FUNCTIONAL REGIONS OF THE CZECH REPUBLIC: COMPARISON OF SIMPLER AND MORE ADVANCED METHODS OF REGIONAL TAXONOMY

Pavel Klapka [1], Marián Halás [1], Petr Tonev [2], Marek Bednář [3]

[1] Palacký University in Olomouc, Faculty of Science, Department of Geography, 17. listopadu 12, 771 46 Olomouc, Czech Republic, pavel.klapka@upol.cz, marian.halas@upol.cz

[2] Masaryk University, Faculty of Economics and Administration, Department of Regional Economics and Administration, Lipová 41a, 602 00 Brno, Czech Republic, tonev@econ.muni.cz

[3] Palacký University in Olomouc, Faculty of Science, Department of Ecology and Environmental Sciences, tř. Svobody 26, 771 46 Olomouc, Czech Republic, marek.bednar@upol.cz

Abstract

The article compares the results of three simpler methods of functional regional taxonomy to the results of the more advanced methods. All methods use daily travel-to-work flows provided by the 2001 census as a regionalisation criterion. Simpler methods rest in the application of primary-flow linkage in order to assign a basic spatial zone to a potential regional core, while more advanced method applies a relativised linkage measure that also takes into account a reverse flow between a pair of basic spatial zones. For comparisons the more advanced method approximates the size parameter used in simpler methods, which is however put into relation to a self-containment of a regional class. The article provides three comparisons of results and identifies main advantages and disadvantages of the two methodological approaches, concluding that the more advanced method provides geographically more relevant results.

Key words: regional taxonomy, regionalization algorithm, functional regions, travel-to-work flows, Czech Republic.

INTRODUCTION

Functional regional taxonomy attempts to delineate functional regions in a defined area. A functional region is usually understood as a region organised by functional relations, i.e. horizontal spatial flows or interactions. The chief objective of the article is to compare the results of three existing simpler methods of delineation of functional regions to the results of a more advanced method newly applied on the territory of the Czech Republic. As such the article provides three different comparisons of spatial patterns of functional regions of different types and documents the advantages and disadvantages of all four methods applied, particularly between simpler and more advanced procedures. The article also introduces to the Czech geographical research a new approach to delineation of functional regions (it has to be noted, however, that in the world the approach has been used since the beginning of the 1980s and that it is not quite new in general). All methods are based on the same spatial interaction used for the delineation of the regions, daily travel-to-work flows (though in some cases it is not explicitly stated) generally regarded as the most effective basis for the delineation of the functional regions (e.g. Ball 1980), the source of the data being the 2001 census of population.

The article discusses some definitions of functional regions, their particular types that are used for the comparisons and differences between them at first, then it proceeds with a discussion of simpler and particularly more advanced methods of the functional regions delineation, with a description and setting of the parameters of all four methodological procedures compared in the article, and finally the article comments on the findings of the comparisons. In order to achieve the objectives of the article the functional regions defined by Czech Statistical Office (ČSÚ 2004), Hampl (2005), and Sýkora and Mulíček (2009) have been included into the analyses (the fourth processed regional taxonomy based on the 2001 census data – Halás et al. 2010 – cannot be included since its methodological procedure completely lacks a basis for comparison).

THEORETICAL AND METHODOLOGICAL FOUNDATIONS

The term functional region has a general character and its meaning can easily be misconstrued or misinterpreted (Klapka et al. 2013). The functional region is based on the spatial flows or interactions that are maximised within the region and minimised across its borders so that the principles of internal cohesiveness and external separation regarding the spatial interactions are met. Generally, any kind of spatial flow or interaction can organise the functional region and its inner structure can be rather random and varied.

The term nodal region, introduced to geography by Nystuen and Dacey (1961), Haggett (1965) or Brown and Holmes (1971), is a special instance of the functional region. It features the orientation of spatial flows or interactions that are centred to or radiate from the so called node (i.e. focus, centre or core). As such the nodal region is organised around its core and its inner structure is developed better than in the case of the functional region (Klapka et al. 2013).

The term local labour market area (LLMA) or travel-to-work area (TTWA) is discussed for instance by Smart (1974), Coombes et al. (1979), Ball (1980) or Coombes and Openshaw (1982). Again LLMAs are special instances of function regions based on labour commuting, i.e. mostly on daily travel-to-work flows. In this case the interactions organising region are restricted to a daily cycle and need not necessarily be oriented at any core, though in practice they mostly are (Klapka et al. 2013).

Simpler methods of regional taxonomy

Simpler methods of delineation of functional regions, in this case we should rather speak of nodal regions, are inspired by the graph theory and they analyse the structure of oriented graph (Nystuen nd Dacey 1961; Slater 1976; Holmes and Haggett 1977). These methods are in the Czech human geographical research used from the beginning of attempts to delineate nodal regions (e.g. Macka 1967; Maryáš and Řehák 1987a, b; Baštová et al. 2005; Halás et al. 2010; Kraft and Vančura 2010) and they are somewhat unluckily referred to as a "first flow" method (cf. for instance Holmes and Haggett 1977 for more correct terminology and who also put forth some disadvantages of the primary-flow linkage method and propose more advantageous methods based on the graph theory).

Simpler methods of regional taxonomy based on the primary flow usually rest in two steps (see e.g. methods used for comparison in this article – ČSÚ 2004, Hampl 2005, Sýkora and Mulíček 2009). Firstly the potential cores of regions are identified, then remaining basic spatial zones are assigned to these cores according to the primary flow, i.e. in case of daily travel-to-work flows according to the highest number of out-commuters from each basic spatial zone. Other flows are usually disregarded. Of course, resulting regions have a strongly nodal character.

More advanced method of regional taxonomy

More advanced methods attempt to aggregate basic spatial zones into regional classes using more complex linkage measures (Smart 1974; Masser and Scheurwater 1978; Coombes et al. 1982). The article applies the maximisation of the measure proposed by Smart (1974) as a linkage criterion:

$$\left[\frac{T_{ij}^2}{\sum_k T_{ik} \cdot \sum_k T_{kj}} + \frac{T_{ji}^2}{\sum_k T_{jk} \cdot \sum_k T_{ki}} \right] \quad [1]$$

where T_{ij} denotes a daily travel-to-work flow from i to j and i is a subset of j and j is a subset of k. This measure has two substantial advantages in comparison to primary flow: it takes into account reverse flows between basic spatial zones (or between a basic spatial zone and regional class), and it relativizes flows between a pair of basic spatial zones by the total inflow and outflow for a basic spatial unit eliminating thus the influence of different size of the zones.

The regional taxonomical procedure has to meet predefined criteria concerning the identification of regional cores and minimum size and self-containment of resulting regional classes. Thence these methods are referred to as rule-based methods of functional regional taxonomy (e.g. Coombes et al. 1982, Casado-Díaz 2000, or Casado-Díaz and Coombes 2011) and, when based on daily travel-to-work flows, they can be used to delineate local labour market areas.

The first effort to do so has been made by Smart (1974), however, his proposal was criticised by Ball (1980) and Coombes and Openshaw (1982) as purely heuristic. Another rule-based method has been developed at the Centre for Urban and Regional Development Studies (CURDS) in Newcastle (Coombes et al. 1979). In this article we apply the second variant of the CURDS algorithm, designed for delineation of LLMAs (Coombes et al. 1986). The algorithm is divided into several steps, each comprising a number of steps and rules (see more in Coombes et al. 1986 for more detail): identification of regional cores, creation of multiple cores, creation of proto-regions, creation of final regional classes (i.e. LLMAs) that satisfy the objective function controlling the minimal size and self-containment of regional classes and the trade-off between the two indicators.

METHODS AND PARAMETERS: LOOKING FOR COMPARABILITY

In order to compare the results of each simpler method of the delineation of functional regions to the results of the more advanced method some common denominator has to be found in the parameters of all the methods discussed. It is only logical that the parameters of the algorithm of the latter method should be adjusted to some of the parameters of the former group of methods. It is not easy since the three simpler methods do not take into account the basic and for the delineation of the regional classes crucial characteristic of functional regions of any type, that is the self-containment of the region (regional class).

Let us shortly remind quantitative characteristics and demands of the three simpler methods of regional taxonomy and look for possible common denominators. ČSÚ (2004) uses total travel-to-work flows as a region-organising spatial interaction. Daily travel-to-work flows are used as a secondary criterion. Resulting regions are called labour micro-regions and they consist of a centre and at least three municipalities in a hinterland (ČSÚ 2004:41). They exhibit a high level of self-containment, particularly for the daily travel-to-work flows (ČSÚ 2004:41). The method sets the minimum population size criterion to 10,000, out of which the population size of a hinterland should exceed 4,000. However, ČSÚ (2004:42) admit that some micro-regions might appear problematic as for their self-containment, since the size criterion is too loose. ČSÚ (2004:41) delineate 184 labour micro-regions (Figure 1).

Hampl (2005) uses two spatial interactions: labour commuting (travel-to-work flows) and school commuting stressing the importance of the former. Elementary functional regions (micro-regions of a first level) are delineated on the basis of labour commuting and considered as basic building units of a regional system (Hampl 2005:79). These will enter the following comparisons. A parameter of their size is known. Hampl (2005:81) requires that the elementary functional regions should have at least 15,000 inhabitants, out of which at least 5,000 inhabitants should be in the hinterland of a regional

core. Both values are considered critical (see further). Hampl (2005:83) delineates 144 elementary functional regions (see also Figure 2).

Sýkora and Mulíček (2009:288) use travel-to-work flows ("commuting to work") as a region-organising spatial interaction. Complex micro-regions are delineated around urban cores and are considered as elemental cells of settlement and regional systems (Sýkora and Mulíček 2009:293). Again, these micro-regions will enter further analyses. Minimum size of micro-regions is set to 6,000 (Sýkora and Mulíček 2009:299). Meeting this criterion 260 complex micro-regions are delineated by Sýkora and Mulíček (2009:300) – see also Figure 3 – although several subjective interventions were included in the process of production of final continuous micro-regions (Sýkora and Mulíček 2009:298, 300).

As mentioned above, the functional regions are basically defined by their self-containment. Naturally this holds true for local labour market areas as well. The size of regions is a further criterion used in most of delineations of LLMAs (e.g. Coombes et al. 1986, Casado-Díaz 2000 etc.). Regarding the criteria used in the three simpler methods it is only size that can serve as a common denominator for our comparisons. However the minimum thresholds set by ČSÚ 2004, Hampl (2005), and Sýkora and Mulíček (2009) concern the total population of a region, while algorithms for LLMA delineation apply only data based on a region-organising process, i.e. the daily travel-to-work flows. This approach basically provides three potential measures of the size: an employed population of a basic spatial zone (region) – $\sum_k T_{jk}$, an employed resident population of a basic spatial zone (region) – T_{jj}, i.e. an inner flow, and a number of jobs in a basic spatial zone (region) – $\sum_k T_{kj}$.

In case there is an attempt to delineate a functional region the number of the employed population is considered the most appropriate as it strongly correlates with the most general size measure of a region – its total population. The differences between regions with low and high levels of unemployment are statistically insignificant. In average there are 45 employed persons per 100 inhabitants in the Czech Republic. Using this percentage it is possible to set the size criterion for the comparisons: in case of ČSÚ (2004) the lower size limit is 4,500, in case of Hampl (2005) it is 6,750, and in case of Sýkora and Mulíček (2009) it is 2,700.

Parameters of the more advanced method

We have used an adjusted second variant of the CURDS algorithm (Coombes et al. 1986). The first step is an identification of potential regional cores. Two parameters that have to be fulfilled simultaneously are applied in order to qualify a basic spatial zone as a potential regional core – job ratio function:

$$\frac{\sum_j T_{ji}}{\sum_j T_{ij}} > 0.8 \qquad [2]$$

and residence-based (or supply-side) self-containment:

$$\frac{T_{ii}}{\sum_j T_{ij}} > 0.5 \qquad [3]$$

Further step is concerned with a level of self-containment of cores and with relations between potential cores and attempts to identify multiple cores. In case a core j does not fulfil requirements for its self-containment, i.e.:

$$\min\left(\frac{T_{jj}}{\sum_k T_{jk}}\,;\,\frac{T_{jj}}{\sum_k T_{kj}}\right) > 0.5 \qquad [4]$$

it is necessary to identify a core i from which more than 10% of flows originates to j and to which more than 1% of flows from j is destined. If there are more cores i fulfilling the requirements a core j is merged with i that maximises [1] and simultaneously [1] exceeds the value of 0.002. The merger of i and j acts as one core in further steps.

