups – efficient and inefficient. DEA compares units with the best units on the base of linear programming theory. In this paper DMUs are districts in the Czech Republic.

Basic DEA models (CCR and BCC) are either input or output oriented. Output oriented model aims to maximize outputs without requiring more of any of input values. Input oriented model try to minimize

inputs while least the given output levels. In case inefficient unit optimal level input or output can be determined.

The CCR model has assumed that all inputs and outputs can be varied. In this paper one of chosen input is non-discretionary therefore the basic CCR model is not suitable for this application. For this reason we will use non-discretionary variable models proposed by Banker and Morey (1986). This variable need to be considered for efficiency evaluation but changes of this variable is not suggested.

Suppose p DMUs and m inputs (x_i , i=1, 2, …, m), n outputs (y_j , j=1, 2, …, n) for each of these p units. We have to solve p optimizations (one for each of p units) to obtain weight (v) for each of m input and weight (u) for each of n outputs for k-th DMU (k=1,2,...,p).

Mathematical model for unit H (one of p units) is following linear programming problem (primal):

Maximize

$$\sum_{j=1}^{n} y_{jH} u_{jH} - \sum_{i \in ND} v_{iH} x_{iH} \qquad \textbf{(1)}$$

subject to

$$\begin{aligned}
&\sum_{j=1}^{n} y_{jk} u_{jH} \le \sum_{i \in ND} x_{ik} v_{iH} + \sum_{i \in D} x_{ik} v_{iH}, k = 1,2,..., p,\\
&\sum_{i \in D} x_{iH} v_{iH} = 1,\\
&u_{jH} \ge \varepsilon,\\
&v_{iH} \ge \varepsilon (i \in D),\\
&v_{iH} \ge 0 (i \in ND).
\end{aligned} \qquad \textbf{(2)}$$

where $(i \in D)$ marks inputs, which are discretionary and $(i \in ND)$ denotes inputs non-discretionary.

Weights in this model are determined so that objective function (1) is maximal (it is dependent on model orientation). If objective function is equal to one, the unit is efficient. A non-efficient unit's coefficient is less or more than one (output or input oriented model).

The dual problem of LP (primal) model is expressed as follows:

Minimize

$$\theta_H - \varepsilon(\sum_{i \in D} s_i^- + \sum_{j=1}^{n} s_j^+) \qquad \textbf{(3)}$$

subject to

$$\begin{aligned}
&x_{iH} \theta_H = \sum_{k=1}^{p} x_{ik} \lambda_{kH} + s_i^- 0, i \in D,\\
&x_{iH} = \sum_{k=1}^{p} x_{ik} \lambda_{kH} + s_i^- 0, i \in ND,\\
&y_{jH} = \sum_{k=1}^{p} y_{jk} \lambda_{kH} - s_j^+, j = 1,2,...,n,\\
&\lambda_{kH} \ge 0, k = 1,2,..., p,\\
&s_i^- \ge 0, i \in D,\\
&s_i^- \ge 0, i \in ND,\\
&s_j^+ \ge 0, j = 1,2,..., n.
\end{aligned} \qquad \textbf{(4)}$$

where λ_{kH} expresses a coefficient of a combination of peer units for unit H, $s_i^- \in R^m$ input excesses and $s_j^+ \in R^n$ output shortfalls.

The value of the objective function of dual model is equal to the value objective function of the primal model (1), (2). We can interpret this value as a necessary reduction of inputs in order to become efficient. DEA models give for non-efficient units a set of recommendations in order to improve their efficiency, with increasing outputs or decreasing outputs.

The λ_{kH} coefficients determine a linear combination of inputs and peer units creating a virtual efficient unit for unit H (see (5)).

$$\begin{aligned}
&x'_{iH} = \sum_{k=1}^{p} x_{ik} \lambda_{kH}, i = 1,2,..., m,\\
&y'_{jH} = \sum_{k=1}^{p} y_{jk} \lambda_{kH}, j = 1,2,..., n.
\end{aligned} \qquad \textbf{(5)}$$

where x´iH is the optimal size of the i-th input for H-th unit and y´jH is the optimal size of the j-th output for the H-th unit.

Based on coefficients λ and sizes of the recommended changes for ineffective units, it is possible to calculate percentage proportion of the corresponding peer unit for each ineffective unit.

The chosen inputs and outputs should not be correlated too much. Table 1 shows partial correlations between each couple of indicators.

