

# Influence of Criteria of Built-up Areas in the Village to the Total Share of Municipalities on Shared Taxes

Jiří Čermák, Martin Gürtler

**Abstract:** *There has become valid the limiting condition of 10 hectares per an inhabitant in the criterion of cadastral acreage of municipalities in the budgetary taxes. The limiting condition has been valid from the year 2013. The limiting condition was implemented to prevent groundless amount of incomes to a budget of some municipalities, especially border municipalities which municipalities get on the basis of its large cadastral area in relation to the cadastral area of the whole Czech Republic. The topic of the article is to compare of incomes of municipalities on the basis of the sole criterion – cadastral area with limiting condition 10 hectares per an inhabitant or built-up area in a municipality ( $m^2$ ). The goal is to find out if the new limiting condition will influence more to the decreasing of extreme values in redistribution in connection with compare criterion of built-up area in a municipality ( $m^2$ ). The criterion of built-up area is the equivalent to the limiting condition of 10 hectares which the Ministry of Finance of the Czech Republic applied in calculation of the share taxes due to mentioned facts. Final distribution of the financial means to the budget of the municipalities is shown in the graphical representation and there are observed incomes per inhabitant in 4 big cities – Prague, Brno, Ostrava and Plzeň and median values of all others municipalities. The results show that in comparison of the criterion of cadastral acreage of municipalities with limiting conditions and built-up area in a municipality ( $m^2$ ) the extreme values are decreasing if both criterions are used. But in the criterion of built-up area of municipality is the redistribution of means more homogeneity per one inhabitant. We can pronounce that if we use the criterion of rebuilt area of municipality the financial means are more redistributed in favour of bigger settlement unit while in the criterion of cadastral acreage of municipality it is more the opposite.*

**Keywords:** Budgetary Taxes · a Criterion of Cadastral Acreage of a Municipality · a Criterion of Built-up area of a Municipality · Incomes of Municipalities

**JEL Classification:** H72 · H40

## 1 Introduction

In 2008, a new legislation was adopted in the framework of budgetary tax determination (further only BTD) which enlarged originally the only criterion of number of inhabitants in a municipality converted according to coefficients of particular size categories by other 2 new criteria – a simple number of inhabitants and a cadastral acreage of the municipality.

The BTD system in force from 2008 changed a way of calculation of shared taxes mainly in a relation to the most criticized deficiencies from the side of professional public and mayors. Step transition of size categories were replace a gradual transitions, also budgets of the smallest municipalities were strengthened by means of introduction of simple inhabitant number criterion, and for some small municipalities with a low number of inhabitants but large cadastral acreage of the municipality also introduction of criterion of cadastral acreage of municipality with the same criterion weight 3 %. In the framework of new valid legislative from 2013, one new criterion - a number of children in kindergartens and pupils of primary schools (further only number pupil criterion) – is introduced among 3 current criteria. At the same time also weights of particular criteria have changed owing to introduction of the number pupil criterion. In the cadastral acreage criterion the weight

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of criterion 3 % remained unchanged; however, a newly set limiting condition in this criterion is so called a value of included size of cadastral area which corresponds with the equivalent 10 ha per one inhabitant in relation to the total included cadastral area in a calculation of share of municipality in shared taxes. The acreage of cadastral area of a municipality which is above the equivalent value in relation to the number of its inhabitant is not newly taken into account.

## 2 Literary review

The state administration can be marked generally as a combination of all government units which in broader concept represents a summary of elected bodies and public authority (executive) bodies at particular government levels on the given state territory. These bodies then together create the public sector. Concrete forms of government in particular states influence in some extent also mutual relations among particular subjects of power in the state (Brueckner, 2009).

In the framework of the state administration it is spoken about its decentralization which is connected with self-reliance and a certain independence of bodies of a local administration. According to the World Bank Institute it is possible to mark decentralization a shift of powers and responsibilities for public function from the central government to lower government levels which are either inferior or partially independent government units. According to Rondinelli (2001) decentralization is divided into political, administrative and economic (also a term fiscal is used) decentralization. If it is spoken about the term decentralization in the framework of fiscal federalism, e.g. Tanzi (2001), it is distinguished only between administrative and fiscal decentralization.

With the administrative decentralization the fiscal decentralization is closely connected. According to Rondinelli (2001) it is crucial in realized restructuring or reorganization in the public sector because it deals with thinking about transparent and efficient ways of financing of public sector.

With the shift of powers and responsibility at a lower government level, looking for an optimal rate of this decentralization of public sector and increase in efficiency of improvement of financing of needs in the public sector is connected. With not only these considerations, which concern fiscal decentralization, the fiscal federalism deals (Bailey, 2004).

Resulting form of redistribution of financial means in favour of local governments and a rate of powers to their autonomic choice differs in particular countries and depends considerably on political decisions, constitutional organization, residential structure and a concrete situation in which local governments in relation to the fiscal decentralization find (Brueckner, 2009).

Differences in particular systems of financing reflect also differences within the system of public budgets because re-distribution processes within the budget system are set in order to suit as best as possible to a hierarchical structure of bodies of state and local government, including to setting of the mechanisms of government financing themselves.

Jílek (2008) states to that that allocation of means among particular government levels should be transparent and a certain amount of means should be predictable for local government levels. Peko-ová (2004) alleges to this point that also constancy of mechanisms according to which means are allocated, and last but not least certain powers of decentralized government levels for obtaining and use of financial means can significantly help to the predictability.

Neyapti (2010) writes that derivation of incomes for particular government levels is not completely simple because a quantity of incomes of local governments (from a view of successful realization of fiscal decentralization) should correspond with the optimal amount and also a determination of responsibility for security of incomes and subsequently expenses of particular government levels in relation to local preferences of citizens of the given society. In financing of local governmental

levels it is possible to use tax tools (tax determination), debt instruments and subsidies<sup>2</sup>. (Hamerníková & Maaytová, 2007).

It is very difficult to set unambiguous recommendation to the tax determination. There is not a uniform opinion what ways of tax determination as the most suitable should be or will be applies in particular countries. This fact is rather a result of political negotiation and polity arising from historical presumption and development of the given area (Oakland, 1996).

In the framework of tax determination it is important, from a view of fiscal relations among particular local administrations, to determine who will have the power to tax and what will be the tax subject. Within the fiscal decentralization many aspects are important on base of which it is decided mainly about what level of government will impose a tax burden; who will carry out administration of these taxes; what will create the tax base, and in what way the calculation of tax will be realized in the set base. Last but not least it is necessary to determine, what taxes will be used and whether they are suitable for application in the tax share system (Olson, 1969).