The preceding step is repeated then with the exception that apart from cores also remaining basic spatial zones ("non-cores") are taken into consideration and cores are ranked by the objective

function controlling the size and self-containment of the cores and defining a trade-off between both parameters. The size parameters entering the objective function have already been discussed. According to an international experience (Coombes et al. 1986; Casado-Díaz 2000; Papps and Newell 2002) we keep the values of self-containment at the levels 0.70–0.75. It means that the lower size limit demands the upper self-containment limit and that the upper size limit allows for the lower self-containment limit when the trade-off between size and self-containment has a linear character. This step forms so called proto-regions (proto travel-to-work areas in Coombes et al. 1986).

Keeping the proportion between lower and upper size limit in the original method that was 3,500 and 20,000 (Coombes et al. 1986) we set these limits at 4,500 and 25,700 for the comparison with ČSÚ (2004), 6,750 and 38,600 for the comparison with Hampl (2005), and 2,700 and 15,400 for the comparison with Sýkora and Mulíček (2009).

The next step takes into account relationships between proto-regions and remaining unallocated basic spatial zones when the maximisation of [1] is the criterion for merger and the objective function either confirms the viability of resulting regions or, when not, the region is dismembered and its constituent basic spatial zones are allocated to successful regions.

DISCUSSION OF RESULTS

Spatial patterns of regional systems of the Czech Republic and their basic characteristics are discussed in this part. The results of each of the simpler methods of the regional taxonomy are compared to the results of the more advanced method that approximates one of its four crucial parameters, i.e. lower size limit, to the particular counterpart of the simpler method. The basic characteristics of the three comparisons are given in Table 1, complete results are given on-line as supplementary materials in Tables S1, S2 and S3. Graphical outcomes of both simpler and more advanced methods are presented in Figures 1, 2 and 3 and also on-line as supplementary materials in Figures S1, S2 and S3.

Regional pattern of 184 regional classes produced by ČSÚ (2004) is presented in Figure 1. The more advanced method has provided for a lower size limit of 4,500 employed 157 regions. The greatest differences between two regional patterns can be identified in the hinterlands of Prague, Brno and Plzeň, wider hinterland of Ostrava and in eastern Bohemia and western Moravia.

Hampl (2005) has identified 144 regions (Figure 2). The more advanced method has provided for a lower size limit of 6,750 employed 138 regions, which is the closest match out of three comparisons. The greatest differences between two regional patterns concern again the hinterlands of Prague and Brno, and for this time also of České Budějovice. Regional patterns of eastern Bohemia (basically from Náchod towards Polička) differ as well.

Sýkora and Mulíček (2009) identify 260 regions (Figure 3). The more advanced method has provided 178 regional classes for a lower size limit of 2,700 employed. Here the regional patterns differ most. Differences are evident in the hinterlands of large cities (Prague, Brno, Plzeň), this time they are not expressed by a different extent of the regions but particularly by their number. Further we bring attention to eastern and north eastern Bohemia and also western Bohemia and parts of southern Bohemia where simpler method has produced scattered regional pattern. Similar pattern is seen along the Bílé Karpaty range at the Czech-Slovak border as well.

The comparisons documented in Table 1 and Figures 1, 2 and 3 identify several traits that are dealt with in the following lines from general to a more specific point of view. First, all three comparisons show that the more advanced method of regional taxonomy applied in this article produces a smaller number of regions with given parameters. However, should regional classes defined by simpler methods meet the self-containment criterion, their number would always be lower than provided by the more advanced method. Second, there is a considerable difference in a size of regions in terms of their population produced by simpler methods and more advanced method, when the size span

Table 1 Overview of results of simpler and more advanced methods of regional taxonomy. Source: ČSÚ 2004; Hampl 2005; Sýkora and Mulíček 2009; own computations.

	Labour micro-regions (ČSÚ)		Elementary functional regions (Hampl)		Complex micro-regions (Sýkora and Mulíček)	
	S	MA	S	MA	S	MA
Number of regions	184	157	144*	138	260	178
Identical core and delineation	10		3		12	
Identical core, different delineation	138		125		160	
Different core	36	9	19	10	88	6
Fail to meet self-containment	39	–	19	–	109	–
Fail to meet objective function	37	–	21	–	91	–
Maximum size of region (10^3 inhab.)	1,443.0	1,314.5	1,489.2	1,361.4	1,434.9	1,329.6
Minimum size of region (10^3 inhab.)	9.8	11.2	15.6	16.9	6.0	7.1
Number of exclaves**		28 (0.5%)		19 (0.3%)		29 (0.5%)

Notes: S – simpler method, MA – more advanced method

* Three regions are organised by two cores, total number of cores is 147, then.

** In case an exclave occurred within one region it has been amalgamated with it, in case an exclave occurred at a border of two or more regions it has been amalgamated with a region that maximised the interaction measure.

is lower in the latter case. Third, simpler methods favour the influence of larger cores, while the more advanced method, particularly when Smart's measure is applied, somewhat mitigates the influence of larger cores and favours the influence of mid-size and smaller cores in case their regions conform to the objective function. Fourth, simpler methods enable smaller cores to form their regions, which is prevented in the more advanced method by the application of the objective function that combines the size and self-containment criteria.

Of course, results of simpler and more advanced methods and differences between them reflect the nature of the settlement system and relative location of regional cores. Performance of simpler and more advanced methods can be demonstrated on typical examples. Simpler methods enable small cores to form their regions even in the wider hinterland of the largest cities and simultaneously lower the influence of mid-size cores (see for instance the case of Prague and Brno in Figures 1, 2 and 3). The more advanced method performs in the opposite way. Smaller regions do not occur in the vicinity of the largest cores and the influence of these cores is lowered by mid-size cores, which is again seen in case of Prague, Brno and also Ostrava this time (Figures 1, 2, 3).

The same difference applies for lower size levels. Smaller regions are formed by simpler methods in the hinterlands of Náchod, Rychnov nad Kněžnou or Tachov, while the more advanced method does not produce such regions, since they do not conform to the objective function. This holds true also in cases of relatively significant secondary district centres unless they are sufficiently far from the primary centre. Thus for instance Frýdlant nad Ostravicí, Čáslav, Slaný, Přelouč, Nové Město nad Metují (towns with 10–15 thousand inhabitants) have their regions when applying simpler methods, but they are always a part of a region of the primary centre (Frýdek-Místek, Kutná Hora, Kladno, Pardubice, Náchod) when applying the more advanced method.

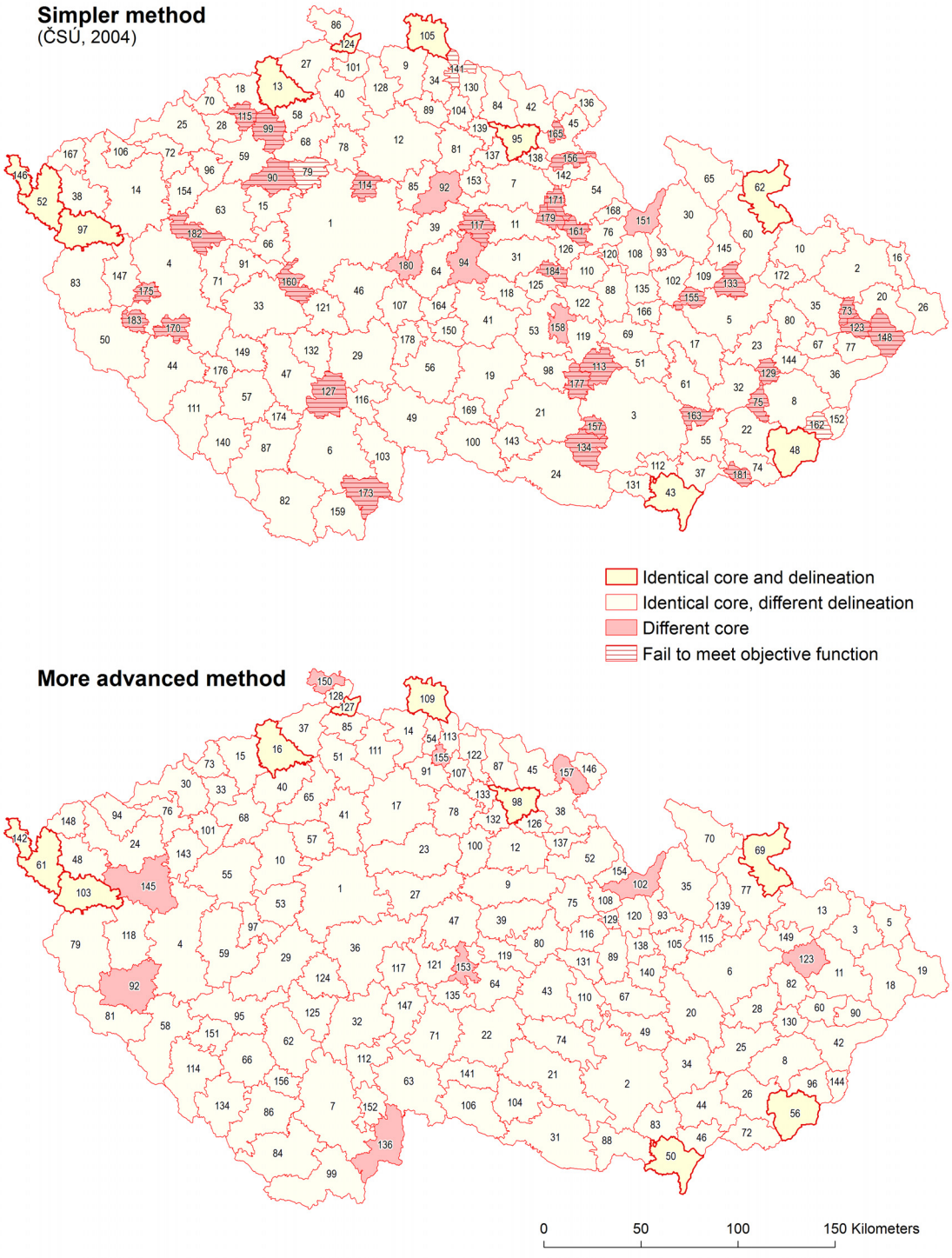

Figure 1 LLMAs and labour micro-regions (ČSÚ). Source: ČSÚ 2004; own design.

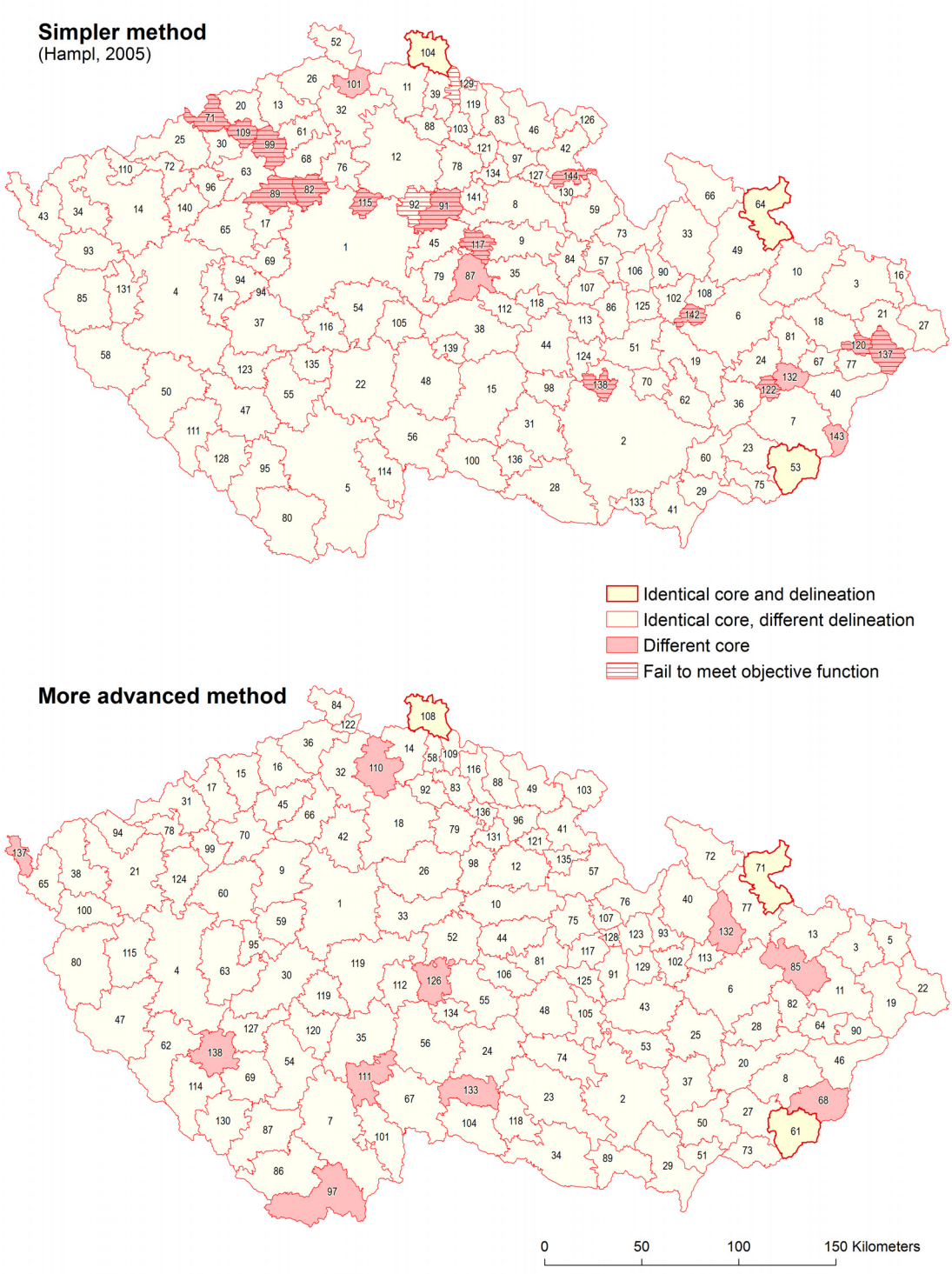

Figure 2 LLMAs and elementary functional regions (Hampl). Source: Hampl 2005; own design.