The ratio of economically active population (as a demanded input) is statistically important correlated with all the input variables at the significance level $\alpha = 0.05$, except of incapacity to work. It is thus theoretically possible to recommend such a configuration of inputs and their weights which should lead to a maximization of input variable and reaching maximal effectiveness of particular administrative units (district) with a mutual combination.

In the next step of the analysis, a typology of ineffective districts was created according to the original values of the input variables (index of aging, rate of incapacity to work, criminality and unemployment rate). This typology should help to compare particular clusters with the results of the DEA analysis and help to make recommendations of the future development of particular groups. Cluster analysis (Aldenderfer and Blashfield 2006, Everitt and Dunn, 2001, Romesburg, 2004) was used to obtain rough typology of Czech districts in 2008. Various algorithms and metrics were tested and their results compared to find the best solution. Hierarchical clustering served as the first step of the classification. The aim of this step was to find a proper count of clusters. Ward´s method gave the best results. This method is distinct from all other methods or linkage rules because it uses an analysis of variance approach to evaluate the distances between clusters.

In short, this method attempts to minimize the Sum of Squares (SS) of any two (hypothetical) clusters that can be formed at each step (Ward 1963). Notation that we can use is as follows: Let Xijk denote the value for variable k in observation j belonging to cluster i.

Furthermore, for this particular method we have to define this as follows:

Error Sum of Squares:

$$ESS = \sum_i \sum_j \sum_k \left| X_{ijk} - \bar{x}_{i\bullet k} \right|^2, \qquad \textbf{(6)}$$

Here we are summing over all variables, and all of the units within each cluster. Here, we are comparing the individual observations for each variable against the cluster means for that variable. Note that when the Error Sum of Squares is small, then this suggests that our data are close to their cluster means, implying that we have a cluster of like units.

Total Sum of Squares:

$$TSS = \sum_i \sum_j \sum_k \left| X_{ijk} - \bar{x}_{\bullet\bullet k} \right|^2, \qquad \textbf{(7)}$$

The total sum of squares is defined in the same as always. Here we are comparing the individual observations for each variable against the grand mean for that variable.

	Index of ageing	Incapacity to work	Criminality	Unemployment rate	Economically active
Index of ageing	.	-0.052265	-0.270278*	-0.316957*	-0.609859*
Incapacity to work		1	-0.237311*	0.089349	0.083163
Criminality			1	0.117066	0.372976*
Unemployment rate				1	0.513089*
Economically active					1

Correlations marked * are significant at the level of α = 0,05..

Table 1: Correlation matrix of analysed variables.

R-Square:

$$r^2 = \frac{TSS - ESS}{TSS}, \qquad \textbf{(8)}$$

This r2 value is interpreted as the proportion of variation explained by a particular clustering of the observations. In general, this method is regarded as very efficient, however, it tends to create clusters of small size (Morey et al., 1983).

The clusters were identified by the k-means method. Computationally, this method seems as analysis of variance (ANOVA) "in reverse." The program will start with k random clusters, and then move objects between those clusters with the goal to 1) minimize variability within clusters and 2) maximize variability between clusters). This is analogous to "ANOVA in reverse" in the sense that the significance test in ANOVA evaluates the between group variability against the within-group variability when computing the significance test for the hypothesis that the means in the groups are different from each other. In k-means clustering, the program tries to move objects (e.g., cases) in and out of groups (clusters) to get the most significant ANOVA results. In the Cluster Analysis module of STATISTICA, the k-means algorithm uses the unscaled squared Euclidean distances for the distance measure; the distance D(i,k) of an observation i from cluster k, for M continuous variables Xj is computed as:

$$D(i,k) = \sqrt{\frac{1}{M}\sum_{j=1}^{M}\left(X_{ij} - \overline{X}_j^{(k)}\right)^2}, \qquad \textbf{(9)}$$

where $\overline{X}_j^{(k)}$ is the mean for variable j and cluster k. The computations were realized with the programs Statistica 9 and the results visualized in ArcGIS 9.3.1.

Results and discussion

According to the chosen indicators, 13 districts seem to be effective: Benešov, Český Krumlov, Hodonín, Hradec Králové, Jeseník, Mělník, Plzeň – jih, Plzeň – sever, Praha – západ, Prachatice, Rychnov nad Kněžnou, Vyškov a Žďár nad Sázavou. Other districts have the score smaller than 100% which is shown in Figure 1.