According to the tax theory in the framework of fiscal decentralization in the property tax it is dealt with one of the most suitable taxes applied by local governments because as Joumard (2002) states, the property tax has an immobile base; it is difficult to avoid this tax; the taxation happens on utility principle (these problems are dealt also by Oates), and a revenue of this kind of tax is for local governments relatively well predictable and is not subject to wider swings in the national economy.

Also shares of lower local and regional authority units are included in this tax very often, or this kind of tax is administrated as an exclusive income of local and regional authorities. As Jílek (2008) states, many countries use this type of tax, mainly Canada, Australia, Ireland, New Zealand, Mexico, Great Britain, but also France, the Netherlands and the USA.

In comparison a share of property tax in total incomes of the budget in France and other countries it is possible to find out that there are big differences among countries. In France, this ratio reaches high values, over 35%. A similar share it is possible to see for example in Spain and Portugal, a significantly higher share is for example in the Netherlands where this value reaches almost 63% (Garcia-Mila, 2003). However, an opposite situation is in Austria where a share of property taxes in the total incomes is almost neglectable because it creates less than 1%.

However, nor in the Czech Republic the share of property taxes in the total quantity of obtained means is too high because it amounts only c. to 5% (Vital – Durand, 2004). Among other types of taxes which are used within tax sharing there are the income tax of individuals (Gruber uses a term employment tax), the tax on income of legal entities (Gruber uses a term corporate tax), and the consumption tax (Kenneth, 2014). Jílek (2008) states that a very high share of this type of tax incomes at the local level (mainly the income tax of individuals and legal entities) is in Scandinavian countries where in Sweden it is even 100 % share, further also in Switzerland and on Iceland.

Within possible approaches of realization of tax determination McLure (2001) defines three basic ways. It is dealt with use of local taxes, surtaxes and share taxes.

The system of local tax is legislatively and administratively independent from viewpoint of hierarchical arrangement of public administration in the framework of a given state. Every unit determines what local taxes it will apply, at what tax base, and it has also a possibility of choice of a concrete tariff. According to Peacock and Wiseman (1961), the group of local taxes is various in many countries. Usually two main forms of local tax are used. In the first case, a municipality collects exclusive local taxes with an exclusive tax base. The second possibility is overlap of tax base. The state and lower government levels share the tax base.

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<sup>2</sup> This work will be further focused in more details on tax incomes.

For example local taxes in Sweden are collected in form of a certain per cent of income of legal and natural entities who live permanently in the area of local society or they have their seat here. Municipalities and areas/regions decide independently about the height of local tax in by state-allowed limit. The corporate and personal income tax as a direct tax has two parts because it subdue to some extent to the local tax, and from a certain height this income is also taxed by the state (Sveriges Kommuner och Landsting, 2008).

According to OECD the own taxes are a very important source of incomes for lower government levels. At the same time they create a very substantial part from a view-point of the budget structure of lower government levels. Plentifully used possibility is also sharing of taxes as well as subsidies. According to OECD it is difficult in some cases of fiscal decentralization to determine borders between tax sharing and a provision of non-purpose subsidy in budgets of lower government levels.

Other case in the framework of tax determination is a system of surtaxes. In this case both the government levels (the central and the regional) levy the same tax. However, the local and regional authorities determine surcharges to the tax rates which are defined by the central government. In case of interest of the central government in achievement of comparable level of public estates it is necessary its intervention in this system (Peacock, 1961). Mostly externalities are compensated by means of subsidies, eventually by special taxes (e.g. in Sweden such undesirable externalities in provision of standard of public services are compensated by an institute of so called compensatory tax which is controlled and redistributed by the state). However, also rise of vertical fiscal disparities in relation to distribution of tax base among particular government levels can happen (Taxes in Sweden 2011). Therefore the current system of local government compensatory mechanism was adopted on the 1st January 2005. The task of newly adopted legislative was also balanced position of local government levels in the area of incomes and also at the level of provided quantity and quality of public goods and services. The compensatory system in Sweden can be divided into 5 different parts: income equalization of local government levels, levelling of costs for provided goods and services, structural grants, transfer payments from central government level, and specific grants/payments from/towards the central governments determined only to chosen local government levels on base of in-advance set parameters of provision/payment (Sveriges Kommuner och Landsting 2008; Lotz, 2013).

The last used type of tax determination is in the CR the system of shared taxes. As Kenneth (2014) states, it is dealt with such a system where tax incomes are divided vertically among central and local governments and also horizontally among particular decentralized governments. At present one of the most widespread ways to secure regional budgets tax incomes. Ways of tax sharing differs in many countries (Marková, 2000).

#### **Tax sharing exists in two forms:**

- 1 Local administrative units gain a share in the nationwide tax yield (This system is applied also in the CR, Slovakia, also in Austria, Belgium, Germany, Spain, Italy, Poland and other countries) (Provazníková, 2007; Kenneth, 2014; Casinello, 2008; Pulecio, 2007).
- 2 Local administrative units gain the given per cent of tax yields which arose on their area (an example can be sharing of personal income tax in Spain, a tax on profits of corporations in Finland, also a yield from tax on incomes of natural persons from enterprise in the CR) (Provazníková, 2007; Kenneth, 2014; Casinello, 2008; Pulecio, 2007).

Also according to the OECD it is important in tax sharing to distinguish from whether particular shares within tax sharing is closely connected with what is generated in the area of the appropriate lower government level, or whether re-distribution processes happen within the system. In existence of re-distribution processes within tax sharing a change of fiscal autonomy of lower government levels can happen as well as a change in motivation of local government levels to additional gaining of incomes. Therefore within the tax determination is very important approach to creation of tax sharing in particular countries always individually, in relation to needs and specifics of particular

systems of financing of lower government units when it is necessary to decide what form of tax sharing is as optimal as possible in the given case.