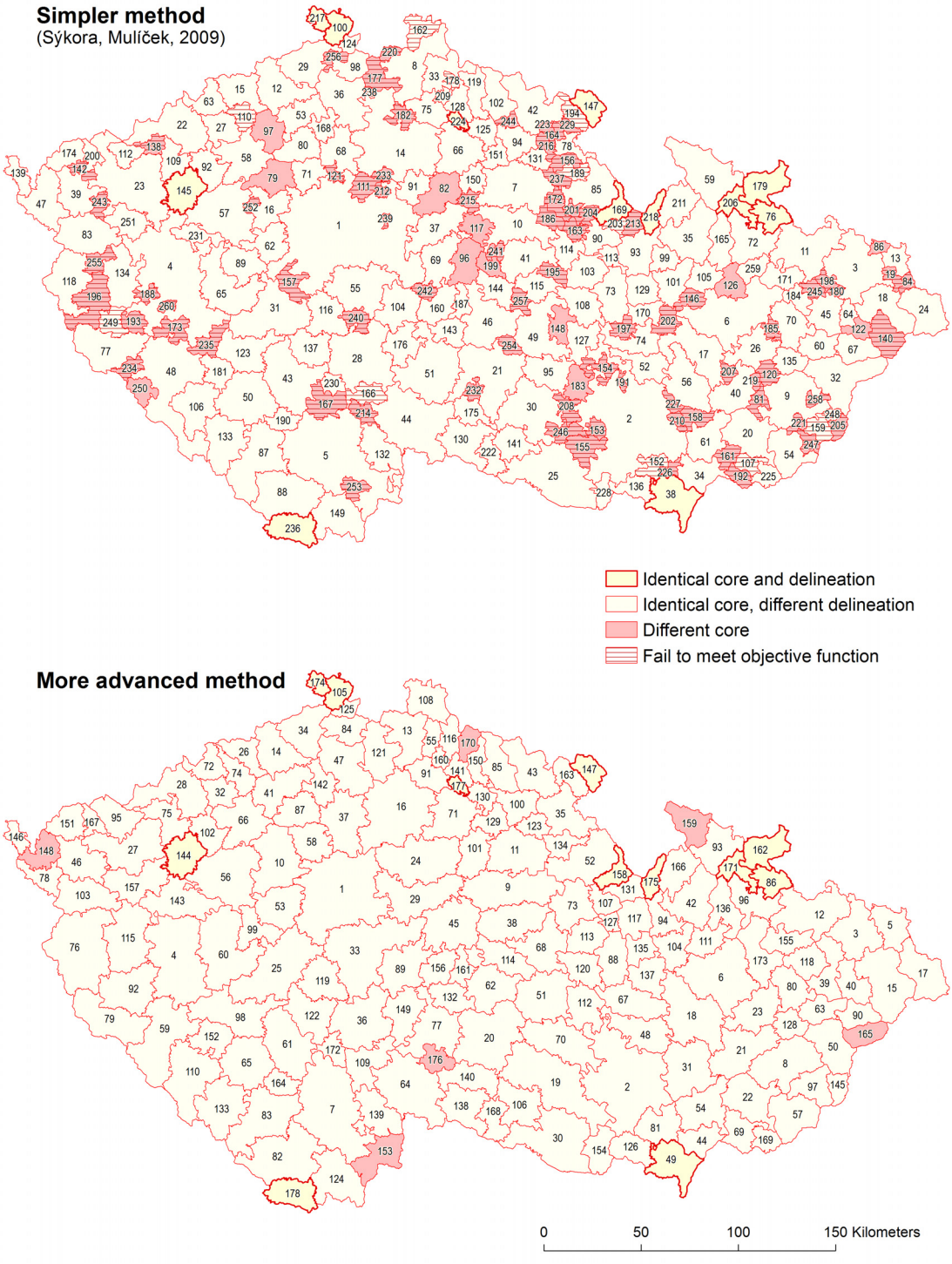

Figure 3 LLMAs and complex micro-regions (Sýkora and Mulíček). Source: Sýkora and Mulíček 2009; own design.

In areas with smaller towns of approximately the same size the simpler methods tend to form a region for each of them, or, if the regions do not exceed the size criterion, these methods divide the whole area between distant larger cores, since based on the primary-flow linkage none of the smaller cores is able to integrate a region. On the contrary, taking into account all relativised flows between all respective basic spatial zones the more advanced method usually delineates the whole area as one (or two) region integrated by the strongest of smaller cores (see for instance Odry – Vítkov – Fulnek, or Slavičín – Luhačovice – Valašské Klobouky – Brumov-Bylnice). Simpler methods could deal with this problem by identification of multiple cores, but this step has been applied only by Hampl (2005) in three cases (Žamberk and Letohrad, Rumburk and Varsndorf, Ústí nad Orlicí and Česká Třebová). It is interesting in this respect that the more advanced method provides regions for last four cases under strict criteria given by the objective function.

Correspondence between regions produced by simpler method and more advanced method occurs only in borderland where the influence of state border and also relief of border mountain ranges is manifested. In the interior of the state territory the delineation of regions differs even though the cores can be identical and the difference is very significant in areas with a dense network of smaller and mid-size settlements.

CONCLUSION

The comparisons of simpler methods and more advanced method of regional taxonomy have manifested significant differences in the resulting regional classes that had been discussed above, and revealed some methodological traits of both types of procedures. First the importance of the analysis of the self-containment of regional classes seems to be assured if functional regions are to be delineated. The self-containment can be tested even when the methods resting in analysis of the primary-flow linkages are applied and unsuccessful regions can be dismembered, which would consolidate the geography of the results. Second the need for a careful estimate of the minimum size criterion in case of simpler methods has proved worthy. If the same estimate is used in the more advanced method as one of the criteria of the objective function the differences between the number of regions is self-evident. In this respect the minimum size estimate made by Hampl (2005) provided the best fit to the results of the more advanced method. On the contrary, 26 complex micro-regions fail to meet the basic trait of a functional region, i.e. the self-containment higher than 50%, which shows that the size criterion applied in this method is too low for the Czech Republic. Third, the more advanced method has appeared to produce geographically more relevant results at given parameters as the size of individual regional classes seems to be more in balance and the basic definition of any type of functional region is fulfilled in terms of the self-containment of the regions. However, the need for a parameters estimation testing seems to be inevitable in order to identify optimal distribution of regional classes.

The advantages of simpler methods rest in the following in our opinion. They are simple, do not demand for a construction and programming of a complex algorithm and if their parameters are carefully estimated they provide relatively precise general view of a regional system. They are able to identify a hierarchical nature of a settlement system and potential centres of functional or administrative regions. The insufficiencies of simpler methods appear to be the application of absolute values and one-way direction of the regionalisation criterion (primary-flow linkage) and of a relatively arbitrary size criterion. The results are hard to be compared in time in case the population, employed or job positions change and in space when in peripheral less populated areas it is more difficult to meet set criteria even for cores that otherwise enjoy a significant position in a settlement system. The primary-flow linkage does not necessarily have to express the regional inclination of a basic spatial zone (this has been partly dealt with in the final controlling mechanism in ČSÚ 2004).

The insufficiency of the more advanced method applied in the article is easy to be overcome, since it concerns just the input data used as a size criterion.

It has been related to employment, which is a characteristic that can manifest significant differences and oscillations in time and space. However, it can be substituted in the algorithm by the total population or economically active population.

The advantages of the more advanced method are as follows. We are able to control both the size and the self-containment of regional classes and the relation between the two parameters. The method uses as a linkage measure relativised and reverse flows between a pair of basic spatial zones (or regional classes), which yields more refined results. The method tends to produce contiguous regional classes even though the contiguity constraint is not comprised in the algorithm (in our case the portion of exclaves did not exceed 0.5% of all the basic spatial zones that had been amalgamated with the cores). If both the size and self-containment parameters of the objective function are set according to the parameters of regions produced by a simpler method, the more advanced method is able to produce larger number of regional classes, which is the trait having been stressed already by Coombes et al. (1982, 1986). If the self-containment is set to 0.60–0.65 for comparisons to Hampl (2005) 181 regional classes are produced (in comparison to Hampl's 144). This assumption requires however further testing.

References

Baštová, M., Krejčí, T., Tonev, P., Toušek, V. 2005: Změny v dojížďce za prací do českých velkoměst v letech 1991–2001. In *Zmeny v štruktúre krajiny ako reflexia súčasných spoločenských zmien v strednej a východnej Európe – zborník z III. medzinárodného geografického kolokvia*. Vydavatelstvo UPJŠ, Košice, 9–14.

Ball, R. M. 1980: The use and definition of travel-to-work areas in Great Britain: some problems. *Regional Studies* 14 (2), 125–139.

Brown, L. A., Holmes, J. 1971: The delimitation of functional regions, nodal regions, and hierarchies by functional distance approaches. *Journal of Regional Science* 11 (1), 57–72.

Casado-Díaz, J. M. 2000: Local labour market areas in Spain: a case study. *Regional Studies* 34 (9), 843–856.

Casado-Díaz, J. M., Coombes, M. 2011: The delineation of 21st century local labour markets areas: a critical review and a research agenda. *Boletín de la Asociación de Geógrafos Españoles* 57, 7–32.

Coombes, M. G., Dixon, J. S., Goddard, J. B., Openshaw, S., Taylor, P. J. 1979: Daily urban systems in Britain: from theory to practice. *Environment and Planning* A 11 (5), 565–574.

Coombes, M. G., Dixon, J. S., Goddard, J. B., Openshaw, S., Taylor, P. J. 1982: Functional regions for the population census of Great Britain. In **Herbert, D. T., Johnston, R. J.** eds. *Geography and the Urban Environment. Progress in Research and Applications* 5, John Wiley and Sons Ltd., Chichester, 63–112.

Coombes, M. G., Green, A. E., Openshaw, S. 1986: An Efficient Algorithm to Generate Official Statistical Reporting Areas: The Case of the 1984 Travel-to-Work Areas Revision in Britain. *The Journal of the Operational Research Society* 37 (10), 943–953.

Coombes, M. G., Openshaw, S. 1982: The use and definition of travel-to-work areas in Great Britain: some comments. *Regional Studies* 16 (2), 141–149.

ČSÚ 2004: *Dojížďka za prací a do škol v Jihomoravském kraji (na základě výsledků SLDB 2001)*. ČSÚ, Krajská reprezentace Brno, Brno.

Haggett, P. 1965: *Locational analysis in human geography*. Arnold, London.

Halás, M., Kladivo, P., Šimáček, P., Mintálová, T. 2010: Delimitation of micro-regions in the Czech Republic by nodal relations. *Moravian Geographical Reports* 18 (2), 16–22.

Hampl, M. 2005: *Geografická organizace společnosti v České republice: transformační procesy a jejich obecný kontext*. Univerzita Karlova, Praha.

Holmes, J. H., Haggett, P. 1977: Graph theory interpretation of flow matrices: a note on maximization procedures for identifying significant links. *Geographical Analysis* 9 (4), 388–399.