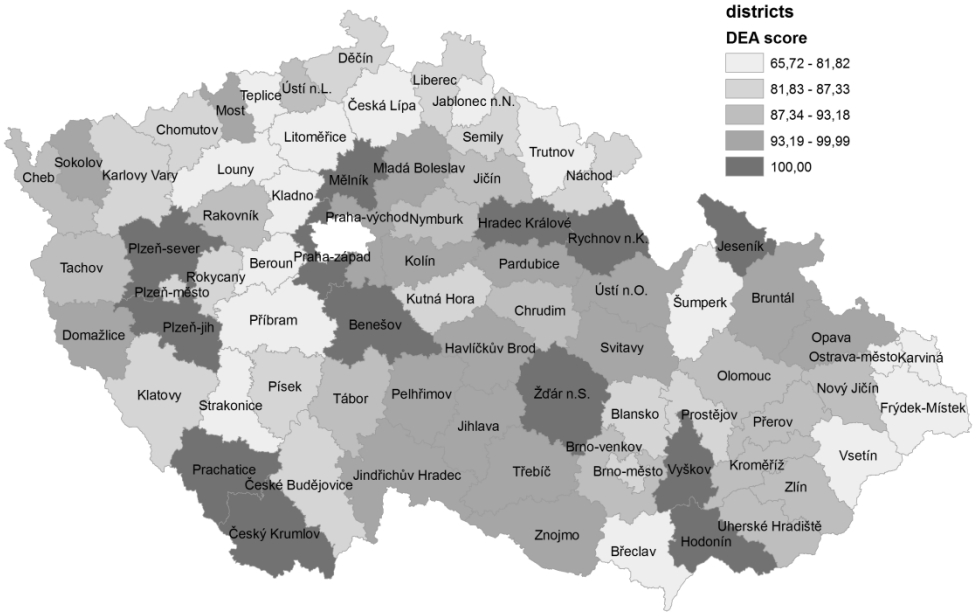

Figure 1: DEA score of Czech districts.

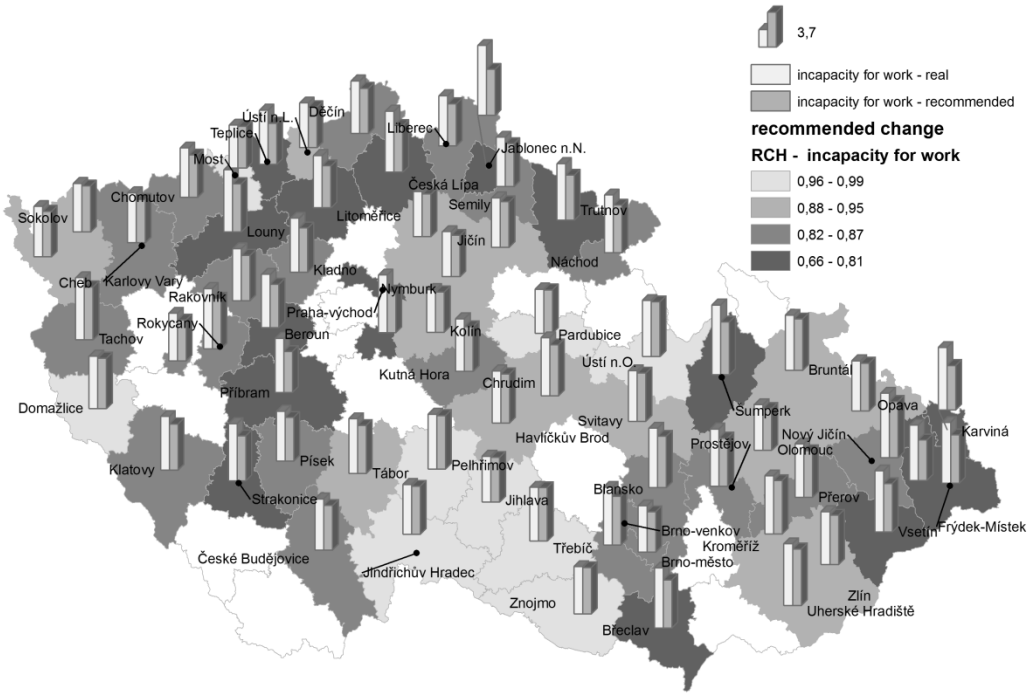

Figure2: Recommended changes for inefficient districts (incapacity for work).