Very often also a question of choice of suitable criteria, on base of which the means are redistributed, is connected with the financing system in form of shared taxes (Aginagalde, 2007). In the framework of tax sharing the financial means are distributed very often according to the criterion of number of inhabitants in particular regional units. However, determination of share in tax or taxes according to the number of inhabitants is often criticized from the side of professional public. Therefore, in the collection of indicators, besides the number of inhabitants, there is also a number of houses, or an acreage of the regional unit, a length of road network, an average income of inhabitants in comparison with the nationwide average, a level of local educational system, a level of provided health or social services and so on. In a theory of local finances, generally a combination of four to five criteria with various statistic weight are recommended, however, the criterion of number of inhabitants has usually a relatively strong weight, its values move about 50 % and more (Team of authors, 2005). For example, in distribution of income tax from dependent activity, an income tax of legal entities, and a turnover tax, a criterion of number of inhabitants or a very interesting criterion of financial power of a municipality, under content of which a power of yields of own taxes is hidden, are used in Austria. In case of number of inhabitants it holds, according to applicable legal methodical calculation, that the number of inhabitants is multiplied by a coefficient which is the higher the bigger is the number of inhabitants in the municipality (Wildmannová & Šelešovský, 2002; Casinello, 2008). For example Spain tax system includes three kinds of taxes: taxes, payments, and special contributions (special levies) (Casinello, 2008). Tax policy in Spain is firmly in hands of the central government except Basque and Navarre. Basque has a duty according to Economic agreement to pay so called quota (a payment) to the state for operation of general services from the side of state for inhabitants of Basque. On base of the Economic agreement Basque pays 6.24 % from expenses realized in the whole Spain from which benefit flows also to Basque inhabitants (Bosh & Durán, 2008).

From the above mentioned reasons for example in Spain criteria within tax sharing are applied both at the state level and also the local level, concretely in areas Basque and Navarre. In this case the system is similar as in the Czech Republic because it also uses adjusting coefficients value of which is higher with increasing number of inhabitants. The remaining part of means are distributed according to fiscal effort of particular municipalities, according to tax capacity of particular municipalities relative to the number of its inhabitants and according to the number of kindergartens, primary and secondary (high) schools. In the historical area Basque, besides the above mentioned criteria very often used also in other countries, also other specific criteria are used, for example a length of beach, the unemployment rate, or a size of inter-regional disparities, but also a concretely set quantity of means determined for redistribution in the framework of tax sharing only for certain municipalities meeting condition of size category of municipalities. Mostly it is dealt with a group of small municipalities up to 1100 inhabitants, but also larger residential units with number of inhabitants even over 10 000 (Oria, 2010; Pulecio, 2007).

In the framework of tax sharing in Slovakia, the system redistribution of means is similar as in the Czech Republic because it also uses adjusting coefficients in relation to increasing number of inhabitants, so the same principle as in Spain. According to Belajová and Balážová (2004) plentifully used criterion of the number of inhabitants of municipality, a number of pupils, and a number of inhabitants over 62 years belong among local used criteria for redistribution of income tax of legal entities within the tax sharing. As a subsidiary criterion, the altitude of a municipality and its adjusted coefficient are used.

On the contrary in Sweden a levelling on the income side happens among particular municipalities by means of a criterion of tax capacity, and on the expenditure side incomes among particular regional authorities are evening up mainly by the help of socio-demographic criteria and to them connected social services and their provided quantity in the nationwide comparison (Sveriges Kommuner och Landsting, 2008).

Despite the above mentioned inadequacies of this system it is possible to speak in shared taxes about many advantages, if the whole system is well set. It is dealt with:

- a stability of tax incomes of regional budgets providing presumption of interconnection of a yield from shared taxes of income type with non-targeted taxes;
- decrease of tax inequality among particular regional authorities;
- increase of powers of regional authority in decision making about for what the tax yield will be used;
- independency of tax collecting on place of accounting of shared tax base;
- a reduction of administrative costs for administration and collection of these taxes which is enabled by centralization of the administration and collecting of shared taxes (Peková, 2004).

On the contrary, among strong disadvantages of shared taxes there it is possible to rank that:

- a dependence of regional authorities on state decision, respectively on fact how big share will flow in budgets of regional authorities from shared taxes, grows;
- they do not motivate regional authorities for creation of own incomes, mainly non-tax ones;
- they decrease responsibilities of regional authorities for amount of their expenses because decision making about tax incomes and their collecting at the central level is separated from decision making about expenses at local level which does not enable efficiently manage and make decisions about expenses of regional authorities for local goods and services (Peková, 2004).

In the theory of local finances, requirements for tax incomes of budgets of lower government levels are emphasised. They relatively fundamentally influence an independence rate, respectively decision making about allocation of resources for provision of public local goods concerning the extent and their quality. Among these requirements for efficient tax system, as Peková (2004) and Oates (2011) state, there are:

- a steady tax base in time which strengthen decisive possibilities of local governments within the allocation function;
- a steady mechanism of calculation for balancing the state with regional authorities in time, mainly in the area of tax incomes, in case of use of possibility of so called shared taxes;
- an easily ascertainable tax duty for a payer;
- effectiveness – a neutral impact on economic decision making of tax payer;
- an adequate tax competence of local authorities, however, a minimization of tax competition among municipalities and regions;
- minimization of tax avoidance;
- impossibility of a transfer of tax yield to other regional authority;
- simplicity of the system and a cheap tax administration – often causes of decentralization of the tax administration and collecting.

Every system of financing is so specific in particular countries that it is necessary to approach its construction individually on base of differences of residential structure and the size of regional authorities in a concrete country. Also for this reason the systems of financing of regional authorities and their form in particular countries are often very specific thanks to which they often substantially differs from each other.

### **3 Aim and methodology**

An often argument which the Ministry of Finances of the Czech Republic (further only MoF CR) stated, for what reasons it also implemented the limiting condition, was in some municipalities, mainly border ones, insubstantially high sum flowing in their budget, which they obtained on base of a high share of its wide cadastral area in relation to the total acreage of the Czech Republic.

Therefore, the aim of this paper is comparison of incomes of municipalities which will be distributed in budgets of municipalities on base of the only criterion – a cadastral acreage with a limiting condition 10 ha per one inhabitant or built-up area in the municipality (in m<sup>2</sup>). The resulting distribution of financial means in budgets of particular municipalities is displayed in graphical illustrations and it is also monitored in incomes per one inhabitant in 4 large towns – Prague, Brno, Ostrava and Plzeň, and also as a median value for all other municipalities. On base of in this way made analysis the aim is to find out whether in comparison of applied modifies existing criterion of cadastral acreage of municipality with the limiting condition corresponding with the equivalent 10 ha per one inhabitant and with application of the criterion of built-up area in the municipality (in m<sup>2</sup>) incomes per one inhabitant within basic collection of municipalities of the Czech Republic will change, respectively whether there will be a better homogeneity in redistribution of financial means in shared taxes in case of use in some of two above mentioned criteria. An aim of the paper is also to verify a presumption that in application of built-up area in the municipality there will be a higher allocation of means in favour of rather bigger settlement units and monitored 4 large towns. For processing of results, data about cadastral acreage of municipalities from a decree No. 264/2013 Col., to the law No. 243/2000 Col., on budgetary determination of taxes, subsequently amended, and also data from unpublished database of the Czech Office for Surveying, Mapping and Cadastre (COSMC) about built-up area in particular municipalities in the CR (in m<sup>2</sup>) were used. For processing of data, knowledge of descriptive and exploratory statistical analysis are used. All calculations as well as visualization of obtained results are realized with use of software OBM SPSS, eventually MS Excel.