Klapka, P., Halás, M., Tonev, P. 2013: Functional regions: concept and types. In *16th International Colloquim on Regional Science. Conference Proceedings* (Valtice 19.–21. 6. 2013). Masarykova univerzita, Brno, 94–101.

Kraft, S., Vančura, M. 2010: Transport concentration areas and their relations to the spatial organization of society: a case study of the Czech Republic. *Geografický časopis* 62 (4), 279–291.

Macka, M. 1967: *Rajóny dojíždění středisek s více jak 1000 dojíždějících v českých zemích 1 : 750 000*. Geografický ústav ČSAV, Brno.

Maryáš, J., Řehák, S. 1987a: Regionální působnost středisek osídlení. In *Atlas obyvatelstva ČSSR*. Geografický ústav ČSAV – Federální statistický úřad, Brno – Praha, map sheet III/4.

Maryáš, J., Řehák, S. 1987b: Soupis sociálně geografických regionů ČSSR. *Zprávy Geografického ústavu ČSAV* 24 (2), 43–58.

Masser, I., Scheurwater J. 1978: The specification of multi-level systems for spatial analysis. In **Masser, I., Brown, P. J. B.** eds. *Spatial representation and spatial interaction. Studies in Applied Regional Science* 10, Martinus Nijhoff, Leiden – Boston, 151–172.

Nystuen, J. D., Dacey, M. F. 1961: A graph theory interpretation of nodal regions. *Regional Science Association, Papers and Proceedings* 7 (1), 29–42.

Papps, K. L., Newell, J. O. 2002: I*dentifying functional labour market areas in New Zealand: a reconnaissance study using travel-to-work data. Discussion Paper 443*. Institute for the Study of Labor, Bonn.

Slater, P. B. 1976: A hierarchical regionalization of Japanese prefectures using 1972 interprefectural migration flows. *Regional Studies* 10 (1), 123–132.

Smart, M. W. 1974: Labour market areas: uses and definition. *Progress in Planning* 2 (4), 239–353.

Sýkora, L., Mulíček, O. 2009: The micro-regional nature of functional urban areas (FUAs): lessons from the analysis of Czech urban and regional system. *Urban Research and Practice* 2 (3), 287–307.

Résumé

Funkční regiony České republiky: srovnání jednodušších a pokročilejších metod regionální taxonomie

Cílem článku je porovnat výsledky tří stávajících jednodušších metod vymezování funkčních regionů s výstupem pokročilejší metody nově aplikované na území České republiky. Článek obsahuje tři různá porovnání prostorových vzorů funkčních regionů různého typu a zabývá se výhodami a nevýhodami aplikovaných metod, především mezi metodami jednodušími a pokročilejšími. Článek přestavuje v českém geografickém výzkumu nový způsob vymezování funkčních regionů. Všechny metody používají jako regionalizační kritérium denní dojížďku za prací ze Sčítání lidu, domů a bytů 2001. Dojížďka za prací je obecně považována za nejefektivnější proces ve funkčních regionálně taxonomických úlohách. Článek analyzuje výsledky vytvořené Českým statistickým úřadem (ČSÚ 2004), Martinem Hamplem (2005) a Luďkem Sýkorou a Ondřejem Mulíčkem (2009).

Jednodušší metody funkční regionální taxonomie jsou inspirovány teorií grafů. V zásadě analyzují orientovaný graf. V českém humánně geografickém výzkumu byly zatím aplikovány při tvorbě funkčních regionů výhradně a poněkud nešťastně se nazývají metodami prvního toku. Tyto metody obvykle spočívají ve výběru potenciálních jader budoucích regionů a ve způsobu přiřazení zbývajících základních prostorových zón k jádrům, v tomto případě podle směru největší vyjížďky ze základní prostorové zóny. V odůvodněných případech bývají výsledky modifikovány, aby poskytly geograficky relevantní obraz. Výsledné regiony pak mají silně nodální charakter.

Pokročilejší metody regionální taxonomie používají pro spojení základních prostorových zón složitější míru, např. v článku použitou míru Smartovu [1]. Tato míra má dvě výhody: jednak uvažuje reversní toky mezi párem základních prostorových zón, jednak tyto toky relativizuje na základě všech příchozích a odchozích toků z dané základní prostorové zóny. Regionálně taxonomická procedura musí

splnit předem definovaná kritéria týkající se identifikace regionálních jader a minimální velikosti a uzavřenosti výsledné regionální třídy. Tento postup je znám jako metoda založená na pravidlech.

Abychom mohli porovnat výsledky jednodušších a pokročilejších metod regionální taxonomie, musíme mezi parametry metod hledat určitý společný jmenovatel. Takovým parametrem je minimální velikost výsledného regionu, respektive regionální třídy. Za základ byly vzaty minimální velikosti regionů všech tří jednodušších metod a jim byly přizpůsobeny parametry algoritmu pokročilejší metody. Algoritmus spočívá ve třech krocích: identifikace regionálních jader, tvorbě regionů a identifikaci hodnot účelové funkce, která hodnotí vzájemně velikost a uzavřenost regionu. Velikost byla odvozena podle velikostních kritérií použitých ve třech jednodušších metodách, uzavřenost byla stanovena na 0,70–0,75. Pokud není hodnota účelové funkce vyšší než zvolený parametr, region je rozpuštěn a jeho základní prostorové zóny přiřazeny k regionům jiným.

Výsledky tří provedených komparací jsou představeny v tabulce 1 a obrázcích 1, 2 a 3. Pokročilejší metoda ve všech případech vymezí menší počet regionů. Velikostní rozmezí regionů vymezených jednoduššími metodami je podstatně větší než v případě aplikace pokročilejší metody. Jednodušší metody zvýrazňují regionální vliv velkých jader, zatímco pokročilejší metoda tento vliv zmírňuje ve prospěch středně velkých a menších jader. Jednodušší metody umožňují vznik malých regionů, čemuž v pokročilejší metodě brání definovaná účelová funkce.

Porovnání jednodušších a pokročilejších metod regionální taxonomie přineslo následující hlavní zjištění. Při vymezování funkčních regionů je velmi vhodné používat kromě velikostního kritéria i kritérium uzavřenosti regionu, protože to je primární znak funkčního regionu. Pokročilejší metody dle našeho názoru poskytují poněkud relevantnější geografický obraz zkoumaného území, zamezují vzniku extrémně velkých či extrémně malých regionálních tříd.

Article received February 28, 2013
Accepted for publication June 20, 2013

Please cite this article as
Klapka, P., Halás, M., Tonev, P., Bednář, M. 2013: Functional regions of the Czech Republic: comparison of simple and advanced methods of regional taxonomy. *Acta Universitatis Palackianae Olomucensis, Facultas Rerum Naturalium, Geographica* 44 (1), 45–57.

Article and supplementary materials available on-line at
http://geography.upol.cz/geographica-44-1c

List of supplementary materials (on-line)

Table S1	Labour micro-regions (ČSÚ) and comparison of results
Table S2	Elementary functional regions and comparison of results
Table S3	Complex micro-regions and comparison of results
Figure S1	LLMAs and labour micro-regions (ČSÚ)
Figure S2	LLMAs and elementary functional regions (Hampl)
Figure S3	LLMAs and complex micro-regions (Sýkora and Mulíček)

Acta Universitatis Palackianae Olomucensis, Facultas Rerum Naturalium, Geographica
Vol. **44**, No. 1, 2013

Supplementary Materials for

Functional regions of the Czech Republic: comparison of simpler and more advanced methods of regional taxonomy

Pavel Klapka [1], Marián Halás [1], Petr Tonev [2], Marek Bednář [3]

[1] Palacký University in Olomouc, Faculty of Science, Department of Geography, 17. listopadu 12, 771 46 Olomouc, Czech Republic, pavel.klapka@upol.cz, marian.halas@upol.cz

[2] Masaryk University, Faculty of Economics and Administration, Department of Regional Economics and Administration, Lipová 41a, 602 00 Brno, Czech Republic, tonev@econ.muni.cz

[3] Palacký University in Olomouc, Faculty of Science, Department of Ecology and Environmental Sciences, tř. Svobody 26, 771 46 Olomouc, Czech Republic, marek.bednar@upol.cz

Article received February 28, 2013
Accepted for publication June 20, 2013

Article and supplementary materials available on-line at
http://geography.upol.cz/geographica-44-1c

This PDF file includes:
Tables S1 to S3
Figures S1 to S3

Table S1 Labour micro-regions (ČSÚ) and comparison of results. Source: ČSÚ (2004), own computations.

Simpler method				More advanced method		
No.	**Name of region**	**Population (2001)**	**Self-containment**	**No.**	**Name of region**	**Population (2001)**
1	Praha	1,442,991	0.917	1	Praha	1,314,470
2	Ostrava	596,910	0.913	2	Brno	560,106
3	Brno	578,644	0.918	3	Ostrava	384,797
4	Plzeň	272,272	0.924	4	Plzeň	272,613
5	Olomouc	171,533	0.881	5	Karviná	253,538
6	České Budějovice	165,240	0.909	6	Olomouc	205,063
7	Hradec Králové	150,784	0.877	7	České Budějovice	170,917
8	Zlín	137,196	0.841	8	Zlín	158,452
9	Liberec	129,378	0.915	9	Pardubice	155,690
10	Opava	127,554	0.909	10	Kladno	147,625
11	Pardubice	123,841	0.852	11	Nový Jičín	136,355
12	Mladá Boleslav	119,614	0.887	12	Hradec Králové	135,910
13	Ústí nad Labem	118,714	0.910	13	Opava	131,031
14	Karlovy Vary	114,536	0.882	14	Liberec	128,345
15	Kladno	111,741	0.731	15	Teplice	126,098
16	Karviná	108,594	0.724	16	Ústí nad Labem	118,714
17	Prostějov	107,489	0.900	17	Mladá Boleslav	116,227
18	Teplice	104,628	0.862	18	Frýdek-Místek	115,588
19	Jihlava	99,135	0.928	19	Třinec	107,299
20	Frýdek-Místek	95,881	0.788	20	Prostějov	105,841
21	Třebíč	89,864	0.919	21	Třebíč	99,124
22	Uherské Hradiště	89,489	0.877	22	Jihlava	96,962
23	Přerov	87,383	0.882	23	Nymburk	96,521
24	Znojmo	86,539	0.945	24	Karlovy Vary	96,272
25	Chomutov	86,359	0.866	25	Kroměříž	92,493
26	Třinec	79,837	0.902	26	Uherské Hradiště	91,292
27	Děčín	78,565	0.915	27	Kolín	90,003
28	Most	77,126	0.810	28	Přerov	89,854
29	Tábor	74,538	0.915	29	Příbram	87,273
30	Šumperk	73,792	0.920	30	Chomutov	85,572
31	Chrudim	72,532	0.839	31	Znojmo	80,263
32	Kroměříž	72,435	0.877	32	Tábor	77,994
33	Příbram	71,498	0.889	33	Most	76,839
34	Jablonec nad Nisou	71,104	0.862	34	Vyškov	76,491
35	Nový Jičín	67,764	0.839	35	Šumperk	73,454
36	Vsetín	67,118	0.878	36	Benešov	73,171
37	Hodonín	66,114	0.884	37	Děčín	72,333

Table S1 – continued.