As the reached effectiveness is less than 100%, the DEA models recommend to change the size, i. e. to reduce inputs (rate of unemployment, criminality, length of incapacity to work) to approximate peer districts. Recommended changes come out from the inputs´ level at the effective units (which are either real or are created by as a combination of real units, not from a theoretically constructed ideal) and hence these changes could be feasible. Figures 2-4 display the recommended changes of individual variables.

The effective districts do not differ from the ineffective ones significantly from the viewpoint of the length of incapacity to work. According to the model, the highest decreasing is recommended at the districts with the highest rate of unemployment accompanied by high criminality and social problems: north Bohemia, Ostrava and Příbram. Only small decreasing is recommended to some districts in Vysočina region, south Bohemia and south Moravia.

The criminality should be (according to the model) decreased to almost one half in most problematic regions which have undergone through industry restructuring or a mining slump after 1989 (north Bohemia, Ostrava, Příbram).

It is worth noticing that most of ineffective districts, respectively "problematic" regions show convenient values of index of ageing which evokes an idea about a necessity of purposeful measures to young population to eliminate its danger by unemployment, criminality, respectively unfavourable health.

Using the k-means method of cluster analysis, we have found that the differentiation of ineffective districts in their economic and social development is statistically significantly determined (at the level of statistical significance of $p<0.05$) by almost all of the input variables, instead of incapacity for work. The allocation of the districts into 3 clusters denotes Figure 5. Particular variables were transformed (divided by compensatory factor) to remove too large influence of measure unit of some variables on the analysis result (Hebák a kol., 2005).

The comparison of the groups of effective and ineffective districts can be seen in Table 2.

Regardless the effective districts cannot be assessed as the districts with more convenient age structure, with higher proportion of young people which is perspective for further development, the lower level of criminality and unemployment is also typical for them. Thus, it would be possible to characterize

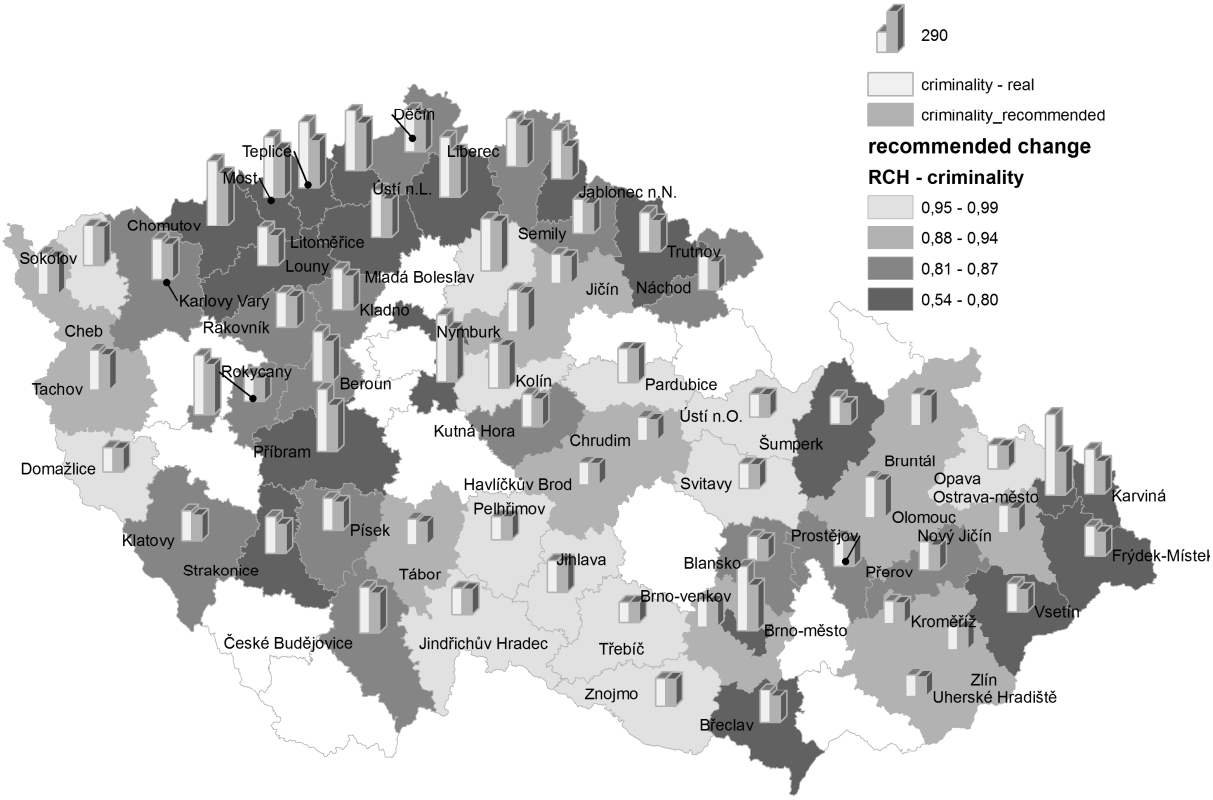

Figure3: Recommended changes for inefficient districts (criminality).