#### 4 Results

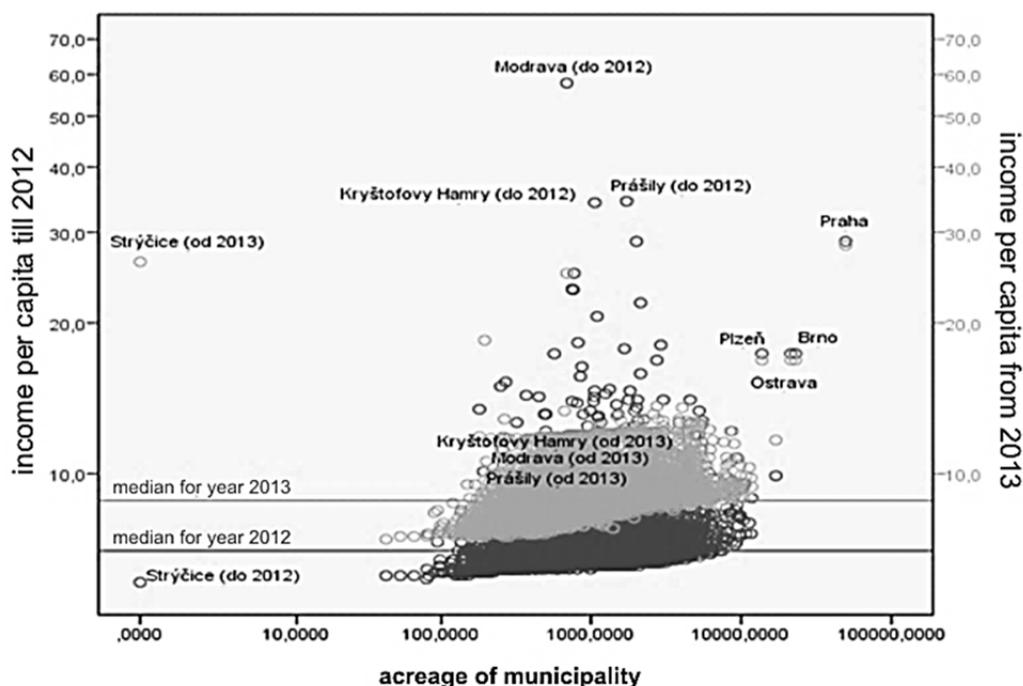
A limiting condition 10 ha per one inhabitant within the criterion of cadastral acreage of municipality touched above all the small border municipalities in the south of country and in north-west part of the republic. Generally it is dealt with 57 municipalities with numbers of inhabitants not exceeding 600 inhabitants; many of these municipalities have even tens of inhabitants. In comparison with incomes in 2012, in most municipalities there was decrease at average to 73.2% of the original amount of incomes of touched municipalities. The most municipalities, about 20, is situated in South-Bohemian and Plzeň regions by reason of close borders with Austria. About 10 municipalities is found at borders with the Federative Republic Germany, so its east part, concretely in the region Karlovy Vary and Ústí nad Labem.

In other regions, there are local and regional authorities with non-included total cadastral acreage in an interval from two to four municipalities. The biggest fall was recorded in municipalities Modrava, Prášíly and Kryštofovy Hamry when the fall in case of Modrava was 18.8 % and in other two municipalities the same on 32 % of original amount of incomes. On the contrary the incomes decreased less in comparison with the year 2012 in two municipalities – Horní Vilémovice and Louka, in the same way on a level of 96.6 %. In conversion of incomes per one inhabitant it means in Horní Vilémovice and Louka an income decrease by 400 CZK, while in Modrava it decreased almost by 50 400 CZK, and in Prášíly and Kryštofovy Hamry by c. 25 000 CZK. All three municipalities showed unjustified extremes in the framework of redistribution of incomes per one inhabitant. Incomes per one inhabitant in Modrava were 2times higher than in Prague and in other two municipalities the incomes were by almost 10 000 CZK higher than in Prague.

Even if it is not dealt with a small number of municipalities, in relation to the total number of municipalities in the Czech Republic incomes of these municipalities very significantly decreased year-on-yearly just owing to change of this criterion, respectively its maximal included value in relation to the number of inhabitants of the touched municipalities. Municipalities affected by this adjustment had to take into account in a very short time this significant income failure in a construction of budget just for the year 2013. Also, their budgetary perspectives had to be adjusted in particular municipalities. In case of financed investment activities realized on base of presumptions of the amount of incomes in the following years significant and serious problems with credit payments

(foreign resources) could happen in these municipalities realized for security just of these investment activities. Therefore, an analysis of basic collection of municipalities was carried out focused on incomes per one inhabitant in redistribution system originally applied till 2012 (the total quantity of means to municipalities according to BTD in this year) and in the new system from 2013 (a presumption of quantity of means redistributed to municipalities within share of taxes according to BRD) in relation to redistribution of financial means by means of the criterion of size of cadastral area of particular municipalities. The result of analysis is illustrated in the following graph.

**Graph 1** Income in thousands CZK per one inhabitant according to acreage of municipality in 2012 and in 2013 (logaritmik scale of axes)