Simpler method			
No.	**Name of region**	**Population (2001)**	**Self-containment**
38	Sokolov	62,534	0.853
39	Kolín	62,331	0.826
40	Česká Lípa	61,112	0.842
41	Havlíčkův Brod	59,230	0.904
42	Trutnov	59,044	0.915
43	Břeclav	58,438	0.909
44	Klatovy	53,414	0.922
45	Náchod	53,292	0.851
46	Benešov	52,909	0.828
47	Písek	51,321	0.903
48	Uherský Brod	51,220	0.838
49	Jindřichův Hradec	50,055	0.929
50	Domažlice	48,978	0.936
51	Blansko	48,842	0.778
52	Cheb	48,255	0.916
53	Žďár nad Sázavou	47,493	0.883
54	Rychnov nad Kněžnou	47,330	0.892
55	Kyjov	46,828	0.812
56	Pelhřimov	45,637	0.914
57	Strakonice	45,295	0.916
58	Litoměřice	45,178	0.810
59	Louny	43,452	0.839
60	Bruntál	43,400	0.911
61	Vyškov	43,159	0.842
62	Krnov	42,888	0.910
63	Rakovník	42,612	0.899
64	Kutná Hora	42,488	0.833
65	Jeseník	42,259	0.975
66	Beroun	42,233	0.735
67	Valašské Meziříčí	42,196	0.804
68	Roudnice nad Labem	42,170	0.799
69	Boskovice	41,862	0.810
70	Litvínov	40,169	0.734
71	Rokycany	39,505	0.816
72	Kadaň	38,910	0.873
73	Kopřivnice	38,760	0.709
74	Veselí nad Moravou	38,365	0.777

More advanced method		
No.	**Name of region**	**Population (2001)**
38	Náchod	71,762
39	Chrudim	67,353
40	Litoměřice	67,277
41	Mělník	67,266
42	Vsetín	66,491
43	Žďár nad Sázavou	62,584
44	Kyjov	62,411
45	Trutnov	62,097
46	Hodonín	60,838
47	Kutná Hora	60,789
48	Sokolov	60,633
49	Blansko	58,932
50	Břeclav	58,438
51	Česká Lípa	57,700
52	Rychnov nad Kněžnou	55,245
53	Beroun	54,988
54	Jablonec nad Nisou	53,119
55	Rakovník	51,780
56	Uherský Brod	51,220
57	Kralupy nad Vltavou	49,976
58	Klatovy	49,823
59	Rokycany	48,767
60	Valašské Meziříčí	48,443
61	Cheb	48,255
62	Písek	48,246
63	Jindřichův Hradec	46,679
64	Havlíčkův Brod	46,549
65	Roudnice nad Labem	46,345
66	Strakonice	45,013
67	Boskovice	43,905
68	Louny	43,796
69	Krnov	42,888
70	Jeseník	42,413
71	Pelhřimov	42,243
72	Veselí nad Moravou	41,081
73	Litvínov	40,169
74	Velké Meziříčí	40,099

Table S1 – continued.

Simpler method			
No.	**Name of region**	**Population (2001)**	**Self-containment**
75	Otrokovice	38,316	0.661
76	Ústí nad Orlicí	37,151	0.805
77	Rožnov pod Radhoštěm	36,414	0.869
78	Mělník	36,158	0.789
79	Kralupy nad Vltavou	36,058	0.721
80	Hranice	35,592	0.863
81	Jičín	35,417	0.854
82	Český Krumlov	35,001	0.891
83	Tachov	34,790	0.907
84	Vrchlabí	34,193	0.891
85	Nymburk	34,165	0.735
86	Rumburk	33,866	0.879
87	Prachatice	32,986	0.889
88	Svitavy	32,581	0.874
89	Turnov	30,730	0.860
90	Slaný	30,688	0.712
91	Hořovice	30,475	0.792
92	Poděbrady	28,849	0.737
93	Zábřeh	28,840	0.766
94	Čáslav	28,519	0.777
95	Dvůr Králové nad Labem	28,002	0.891
96	Žatec	26,613	0.838
97	Mariánské Lázně	26,543	0.872
98	Velké Meziříčí	26,326	0.876
99	Lovosice	26,274	0.734
100	Dačice	25,924	0.906
101	Nový Bor	25,903	0.795
102	Mohelnice	25,865	0.859
103	Třeboň	25,441	0.879
104	Semily	24,966	0.851
105	Frýdlant	24,285	0.796
106	Ostrov	23,974	0.761
107	Vlašim	23,446	0.783
108	Lanškroun	23,278	0.837
109	Uničov	23,096	0.771
110	Litomyšl	23,053	0.847
111	Sušice	22,747	0.856

More advanced method		
No.	**Name of region**	**Population (2001)**
75	Vysoké Mýto	40,097
76	Kadaň	39,139
77	Bruntál	38,598
78	Jičín	38,199
79	Tachov	37,898
80	Hlinsko	36,241
81	Domažlice	34,705
82	Hranice	34,217
83	Hustopeče	33,923
84	Český Krumlov	33,396
85	Nový Bor	32,355
86	Prachatice	32,223
87	Vrchlabí	31,761
88	Mikulov	31,687
89	Svitavy	31,512
90	Rožnov pod Radhoštěm	31,380
91	Turnov	31,004
92	Horšovský Týn	30,803
93	Zábřeh	29,581
94	Ostrov	29,373
95	Blatná	28,776
96	Slavičín	28,335
97	Hořovice	28,003
98	Dvůr Králové nad Labem	28,002
99	Kaplice	27,899
100	Nový Bydžov	27,298
101	Žatec	26,754
102	Letohrad	26,595
103	Mariánské Lázně	26,543
104	Moravské Budějovice	26,008
105	Mohelnice	25,913
106	Dačice	25,382
107	Semily	24,837
108	Ústí nad Orlicí	24,614
109	Frýdlant	24,285
110	Bystřice nad Pernštejnem	24,256
111	Mimoň	24,136

Table S1 – continued.

Simpler method				More advanced method		
No.	**Name of region**	**Population (2001)**	**Self-containment**	**No.**	**Name of region**	**Population (2001)**
112	Hustopeče	22,304	0.768	112	Soběslav	24,026
113	Tišnov	21,882	0.608	113	Tanvald	23,978
114	Brandýs nad Labem-Stará Boleslav	21,667	0.662	114	Sušice	23,823
115	Bílina	21,470	0.701	115	Uničov	23,570
116	Soběslav	21,174	0.766	116	Litomyšl	23,154
117	Přelouč	21,123	0.723	117	Vlašim	22,994
118	Chotěboř	21,086	0.835	118	Stříbro	22,862
119	Bystřice nad Pernštejnem	21,069	0.791	119	Chotěboř	22,306
120	Česká Třebová	21,027	0.810	120	Lanškroun	21,919
121	Sedlčany	20,917	0.819	121	Ledeč nad Sázavou	21,824
122	Polička	20,747	0.875	122	Jilemnice	21,714
123	Frenštát pod Radhoštěm	20,740	0.730	123	Odry	21,677
124	Varnsdorf	20,707	0.867	124	Sedlčany	21,483
125	Hlinsko	20,270	0.852	125	Milevsko	21,199
126	Vysoké Mýto	20,183	0.788	126	Jaroměř	21,165
127	Týn nad Vltavou	19,935	0.726	127	Varnsdorf	20,707
128	Mimoň	19,817	0.754	128	Rumburk	19,838
129	Holešov	19,807	0.672	129	Česká Třebová	19,446
130	Jilemnice	19,573	0.840	130	Bystřice pod Hostýnem	18,930
131	Mikulov	19,549	0.814	131	Polička	18,777
132	Milevsko	18,979	0.833	132	Hořice	18,568
133	Šternberk	18,671	0.732	133	Nová Paka	18,411
134	Moravský Krumlov	18,420	0.709	134	Vimperk	18,068
135	Moravská Třebová	18,296	0.841	135	Humpolec	17,899
136	Broumov	18,262	0.893	136	České Velenice	17,768
137	Hořice	18,221	0.780	137	Dobruška	17,744
138	Jaroměř	17,995	0.773	138	Moravská Třebová	17,717
139	Nová Paka	17,927	0.831	139	Rýmařov	17,680
140	Vimperk	17,736	0.879	140	Jevíčko	17,597
141	Tanvald	17,671	0.709	141	Telč	17,285
142	Dobruška	17,466	0.776	142	Aš	17,041
143	Moravské Budějovice	17,422	0.831	143	Podbořany	16,234
144	Bystřice pod Hostýnem	17,340	0.767	144	Valašské Klobouky	15,696
145	Rýmařov	17,330	0.901	145	Toužim	15,577
146	Aš	17,041	0.909	146	Broumov	15,336
147	Stříbro	17,033	0.821	147	Pacov	14,970
148	Frýdlant nad Ostravicí	16,881	0.661	148	Kraslice	14,106

Table S1 – continued.

Simpler method			
No.	**Name of region**	**Population (2001)**	**Self-containment**
149	Blatná	16,547	0.846
150	Humpolec	16,510	0.861
151	Jablonné nad Orlicí	16,466	0.847
152	Valašské Klobouky	16,101	0.766
153	Nový Bydžov	16,001	0.801
154	Podbořany	15,689	0.840
155	Litovel	15,585	0.708
156	Nové Město nad Metují	15,361	0.727
157	Ivančice	15,205	0.714
158	Nové Město na Moravě	15,052	0.748
159	Kaplice	14,969	0.856
160	Dobříš	14,023	0.637
161	Choceň	13,818	0.719
162	Slavičín	13,510	0.713
163	Bučovice	12,913	0.653
164	Ledeč nad Sázavou	12,830	0.824
165	Červený Kostelec	12,641	0.697
166	Jevíčko	12,366	0.811
167	Kraslice	12,205	0.778
168	Žamberk	12,073	0.814
169	Telč	11,957	0.793
170	Přeštice	11,945	0.612
171	Týniště nad Orlicí	11,925	0.663
172	Vítkov	11,911	0.828
173	Trhové Sviny	11,346	0.689
174	Vodňany	10,981	0.764
175	Nýřany	10,948	0.629
176	Horažďovice	10,924	0.803
177	Velká Bíteš	10,726	0.750
178	Pacov	10,695	0.838
179	Holice	10,584	0.654
180	Sázava	10,304	0.784
181	Strážnice	10,170	0.670
182	Kralovice	9,967	0.781
183	Holýšov	9,866	0.679
184	Skuteč	9,787	0.743

More advanced method		
No.	**Name of region**	**Population (2001)**
149	Vítkov	14,043
150	Šluknov	14,028
151	Horažďovice	13,897
152	Třeboň	13,521
153	Světlá nad Sázavou	12,616
154	Žamberk	12,291
155	Železný Brod	11,840
156	Vodňany	11,628
157	Police nad Metují	11,176

Table S2 Elementary functional regions and comparison of results. Source: Hampl (2005), own computations.

Simpler method				More advanced method		
No.	**Name of region**	**Population (2001)**	**Self-containment**	**No.**	**Name of region**	**Population (2001)**
1	Praha	1,489,174	0.920	1	Praha	1,361,425
2	Brno	686,580	0.933	2	Brno	564,795
3	Ostrava	602,410	0.911	3	Ostrava	384,797
4	Plzeň	314,898	0.958	4	Plzeň	282,524
5	České Budějovice	231,367	0.937	5	Karviná	253,538
6	Olomouc	196,440	0.901	6	Olomouc	205,063
7	Zlín	190,139	0.904	7	České Budějovice	175,928
8	Hradec Králové	162,957	0.885	8	Zlín	158,452
9	Pardubice	137,741	0.877	9	Kladno	155,806
10	Opava	134,585	0.920	10	Pardubice	155,690
11	Liberec	134,305	0.914	11	Nový Jičín	136,355
12	Mladá Boleslav	124,629	0.892	12	Hradec Králové	135,694
13	Ústí nad Labem	120,378	0.912	13	Opava	132,943
14	Karlovy Vary	115,895	0.885	14	Liberec	128,345
15	Jihlava	113,015	0.943	15	Teplice	126,098
16	Karviná	109,526	0.725	16	Ústí nad Labem	118,714
17	Kladno	108,458	0.732	17	Most	117,008
18	Nový Jičín	107,221	0.884	18	Mladá Boleslav	116,495
19	Prostějov	106,818	0.899	19	Frýdek-Místek	115,588
20	Teplice	104,628	0.862	20	Kroměříž	109,144
21	Frýdek-Místek	95,881	0.788	21	Karlovy Vary	107,722
22	Tábor	95,269	0.937	22	Třinec	107,299
23	Uherské Hradiště	88,982	0.874	23	Třebíč	103,599
24	Přerov	88,503	0.885	24	Jihlava	96,492
25	Chomutov	86,222	0.866	25	Prostějov	96,355
26	Děčín	78,913	0.914	26	Nymburk	93,520
27	Třinec	78,905	0.906	27	Uherské Hradiště	91,292
28	Znojmo	78,413	0.939	28	Přerov	90,317
29	Hodonín	76,075	0.882	29	Břeclav	87,672
30	Most	76,045	0.805	30	Příbram	87,273
31	Třebíč	75,998	0.858	31	Chomutov	85,572
32	Česká Lípa	74,616	0.876	32	Česká Lípa	83,438
33	Šumperk	74,407	0.918	33	Kolín	83,333
34	Sokolov	74,353	0.867	34	Znojmo	79,533
35	Chrudim	74,331	0.839	35	Tábor	79,002
36	Kroměříž	72,846	0.876	36	Děčín	78,682
37	Příbram	71,888	0.887	37	Vyškov	76,491

Table S2 – continued.