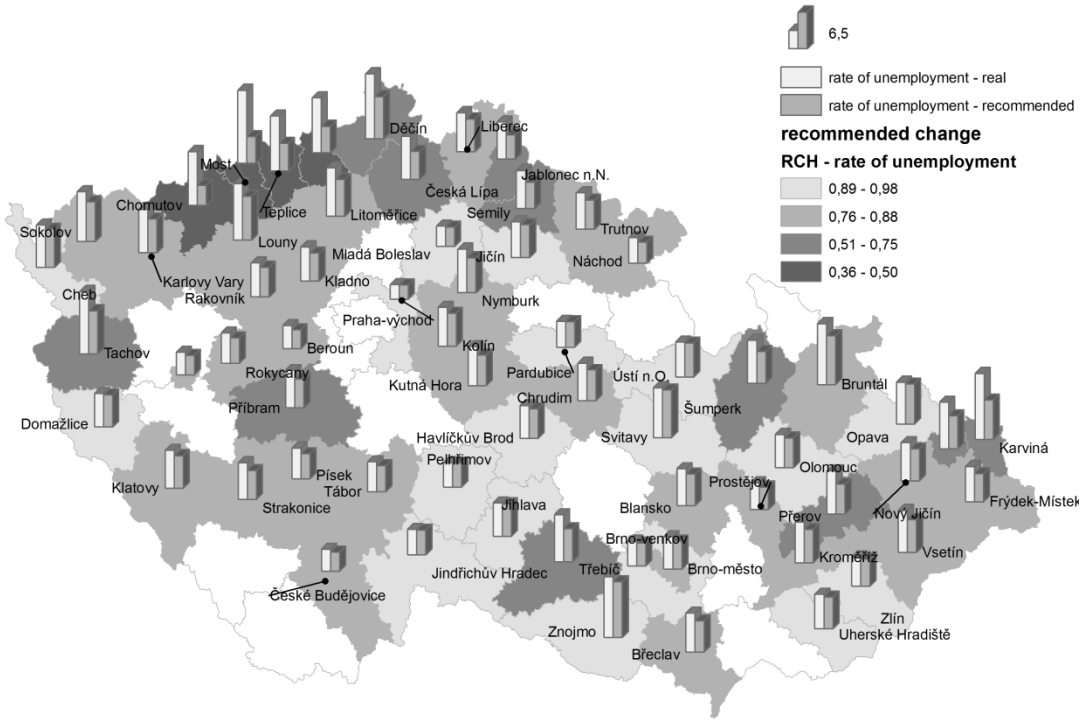

Figure4: Recommended changes for inefficient districts (unemployment).

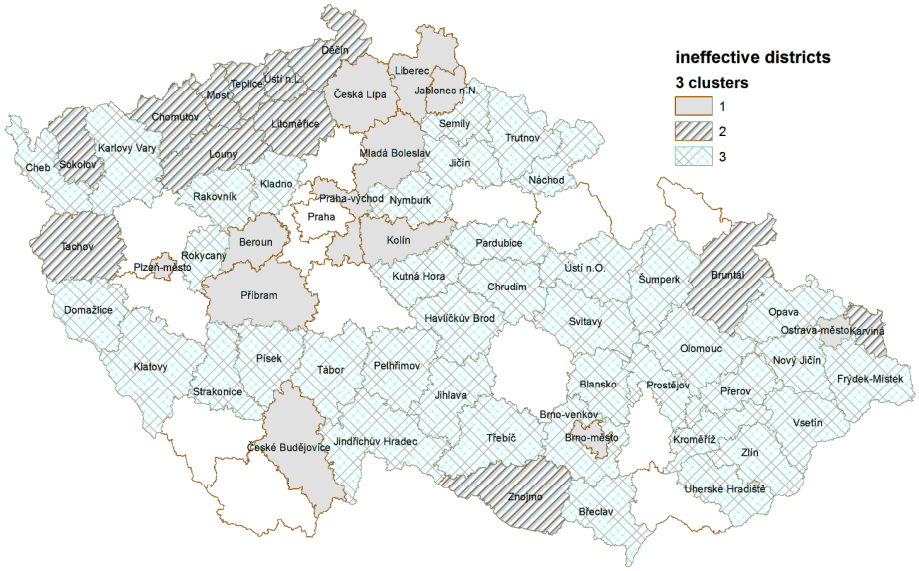

Figure 5: typology of ineffective districts.