Source: own processing on base of data CzSO and MoF CR

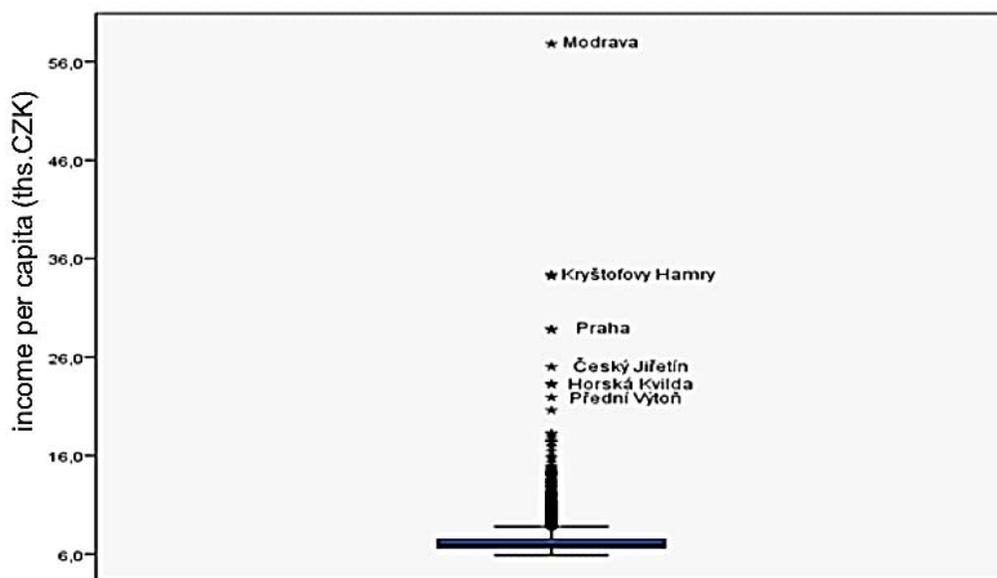
From the graph 1 it is obvious that in the system of financing of local and regional authorities till 2012, when the limiting condition of this included value in height of maximally 10 ha per inhabitant was not implemented, this criterion favourably influenced increase of budgetary incomes mainly in the group of small municipalities and small border municipalities (for example Prášily, Modrava, Kryštofovy Hamry). At the same time there are evident differences in volume of allocated means in relation to the other municipalities, in four large towns – Prague, Brno, Ostrava, Plzeň. In 2013, when the limiting condition 10 ha per one inhabitant was used from the side of MoF CR for the first time, it is possible to see that already small municipalities Modrava, Prášily a Kryštofovy Hamry do not appear in extreme values. In all four large towns - Prague, Brno, Ostrava, Plzeň - a slight decrease in incomes was recorded which is given rather by a slight decrease of incomes per one inhabitant than by efficiency of this limiting condition in the criterion of cadastral acreage of municipality. In a general comparison with the year 2013 it is obvious that the median value of income per one inhabitant is higher in 2013 than in the foregoing year. Extreme values for four large towns stay almost unchanged, however, in a year-on-year comparison of the whole basic collection of municipalities extreme values significantly decreased in 2013 and redistribution of incomes per one inhabitant, according to this criterion with the limiting condition 10 ha, reaches better homogeneity also in 2013. Generally it can be stated that the MF CR intention to remove most extremes in redistri-

bution, which happened within redistribution of financial means according to this criterion without the limiting condition 10 ha, was successful in the biggest extremes. It is very interesting in relation to this limiting condition in the criterion of cadastral acreage of municipality to watch in what way incomes of municipalities will be influenced if the criterion of cadastral acreage of municipality would be replaced by a criterion of built up area in the municipality. Also this is the reason why the following calculations and graphical illustrations count on a modification of this existing criterion.

### Incomes per one inhabitant in shared taxes in 2012 and 2013

For the present, within the analysis of financing system of local and regional authorities in the Czech Republic in 2012 (the real volume of means) and 2013 (a presumption of MoF CR) the whole income redistribution was researched in connection with one criterion and a converted amount of financial means per one inhabitant. However, the following graphical illustration offers a view of a system of financing of regional authorities in 2012 according to redistribution of financial means to municipalities which are converted to one inhabitant.

**Graph 2** Distribution of incomes from budgetary determination of taxes (BTD) per one inhabitant in 2012 (logarithmic scale of axes)

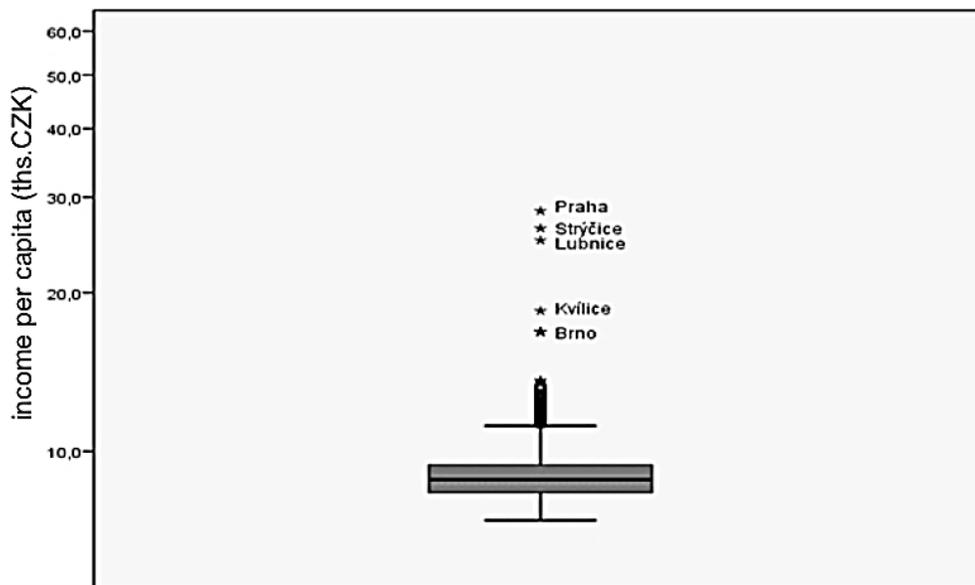


Source: own processing on base of data CzSO and MoF CR

From the graph 2 it is obvious that interquartile span is relatively small. It explains also why many municipalities are found above the border of non-outlying maximum and create a relatively significant zone of outliers. Then, above all the city Prague, Kryštofovy Hamry and Modrava achieve extreme values. In 2012 there is evident a relatively strong asymmetry in income redistribution per one inhabitant from the budgetary tax determination. It is given mainly by setting of weights of particular criteria, especially the criterion of cadastral acreage of municipality which in case of Kryštofových Hamrů and Modravy, but also in other small municipalities and smaller residential units in border area, whose size of cadastral area is often comparable with municipalities having even several thousand of inhabitants, by far do not reach this equivalent in relation to the number of inhabitants. In the city Prague this value is given above all differently set coefficient for conversion of inhabitants but also by particular coefficients which are set in four so called transitional size categories.

On the contrary the following graphical illustration offers a view of the system of financing of local and regional authorities in 2013 according to redistribution of financial means to particular municipalities, also converted per one inhabitant.