Simpler method			
No.	**Name of region**	**Population (2001)**	**Self-containment**
38	Havlíčkův Brod	71,066	0.911
39	Jablonec nad Nisou	70,191	0.859
40	Vsetín	67,636	0.877
41	Břeclav	67,462	0.899
42	Náchod	65,933	0.890
43	Cheb	65,509	0.952
44	Žďár nad Sázavou	63,568	0.927
45	Kolín	60,337	0.832
46	Trutnov	59,924	0.917
47	Strakonice	57,291	0.910
48	Pelhřimov	56,531	0.930
49	Bruntál	54,662	0.938
50	Klatovy	53,978	0.924
51	Boskovice	53,743	0.843
52	Rumburk + Varnsdorf	53,144	0.952
53	Uherský Brod	51,220	0.838
54	Benešov	51,080	0.828
55	Písek	50,525	0.902
56	Jindřichův Hradec	50,126	0.929
57	Ústí nad Orlicí + Česká Třebová	48,811	0.873
58	Domažlice	48,414	0.933
59	Rychnov nad Kněžnou	47,112	0.892
60	Kyjov	45,940	0.811
61	Litoměřice	44,595	0.811
62	Vyškov	43,596	0.841
63	Louny	42,973	0.840
64	Krnov	42,888	0.910
65	Rakovník	42,750	0.897
66	Jeseník	42,259	0.975
67	Valašské Meziříčí	42,196	0.804
68	Roudnice nad Labem	42,170	0.799
69	Beroun	41,663	0.737
70	Blansko	41,561	0.782
71	Litvínov	40,169	0.734
72	Kadaň	38,757	0.873
73	Žamberk + Letohrad	38,698	0.896
74	Rokycany	38,446	0.817

More advanced method		
No.	**Name of region**	**Population (2001)**
38	Sokolov	74,739
39	Benešov	73,626
40	Šumperk	73,454
41	Náchod	72,022
42	Mělník	71,214
43	Boskovice	67,991
44	Chrudim	67,353
45	Litoměřice	67,277
46	Vsetín	66,491
47	Domažlice	64,268
48	Žďár nad Sázavou	63,113
49	Trutnov	62,675
50	Kyjov	62,411
51	Hodonín	60,838
52	Kutná Hora	60,262
53	Blansko	59,376
54	Písek	58,548
55	Havlíčkův Brod	57,674
56	Pelhřimov	56,205
57	Rychnov nad Kněžnou	55,463
58	Jablonec nad Nisou	55,296
59	Beroun	54,988
60	Rakovník	51,680
61	Uherský Brod	51,220
62	Klatovy	49,877
63	Rokycany	48,767
64	Valašské Meziříčí	48,443
65	Cheb	48,255
66	Roudnice nad Labem	46,908
67	Jindřichův Hradec	46,679
68	Slavičín	44,031
69	Strakonice	43,908
70	Louny	43,796
71	Krnov	42,888
72	Jeseník	42,413
73	Veselí nad Moravou	41,081
74	Velké Meziříčí	40,099

Table S2 – continued.

Simpler method				More advanced method		
No.	**Name of region**	**Population (2001)**	**Self-containment**	**No.**	**Name of region**	**Population (2001)**
75	Veselí nad Moravou	38,365	0.777	75	Vysoké Mýto	40,097
76	Mělník	36,449	0.783	76	Letohrad	40,005
77	Rožnov pod Radhoštěm	36,414	0.869	77	Bruntál	38,598
78	Jičín	36,214	0.857	78	Kadaň	38,451
79	Kutná Hora	35,472	0.839	79	Jičín	38,199
80	Český Krumlov	35,112	0.890	80	Tachov	37,898
81	Hranice	34,975	0.866	81	Hlinsko	36,241
82	Kralupy nad Vltavou	33,977	0.720	82	Hranice	36,033
83	Vrchlabí	33,647	0.887	83	Semily	34,662
84	Vysoké Mýto	33,006	0.859	84	Rumburk	33,866
85	Tachov	32,859	0.909	85	Odry	33,808
86	Svitavy	32,581	0.874	86	Český Krumlov	33,396
87	Čáslav	32,482	0.792	87	Prachatice	32,870
88	Turnov	31,643	0.857	88	Vrchlabí	31,761
89	Slaný	30,442	0.713	89	Mikulov	31,687
90	Zábřeh	29,006	0.765	90	Rožnov pod Radhoštěm	31,380
91	Poděbrady	28,921	0.731	91	Svitavy	31,312
92	Nymburk	28,588	0.730	92	Turnov	30,643
93	Mariánské Lázně	28,396	0.888	93	Zábřeh	29,581
94	Hořovice	28,138	0.799	94	Ostrov	29,373
95	Prachatice	27,931	0.896	95	Hořovice	28,003
96	Žatec	26,713	0.837	96	Dvůr Králové nad Labem	28,002
97	Dvůr Králové nad Labem	26,444	0.891	97	Kaplice	27,899
98	Velké Meziříčí	26,427	0.876	98	Nový Bydžov	27,579
99	Lovosice	26,355	0.734	99	Žatec	26,754
100	Dačice	26,029	0.905	100	Mariánské Lázně	26,543
101	Nový Bor	25,903	0.796	101	Třeboň	26,278
102	Mohelnice	25,084	0.862	102	Mohelnice	25,913
103	Semily	24,966	0.851	103	Broumov	25,674
104	Frýdlant	24,285	0.796	104	Dačice	25,382
105	Vlašim	23,998	0.782	105	Bystřice nad Pernštejnem	25,042
106	Lanškroun	23,466	0.838	106	Chotěboř	24,816
107	Litomyšl	23,286	0.845	107	Ústí nad Orlicí	24,614
108	Uničov	23,096	0.771	108	Frýdlant	24,285
109	Bílina	23,032	0.712	109	Tanvald	24,177
110	Ostrov	22,872	0.751	110	Mimoň	24,136
111	Sušice	22,304	0.847	111	Soběslav	24,026

Table S2 – continued.

Simpler method			
No.	**Name of region**	**Population (2001)**	**Self-containment**
112	Chotěboř	21,907	0.836
113	Polička	21,857	0.869
114	Třeboň	21,510	0.837
115	Brandýs nad Labem-Stará Boleslav	21,444	0.654
116	Sedlčany	20,917	0.820
117	Přelouč	20,018	0.730
118	Hlinsko	19,916	0.854
119	Jilemnice	19,573	0.840
120	Frenštát pod Radhoštěm	19,423	0.742
121	Nová Paka	19,088	0.821
122	Holešov	19,073	0.675
123	Blatná	18,907	0.836
124	Bystřice nad Pernštejnem	18,836	0.801
125	Moravská Třebová	18,337	0.841
126	Broumov	18,262	0.893
127	Jaroměř	18,228	0.774
128	Vimperk	17,786	0.880
129	Tanvald	17,671	0.710
130	Dobruška	17,575	0.775
131	Stříbro	17,379	0.828
132	Bystřice pod Hostýnem	17,340	0.767
133	Mikulov	17,324	0.803
134	Hořice	17,254	0.776
135	Milevsko	17,197	0.828
136	Moravské Budějovice	17,024	0.813
137	Frýdlant nad Ostravicí	16,881	0.661
138	Tišnov	16,578	0.604
139	Humpolec	16,302	0.863
140	Podbořany	15,818	0.841
141	Nový Bydžov	15,602	0.807
142	Litovel	15,585	0.708
143	Valašské Klobouky	15,583	0.768
144	Nové Město nad Metují	15,252	0.725

More advanced method		
No.	**Name of region**	**Population (2001)**
112	Vlašim	23,818
113	Uničov	23,266
114	Sušice	23,191
115	Stříbro	22,862
116	Jilemnice	22,639
117	Litomyšl	22,293
118	Moravské Budějovice	22,263
119	Sedlčany	21,483
120	Milevsko	21,199
121	Jaroměř	21,165
122	Varnsdorf	20,707
123	Lanškroun	20,582
124	Podbořany	20,432
125	Polička	20,078
126	Ledeč nad Sázavou	19,706
127	Blatná	19,545
128	Česká Třebová	19,446
129	Moravská Třebová	19,244
130	Vimperk	18,663
131	Hořice	18,568
132	Rýmařov	17,984
133	Telč	17,755
134	Humpolec	17,717
135	Dobruška	17,679
136	Nová Paka	17,486
137	Aš	17,041
138	Horažďovice	16,941

Table S3 Complex micro-regions and comparison of results. Source: Sýkora and Mulíček (2009), own computations.

Simpler method				More advanced method		
No.	**Name of region**	**Population (2001)**	**Self-containment**	**No.**	**Name of region**	**Population (2001)**
1	Praha	1,434,095	0.912	1	Praha	1,329,646
2	Brno	572,587	0.911	2	Brno	560,106
3	Ostrava	423,377	0.855	3	Ostrava	386,524
4	Plzeň	262,013	0.909	4	Plzeň	260,274
5	České Budějovice	183,028	0.914	5	Karviná	253,538
6	Olomouc	171,800	0.880	6	Olomouc	197,657
7	Hradec Králové	143,291	0.874	7	České Budějovice	170,854
8	Liberec	132,518	0.907	8	Zlín	158,452
9	Zlín	130,743	0.827	9	Pardubice	155,690
10	Pardubice	127,467	0.856	10	Kladno	147,625
11	Opava	122,592	0.915	11	Hradec Králové	135,910
12	Ústí nad Labem	120,378	0.912	12	Opava	131,649
13	Karviná	115,988	0.738	13	Liberec	128,345
14	Mladá Boleslav	106,616	0.841	14	Ústí nad Labem	118,714
15	Teplice	104,628	0.862	15	Frýdek-Místek	117,924
16	Kladno	101,666	0.728	16	Mladá Boleslav	116,766
17	Prostějov	97,047	0.899	17	Třinec	107,299
18	Frýdek-Místek	95,881	0.788	18	Prostějov	105,841
19	Havířov	95,271	0.546	19	Třebíč	99,778
20	Uherské Hradiště	90,523	0.877	20	Jihlava	96,314
21	Jihlava	86,280	0.891	21	Kroměříž	92,493
22	Chomutov	86,069	0.867	22	Uherské Hradiště	91,292
23	Karlovy Vary	85,210	0.831	23	Přerov	89,854
24	Třinec	78,905	0.906	24	Nymburk	89,185
25	Znojmo	78,464	0.939	25	Příbram	88,004
26	Přerov	77,758	0.862	26	Teplice	87,419
27	Most	77,317	0.810	27	Karlovy Vary	86,395
28	Tábor	73,833	0.912	28	Chomutov	85,572
29	Děčín	72,762	0.917	29	Kolín	79,491
30	Třebíč	72,727	0.852	30	Znojmo	76,701
31	Příbram	72,506	0.887	31	Vyškov	76,491
32	Vsetín	67,636	0.877	32	Most	75,670
33	Jablonec nad Nisou	67,583	0.851	33	Benešov	73,171
34	Hodonín	66,114	0.884	34	Děčín	72,333
35	Šumperk	65,717	0.907	35	Náchod	71,762
36	Česká Lípa	61,112	0.842	36	Tábor	69,622
37	Kolín	60,729	0.830	37	Mělník	67,266

Table S3 – continued.

Simpler method			
No.	**Name of region**	**Population (2001)**	**Self-containment**
38	Břeclav	58,438	0.909
39	Sokolov	55,654	0.841
40	Kroměříž	55,290	0.845
41	Chrudim	53,835	0.833
42	Trutnov	53,005	0.859
43	Písek	50,525	0.902
44	Jindřichův Hradec	50,366	0.927
45	Nový Jičín	50,128	0.781
46	Havlíčkův Brod	48,758	0.883
47	Cheb	48,468	0.917
48	Klatovy	48,312	0.891
49	Žďár nad Sázavou	48,280	0.885
50	Strakonice	46,439	0.913
51	Pelhřimov	45,904	0.916
52	Blansko	45,329	0.771
53	Litoměřice	44,595	0.811
54	Uherský Brod	44,497	0.811
55	Benešov	44,418	0.812
56	Vyškov	43,944	0.838
57	Rakovník	43,127	0.895
58	Louny	43,088	0.840
59	Jeseník	42,259	0.975
60	Valašské Meziříčí	42,236	0.804
61	Kyjov	41,611	0.823
62	Beroun	41,356	0.738
63	Litvínov	40,169	0.734
64	Kopřivnice	39,457	0.704
65	Rokycany	38,978	0.817
66	Jičín	38,741	0.857
67	Rožnov pod Radhoštěm	36,414	0.869
68	Mělník	35,914	0.786
69	Kutná Hora	35,057	0.842
70	Hranice	34,935	0.866
71	Kralupy nad Vltavou	34,381	0.719
72	Bruntál	33,210	0.864
73	Svitavy	32,581	0.874
74	Boskovice	32,440	0.769

More advanced method		
No.	**Name of region**	**Population (2001)**
38	Chrudim	67,248
39	Nový Jičín	66,256
40	Kopřivnice	66,036
41	Litoměřice	65,762
42	Šumperk	63,511
43	Trutnov	62,097
44	Hodonín	60,838
45	Kutná Hora	60,789
46	Sokolov	60,633
47	Česká Lípa	60,625
48	Blansko	58,932
49	Břeclav	58,438
50	Vsetín	58,000
51	Žďár nad Sázavou	57,234
52	Rychnov nad Kněžnou	55,245
53	Beroun	54,988
54	Kyjov	53,754
55	Jablonec nad Nisou	53,119
56	Rakovník	51,334
57	Uherský Brod	51,220
58	Kralupy nad Vltavou	49,976
59	Klatovy	49,823
60	Rokycany	48,466
61	Písek	47,996
62	Havlíčkův Brod	46,713
63	Valašské Meziříčí	46,585
64	Jindřichův Hradec	46,237
65	Strakonice	45,013
66	Louny	43,796
67	Boskovice	43,465
68	Hlinsko	40,496
69	Veselí nad Moravou	40,462
70	Velké Meziříčí	40,344
71	Jičín	40,286
72	Litvínov	40,169
73	Vysoké Mýto	40,097
74	Bílina	39,848

Table S3 – continued.