Variable	Ineffecitve districts – cluster no.			effective districts
	1	2	3	
Index of ageing	102.5	88.6	106.3	97.7
Incapacity for work	5.54	5.54	5.71	5.4
Crime rate	412.2	340.4	215.8	210.6
Rate of unemployment	5.57	10.4	6.3	5.8

Table 2: comparison of the effective and ineffective groups of districts (means).

these districts as the districts with relatively good work opportunities. This group of districts shows lower values of incapacity for work, it doesn´t differ statistically from the group of ineffective districts ($p = 0.395$).

Ineffective districts can be on the base of realized cluster analysis divided into three groups:

Cluster 1 consists of, according to the value of reached score, problematic districts with less suitable age structure, high criminality but paradoxically the lowest rate of unemployment in comparison to other clusters. This group includes districts with important regional centres where a reduction of industrial production in nineties was more – less successfully compensated by new jobs. Mainly industrial districts with traditional production, undergoing the restructuring after 1989, belong to this cluster. The average score of the cluster is 83.6 with the standard deviation of 9.1.

Cluster 2 can be marked as a group of "most problematic" Czech districts with the high criminality, connected with the high rate of unemployment. Typical industrial districts undergoing the industry restructuring or mining slump after the velvet revolution (north Bohemia) belong to this group. A relatively favourable age structure can be perceived as a positive factor for further development.

Cluster 3 represents a numerously largest group. It includes districts with lower rate of unemployment, low criminality but undergoing process of demographic ageing in comparison to other clusters which leads to less convenient age structure with higher counts of older people. This fact could be connected with the highest value of incapacity of work. Mainly regions of Moravia, Vysočina and cross-border region of South and West Bohemia with traditional population belong to this group.

Variable	Příbram district	
	Original value	Recommended value
Efficiency score	75.42	100
Index of ageing	104	104
Incapacity to work	5.7	4.3
Crime rate	447	331
Unemployment rate	6.7	5

Table 3: Recommendations for cluster 1 representatives – Příbram district.

Variable	Děčín district	
	Original value	Recommended value
Efficiency score	85.7	100
Index of ageing	86.4	86.4
Incapacity to work	5.5	4.72
Crime rate	309	265
Unemployment rate	11.4	7.4

Table 4: Recommendations for cluster 2 representatives – Děčín district.

Variable	Tábor district	
	Original value	Recommended value
Efficiency score	87.8	100
Index of ageing	114.7	114.7
Incapacity to work	5.8	5.1
Crime rate	188	165
Unemployment rate	5.3	4.7

Table 5: Recommendations for cluster 3 representatives – Tábor district.

One representative (district) was selected from each cluster and the inputs' changes recommended by DEA model by the given output to reach 100% effectiveness are shown in tables 3-5.

Conclusion

Some findings offer a relatively new view at a possible regional (districts) structuring. One of the advantages of the DEA models is that, except an assessment of effectiveness, they give recommendations to ineffective units which lead to improvement of the effectiveness of these units. The recommendations are based on comparisons with other real units. Only some of the units are very close to the effectiveness limit and the other can approach the limits using suitable adjustment changes of inputs, respectively outputs. Naturally, it is not always possible to follow all the recommendations but it is minimally possible to consider on what the particular unit should concern.

Any proposed solution of a given state is not applicable without considering other facts which were not included in the examination. In spite of it, this analysis can be assumed to be inspiring for a direction of the regional, respectively economic policy. It indicates on the base of mathematic-statistical instruments, that it is possible to reduce existing differences among Czech districts. According to conditions of particular districts, it is

not probably realistic to try to reach the same, "ideal" values of examined variable: the rate of unemployment, frequency of cries, average length of incapacity for work and also index of ageing. However, the comparison to existing and in examined connections "potentially achievable" values of the above mentioned indicators offer to authors of economic policy information for formulation of steps enabling a realisation of adequate growth goals and regional development in the Czech Republic.

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