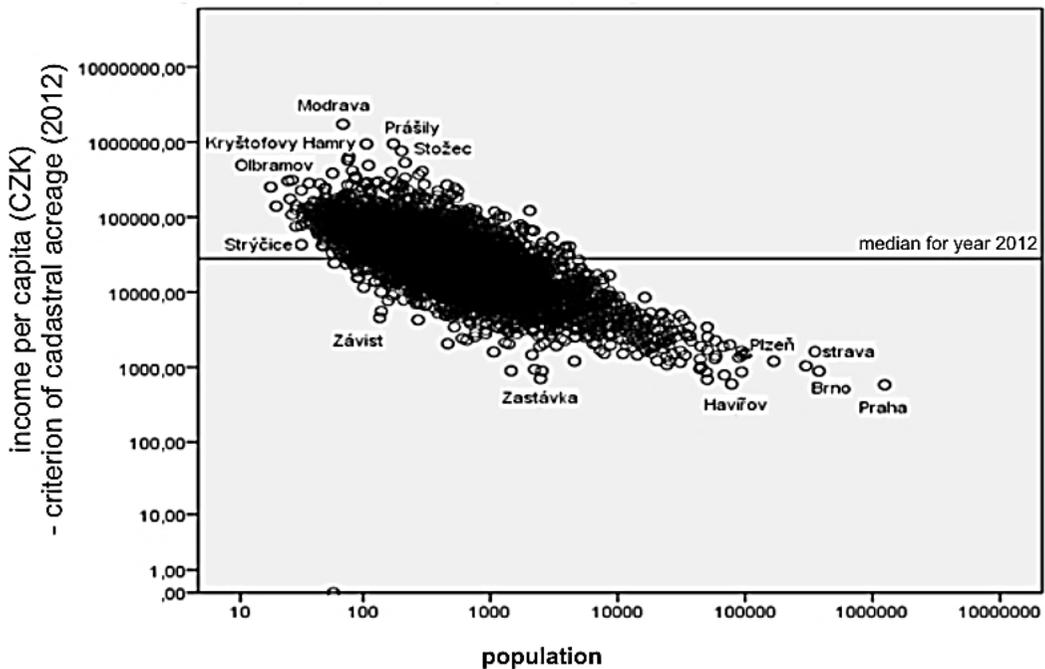
**Graph 3** Distribution of incomes from budgetary tax determination (BTD) per one inhabitant in 2013 (logarithmic scale of axes)



Source: own processing on base of data CzSO and MoF CR

From the graph 3 it is obvious that interquartile span is much bigger against 2013. It also explains why a smaller number of municipalities is found above the border of non-outlying maximum and creates a less important zone of outliers. Above all the Prague reaches the extreme values as well as municipalities Strýčice and Lubnice. Separately, above the zone of outliers there is also a municipality Kvilice and the town Brno. In 2013, there is obvious a significant improvement in relation to asymmetry in income redistribution per one inhabitant from BTD. It is given mainly by a newly applied criterion of number of children in kindergartens and pupils in primary schools, a change of weights of remaining criteria, and mainly by introduction of limiting condition 10 ha per one inhabitant of municipality in relation to the criterion cadastral acreage of municipality which meant in 2012 mainly for municipalities Kryštofovy Hamry and Modrava, but also other small municipalities and smaller residential units in borderland whose size of cadastral area is often comparable with municipalities having even several thousand of inhabitants, more financial means from BTD in favour of these municipalities than in 2013, this owing to non-included total size of cadastral area of these municipalities, but inclusion only up to the height of equivalent which corresponds with the number of inhabitants. In the city Prague, but also the town Brno, the outlier is given mainly by differently set coefficient for conversion of inhabitants from other municipalities, but also by particular coefficients set in four so called transitional size categories. While in 2012 the town Brno is not separately figured in the graphical illustration, in 2013 thanks to a smaller zone of outliers the town Brno is already placed as a separate outlier.

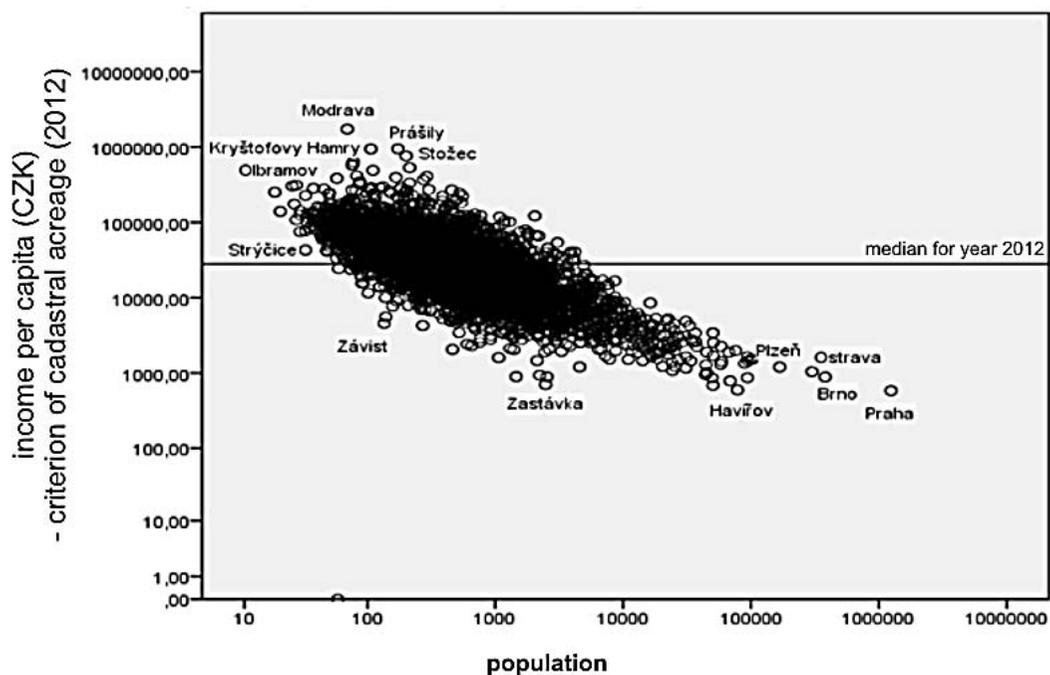
**Graph 4** Income in thousands CZK per one inhabitant according to criterion of cadastral acreage of municipality in 2013 (logarithmic scale of axes)