Simpler method				More advanced method		
No.	**Name of region**	**Population (2001)**	**Self-containment**	**No.**	**Name of region**	**Population (2001)**
75	Turnov	31,908	0.855	75	Kadaň	39,407
76	Krnov	31,641	0.887	76	Tachov	37,898
77	Domažlice	31,382	0.828	77	Pelhřimov	35,611
78	Náchod	30,571	0.728	78	Cheb	34,958
79	Slaný	30,473	0.713	79	Domažlice	34,705
80	Roudnice nad Labem	29,833	0.729	80	Hranice	34,217
81	Otrokovice	29,527	0.591	81	Hustopeče	33,923
82	Poděbrady	28,849	0.737	82	Český Krumlov	33,396
83	Mariánské Lázně	28,396	0.888	83	Prachatice	32,870
84	Český Těšín	28,394	0.614	84	Nový Bor	32,355
85	Rychnov nad Kněžnou	28,385	0.778	85	Vrchlabí	31,761
86	Bohumín	28,055	0.736	86	Krnov	31,641
87	Prachatice	27,931	0.896	87	Roudnice nad Labem	31,618
88	Český Krumlov	27,889	0.871	88	Svitavy	31,512
89	Hořovice	27,866	0.797	89	Vlašim	31,330
90	Ústí nad Orlicí	27,784	0.783	90	Rožnov pod Radhoštěm	31,049
91	Nymburk	27,460	0.739	91	Turnov	31,004
92	Žatec	26,903	0.838	92	Horšovský Týn	30,803
93	Lanškroun	26,757	0.839	93	Jeseník	30,144
94	Dvůr Králové nad Labem	26,677	0.893	94	Zábřeh	29,581
95	Velké Meziříčí	26,427	0.876	95	Ostrov	29,373
96	Čáslav	26,398	0.778	96	Bruntál	28,660
97	Lovosice	26,355	0.734	97	Slavičín	28,335
98	Nový Bor	25,903	0.795	98	Blatná	28,045
99	Zábřeh	25,715	0.759	99	Hořovice	28,003
100	Rumburk	25,496	0.829	100	Dvůr Králové nad Labem	28,002
101	Mohelnice	25,084	0.862	101	Nový Bydžov	27,298
102	Vrchlabí	24,888	0.810	102	Žatec	26,754
103	Litomyšl	23,160	0.845	103	Mariánské Lázně	26,543
104	Vlašim	23,114	0.783	104	Mohelnice	25,913
105	Uničov	23,096	0.771	105	Rumburk	25,496
106	Sušice	22,052	0.841	106	Moravské Budějovice	24,616
107	Veselí nad Moravou	21,980	0.671	107	Ústí nad Orlicí	24,614
108	Polička	21,915	0.868	108	Frýdlant	24,285
109	Kadaň	21,717	0.729	109	Soběslav	24,026
110	Bílina	21,470	0.701	110	Sušice	23,823
111	Brandýs nad Labem-Star	21,444	0.654	111	Uničov	23,570

Table S3 – continued.

Simpler method				More advanced method		
No.	**Name of region**	**Population (2001)**	**Self-containment**	**No.**	**Name of region**	**Population (2001)**
112	Ostrov	21,069	0.749	112	Bystřice nad Pernštejnem	23,422
113	Česká Třebová	21,027	0.810	113	Litomyšl	23,154
114	Vysoké Mýto	20,464	0.779	114	Chotěboř	23,040
115	Hlinsko	20,270	0.852	115	Stříbro	22,862
116	Sedlčany	20,255	0.821	116	Tanvald	22,221
117	Přelouč	19,880	0.729	117	Lanškroun	21,919
118	Tachov	19,864	0.839	118	Odry	21,677
119	Jilemnice	19,838	0.823	119	Sedlčany	21,483
120	Holešov	19,807	0.672	120	Polička	21,326
121	Neratovice	19,766	0.641	121	Mimoň	21,211
122	Frenštát pod Radhoštěm	19,423	0.742	122	Milevsko	21,199
123	Blatná	19,288	0.834	123	Jaroměř	21,165
124	Varnsdorf	19,278	0.863	124	Kaplice	20,787
125	Nová Paka	19,142	0.822	125	Varnsdorf	20,707
126	Šternberk	18,671	0.732	126	Mikulov	20,623
127	Bystřice nad Pernštejnem	18,586	0.801	127	Česká Třebová	19,446
128	Semily	18,559	0.830	128	Bystřice pod Hostýnem	18,930
129	Moravská Třebová	18,296	0.841	129	Hořice	18,568
130	Dačice	18,029	0.891	130	Nová Paka	18,411
131	Jaroměř	17,995	0.773	131	Letohrad	18,242
132	Třeboň	17,687	0.794	132	Humpolec	18,235
133	Vimperk	17,567	0.878	133	Vimperk	18,068
134	Stříbro	17,379	0.827	134	Dobruška	17,744
135	Bystřice pod Hostýnem	17,340	0.767	135	Moravská Třebová	17,717
136	Mikulov	17,324	0.803	136	Rýmařov	17,680
137	Milevsko	17,197	0.828	137	Jevíčko	17,597
138	Klášterec nad Ohří	17,193	0.671	138	Dačice	17,594
139	Aš	17,041	0.909	139	Třeboň	17,504
140	Frýdlant nad Ostravicí	16,881	0.661	140	Telč	17,017
141	Moravské Budějovice	16,780	0.817	141	Semily	16,938
142	Chodov	16,481	0.628	142	Štětí	16,242
143	Humpolec	16,357	0.863	143	Kralovice	16,178
144	Chotěboř	16,241	0.803	144	Podbořany	15,715
145	Podbořany	15,715	0.841	145	Valašské Klobouky	15,696
146	Litovel	15,585	0.708	146	Aš	15,446
147	Broumov	15,336	0.863	147	Broumov	15,336
148	Nové Město na Moravě	15,052	0.748	148	Františkovy Lázně	14,892

Table S3 – continued.

Simpler method			
No.	**Name of region**	**Population (2001)**	**Self-containment**
149	Kaplice	14,969	0.856
150	Nový Bydžov	14,764	0.816
151	Hořice	14,756	0.786
152	Hustopeče	14,702	0.728
153	Ivančice	14,600	0.716
154	Tišnov	14,150	0.531
155	Moravský Krumlov	14,109	0.704
156	Nové Město nad Metují	14,036	0.712
157	Dobříš	13,813	0.628
158	Bučovice	13,580	0.644
159	Slavičín	13,436	0.713
160	Ledeč nad Sázavou	13,351	0.818
161	Bzenec	13,188	0.664
162	Frýdlant	13,032	0.698
163	Choceň	12,668	0.702
164	Červený Kostelec	12,641	0.697
165	Rýmařov	12,506	0.851
166	Soběslav	12,493	0.699
167	Týn nad Vltavou	12,462	0.631
168	Štětí	12,337	0.760
169	Žamberk	12,291	0.816
170	Jevíčko	12,061	0.804
171	Vítkov	11,993	0.824
172	Týniště nad Orlicí	11,925	0.663
173	Přeštice	11,827	0.615
174	Kraslice	11,819	0.784
175	Telč	11,553	0.791
176	Pacov	11,483	0.836
177	Stráž pod Ralskem	11,397	0.629
178	Tanvald	11,337	0.548
179	Město Albrechtice	11,247	0.787
180	Studénka	11,198	0.610
181	Horažďovice	10,924	0.803
182	Mnichovo Hradiště	10,875	0.572
183	Velká Bíteš	10,836	0.747
184	Odry	10,804	0.767
185	Lipník nad Bečvou	10,745	0.675

More advanced method		
No.	**Name of region**	**Population (2001)**
149	Pacov	14,789
150	Jilemnice	14,473
151	Kraslice	14,106
152	Horažďovice	13,897
153	České Velenice	13,785
154	Hrušovany nad Jevišovkou	13,688
155	Vítkov	13,425
156	Ledeč nad Sázavou	12,994
157	Toužim	12,736
158	Žamberk	12,291
159	Javorník	12,115
160	Železný Brod	11,840
161	Světlá nad Sázavou	11,556
162	Město Albrechtice	11,247
163	Police nad Metují	11,176
164	Vodňany	10,981
165	Velké Karlovice	10,680
166	Hanušovice	10,097
167	Nejdek	9,877
168	Jemnice	9,481
169	Velká nad Veličkou	9,276
170	Rokytnice nad Jizerou	8,998
171	Vrbno pod Pradědem	8,946
172	Bechyně	8,685
173	Moravský Beroun	8,398
174	Velký Šenov	8,370
175	Králíky	8,353
176	Počátky	8,154
177	Lomnice nad Popelkou	7,945
178	Vyšší Brod	7,112

Table S3 – continued.

Simpler method			
No.	**Name of region**	**Population (2001)**	**Self-containment**
186	Holice	10,584	0.654
187	Světlá nad Sázavou	10,472	0.800
188	Nýřany	10,421	0.632
189	Dobruška	10,358	0.684
190	Vodňany	10,302	0.767
191	Kuřim	10,193	0.486
192	Strážnice	10,170	0.670
193	Holýšov	9,866	0.679
194	Police nad Metují	9,830	0.734
195	Skuteč	9,787	0.743
196	Bor	9,760	0.736
197	Letovice	9,727	0.670
198	Bílovec	9,653	0.623
199	Třemošnice	9,546	0.764
200	Nejdek	9,495	0.792
201	Kostelec nad Orlicí	9,474	0.633
202	Konice	9,464	0.667
203	Letohrad	9,410	0.711
204	Vamberk	9,253	0.639
205	Brumov-Bylnice	8,991	0.617
206	Vrbno pod Pradědem	8,946	0.874
207	Kojetín	8,900	0.572
208	Náměšť nad Oslavou	8,798	0.673
209	Železný Brod	8,780	0.748
210	Slavkov u Brna	8,769	0.619
211	Hanušovice	8,690	0.835
212	Lysá nad Labem	8,682	0.550
213	Jablonné nad Orlicí	8,644	0.745
214	Veselí nad Lužnicí	8,639	0.711
215	Chlumec nad Cidlinou	8,579	0.704
216	Česká Skalice	8,541	0.694
217	Velký Šenov	8,370	0.865
218	Králíky	8,353	0.858
219	Hulín	8,336	0.563
220	Hrádek nad Nisou	8,113	0.686
221	Luhačovice	8,073	0.665
222	Jemnice	8,051	0.830

Table S3 – continued.

Simpler method			
No.	**Name of region**	**Population (2001)**	**Self-containment**
223	Úpice	8,005	0.546
224	Lomnice nad Popelkou	7,945	0.763
225	Velká nad Veličkou	7,728	0.760
226	Velké Pavlovice	7,602	0.668
227	Rousínov	7,580	0.553
228	Hrušovany nad Jevišovkou	7,547	0.798
229	Hronov	7,515	0.536
230	Bechyně	7,392	0.757
231	Kralovice	7,285	0.784
232	Třešť	7,202	0.657
233	Benátky nad Jizerou	7,166	0.543
234	Kdyně	7,135	0.713
235	Nepomuk	7,120	0.664
236	Vyšší Brod	7,112	0.867
237	Opočno	7,108	0.670
238	Mimoň	7,034	0.600
239	Český Brod	7,025	0.554
240	Votice	6,948	0.622
241	Heřmanův Městec	6,919	0.526
242	Zruč nad Sázavou	6,895	0.686
243	Horní Slavkov	6,880	0.748
244	Hostinné	6,873	0.606
245	Fulnek	6,832	0.619
246	Dukovany	6,760	0.387
247	Bojkovice	6,723	0.753
248	Valašské Klobouky	6,592	0.608
249	Horšovský Týn	6,555	0.658
250	Nýrsko	6,552	0.759
251	Toužim	6,512	0.779
252	Nové Strašecí	6,393	0.529
253	Trhové Sviny	6,356	0.612
254	Polná	6,272	0.706
255	Planá	6,208	0.625
256	Česká Kamenice	6,151	0.609
257	Ždírec nad Doubravou	6,092	0.742
258	Vizovice	6,085	0.537
259	Moravský Beroun	6,068	0.862
260	Dobřany	6,037	0.482

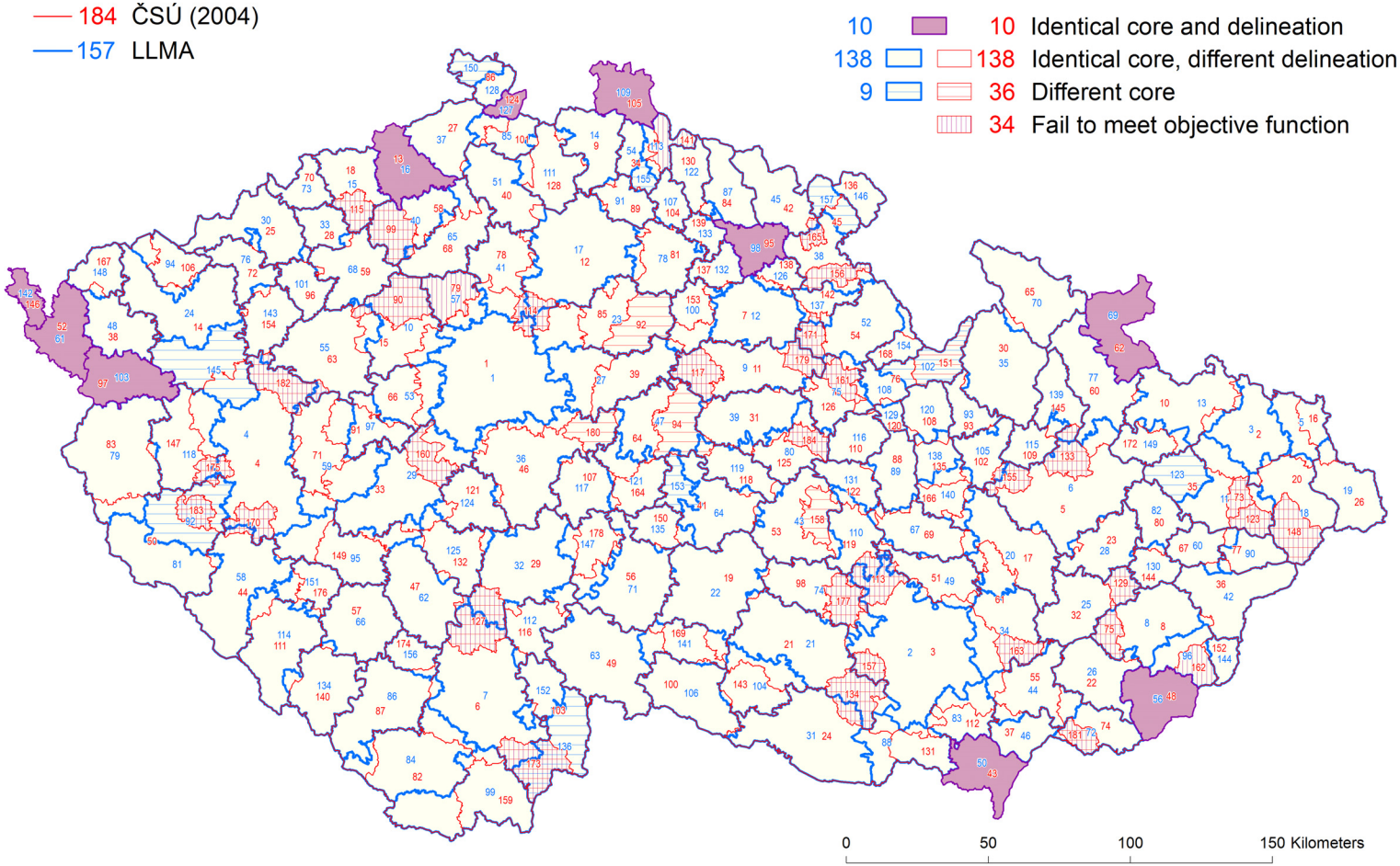

Figure S1 LLMAs and labour micro-regions (ČSÚ). Source: ČSÚ (2004); own design.

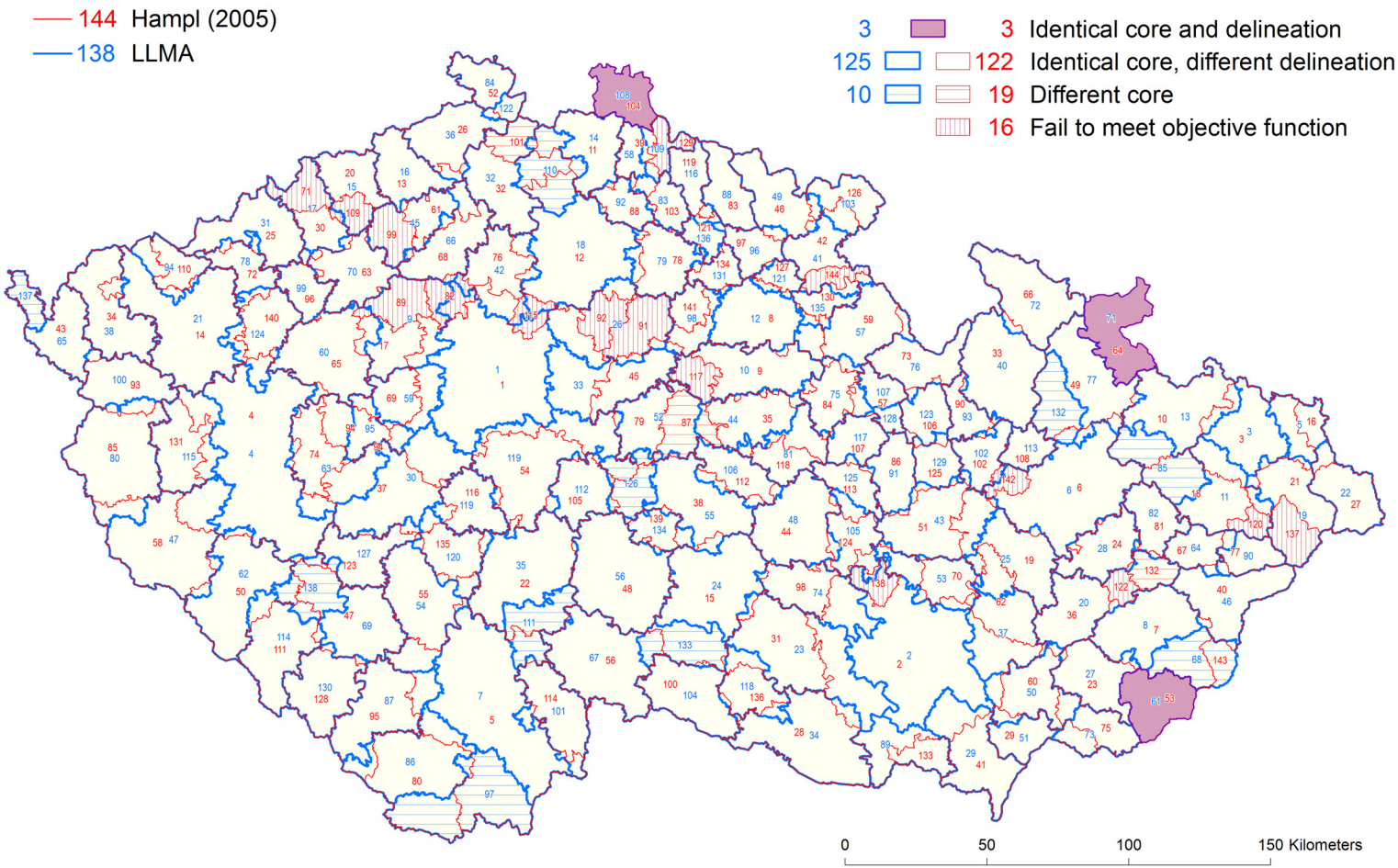

Figure S2 LLMAs and elementary functional regions (Hampl). Source: Hampl (2005); own design.

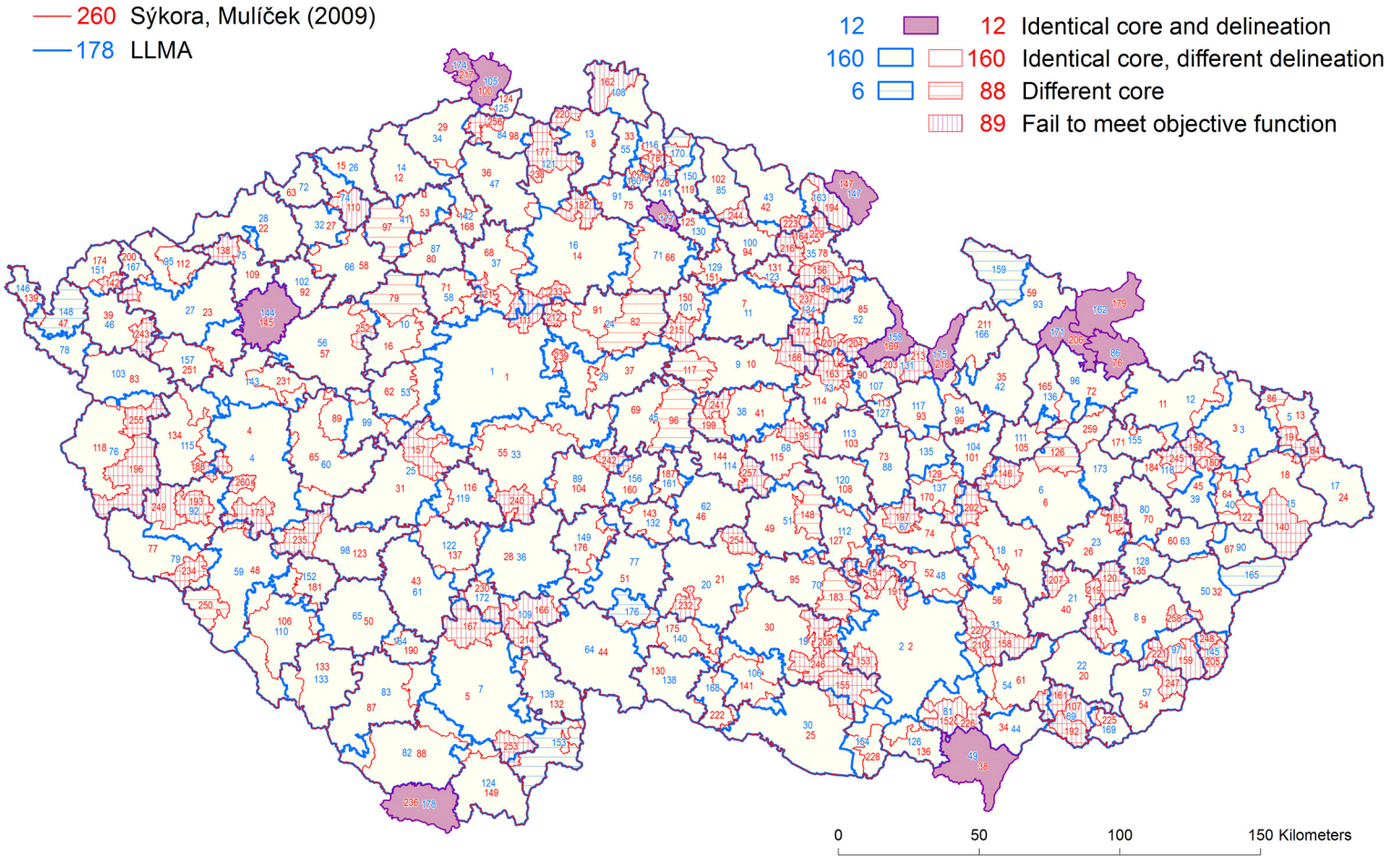

Figure S3 LLMAs and complex micro-regions (Sýkora, Mulíček). Source: Sýkora and Mulíček (2009); own design.