Source: own processing on base of data CzSO and MoF CR

The above mentioned graphical illustration (graph 4) shows an income distribution (according to the only one criterion of cadastral acreage) converted on one inhabitant in 2012 (the real among of means) when in the criterion of cadastral acreage of the municipality the limiting condition 10 ha per one inhabitant was not used yet from the side of the MoF CR. If only the criterion of cadastral acreage of municipality were applied for redistribution of means, as it is obvious from the graph 4, there would be a significant fall of incomes of four biggest towns (Prague, Brno, Ostrava and Plzeň) whose amount would move at a level around 1000 CZK, and on the contrary there would be an increase of incomes converted per one inhabitant in all other municipalities. The biggest increase of incomes per one inhabitant would happen above all in border municipalities which have big acreage, but a small number of inhabitants. In graphical illustration there are again municipalities Modrava, Kryštofovy Hamry, Prášíly and Strýčice which appear also in the graphical illustration of income distribution according to BTĐ per one inhabitant according to the acreage of municipality in 2012 (graph 1). On the contrary the below mentioned graph 5 offers a graphical illustration of income distribution (according to the only criterion of cadastral acreage with limitation) converted per one inhabitant in 2013 when in the criterion of cadastral acreage of municipality the limiting condition 10 ha per one inhabitant was already used from the side of the MoF CR. If only the criterion of cadastral acreage of municipality were used with setting of this limiting condition, there would be such a ceilings of incomes converted per one inhabitant maximal value of which would move at a level around 185 000 CZK. In comparison with the foregoing graph 4 it means decrease of extreme values in some municipalities by hundreds of thousands of crowns in case of Kryštofovy Hamry, Prášíly, Modrava by more than 800 000 CZK, respectively by more than 1 million CZK in case of Modrava. Vice versa, incomes of bigger residential units with corresponding number of inhabitants in relation to the limiting condition 10 ha in cadastral acreage of municipality would be slightly strengthened by redistribution of means from municipalities with a small number of inhabitants, but a large cadastral area.

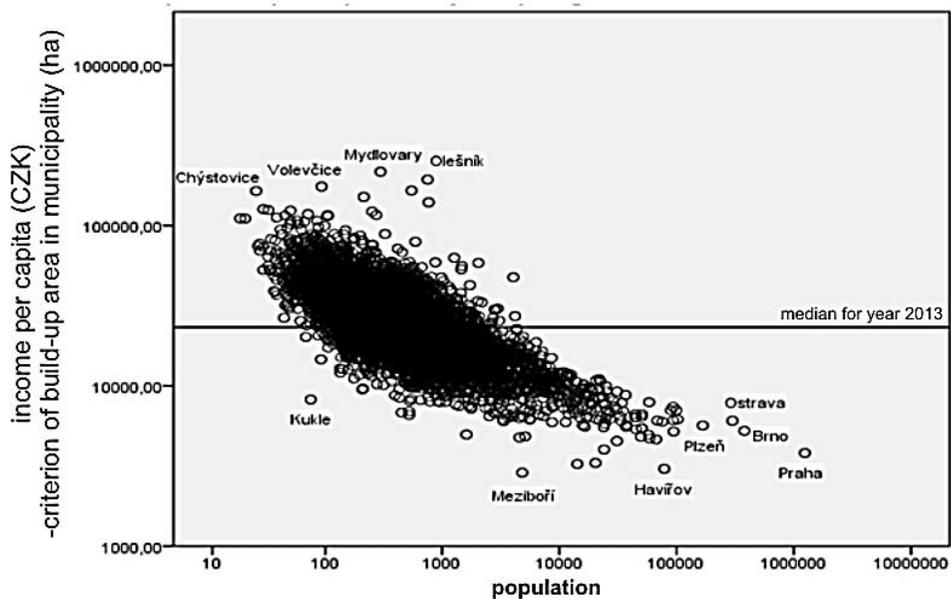
**Graph 5** Income in thousand CZK per one inhabitant according to criterion of cadastral acreage in 2013 with application of the limiting condition 10 ha



Source: own processing on base of data CzSO and MoF CR

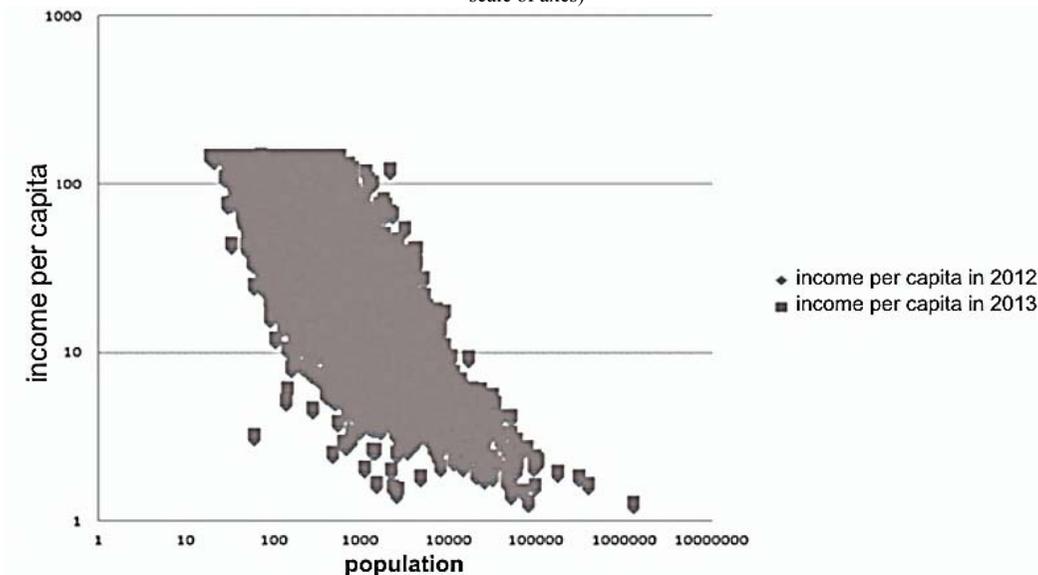
The graph 6 offers graphical illustration of income distribution converted per one inhabitant in 2013 with application of the only criterion – built-up area in a municipality which is replaced by the original applied criterion of cadastral acreage in the municipality. As it is obvious from the graphs 4, 5 and 6, the median value in application of criteria of built-up area is lower in the municipality than in application of the criterion of cadastral acreage of the municipality without or with the limiting condition 10 ha. At the same time the number of extreme values which some municipalities reached in comparison with the graph 4 decreased. Compared to the graph 5, significantly smaller number of municipalities is found in extreme values because the number of municipalities incomes of which are with application of the criterion of built-up area in the municipality, in conversion per one inhabitant, above a level 100 000 CZK is only approximately about 20 with the fact that the most means would be given in the budget of the municipality Mydlovary (c. 270 000 CZK), then the municipality Olešník (c. 250 000 CZK), followed by the municipality Volevčice with approximately 220 000 CZK and the municipality Chýstovice with approximately 180 000 CZK. It almost corresponds with the maximal value of redistributed means converted per one inhabitant within the criterion of cadastral acreage of municipality with the limiting condition 10 ha. The remaining municipalities lie above the border 100 000 CZK would not exceed the sum 180 000 CZK per one inhabitant.

**Graph 6** Income in thousands CZK per one inhabitant according to criterion of built-up area in municipality in 2013 (logaritmick scale of axes)

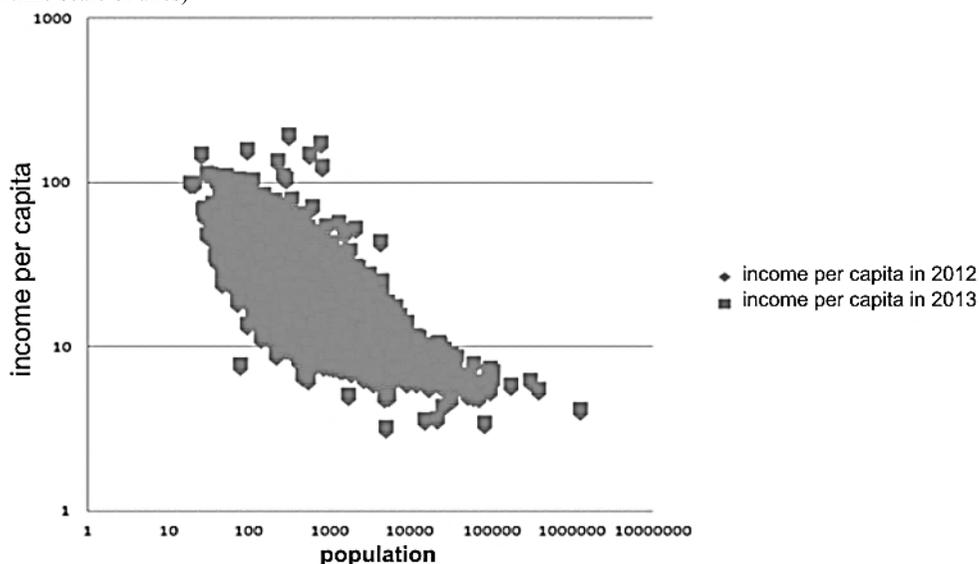


Source: own processing on base of data CzSO, MoF CR and COSMC

**Graph 7** Redistribution of means according to criterion of cadastral acreage of municipality in 2012 and 2013 (logaritmick scale of axes)



Source: own processing on base of data CzSO, MoF CR and COSMC

**Graph 8** Redistribution of means according to criterion of built-up area in municipality in 2012 and 2013 (logarithmic scale of axes)

Source: own processing on base of data CzSO, MoF CR and COSMC

A distribution of means per one inhabitant is also offered by a graphical illustration in MS Excel with use of the criterion of cadastral acreage of municipality in 2012 (a real quantity of means) and 2013 (a proposal according to MoF CR) with the limiting condition 10 ha per one inhabitant and with use of the criterion of built-up area in the municipality in 2012 (the real quantity of means) and 2013 (a proposal according to MoF CR). As it is evident from the graphs 7 and 9, if the only criterion for redistribution of financial means among the CR municipalities is taken into account, with use of the criterion of built-up area in the municipality less extreme values appear from a view-point of distribution of incomes per one inhabitant and so also a bigger homogeneity in redistribution than with use of the criterion of cadastral area of particular municipalities with the limiting condition 10 ha per one inhabitant. It is documented also by results shown in the following table.

**Table 1** Redistribution of incomes per one inhabitant in 2012 and 2013 with use of criterion of cadastral area of municipality and criterion of built-up area in municipality (in thousand CZK)

Town/ medi- an	Current system		System 1 – cadastral acreage		System 1 – cadastral acreage		System 2 – built-up area		System 2 – built-up area	
	income per one inhab. 2012	income per one inhab. 2013	income per one inhab. 2012	income per one inhabitant 2013	share in old 2012 in %	share in old 2013 in %	income per one inhabitant 2012	income per one inhabitant 2013	share in old 2012 in %	share in old 2013 in %
Pra- gue	28,8	28,3	1,193070028	1,315220181	4	5	3,831727247	4,224031184	13	15
Brno	17,4	16,9	1,538926416	1,696486402	9	10	5,084117631	5,604645121	29	33
Os- trava	17,4	16,9	1,699572407	1,873579821	10	11	5,782295425	6,374304489	33	38
Plzeň	17,4	16,9	1,812541069	1,998114559	10	12	5,418206587	5,972939124	31	35
medi- an	6,9	8,8	26,8	29,5	387	335	19,9	21,9	288	249

Source: own processing on base of data CzSO, MoF CR and COSMC

Anyhow the redistribution of means to municipalities from shared taxes according to the only criterion, either the cadastral acreage of the municipality or built-up area in the municipality, unsuitable, mainly thanks to a low share of four large towns in redistributed means by the help of one criterion (in conversion per one inhabitant) in comparison with really received incomes in the budget of four large towns in 2012 and 2013, despite this fact it is possible to derive from results in the table 1 partially increase of incomes converted per one inhabitant for four large towns with that the least means would be sent to Prague on base of the biggest number of inhabitants in relation to built-up area; other three large towns would receive in conversion per one inhabitant means in big quantity. The most significant improvement is seen in other towns and municipalities in the CR with application of the only criterion for redistribution of shared taxes, namely in the applied criterion of cadastral acreage in the municipality. Vice versa, from the table it is possible to derive that with application the only criterion, namely the built-up area in the municipality the other towns and municipalities in the CR would emerge better off, however, from a lower value. In conversion per one inhabitant of other municipalities (the median value) it is obvious that the criterion of built-up area in the municipality strengthens incomes of bigger territorial units, respectively of four large towns, and on the contrary there is decrease of incomes converted per one inhabitant in other towns and municipalities in the CR. Generally with use of the criterion of built-up area the extreme values decrease in redistribution of means to municipalities and thereby there is a better homogeneity of redistributed means.

## 5 Conclusion

As it is obvious from the carried out analysis (Graphs 1, 2 and 3), within implementation of a limiting condition corresponding with the equivalent 10 ha per one inhabitant within the criterion of cadastral acreage of a municipality a substantial decrease of extreme values happened in redistribution of shared tax incomes per one inhabitant in particular municipalities of the CR. At the same time it is possible to state that with comparison of criterion of cadastral acreage of municipality the extreme values decrease in redistribution with the applied criterion of built-up area in the municipality with application of which a better homogeneity appears within redistribution of means converted per one inhabitant according to this criterion (see the graphs 4 to 8). At the same time it is possible to state that the redistribution of shared tax means according to one criterion, and either the cadastral acreage of the municipality or the built-up area is unsuitable because incomes per one inhabitant are substantially lower in the four large towns than in comparison with values really received in budgets of these four large towns in 2012 and 2013. Vice versa, with application of both the criterion the cadastral acreage of the municipality and the built-up area in the municipality there incomes converted per one inhabitant for all other towns and municipalities in the CR would increase. Moreover, from the table 1 it is obvious that the application of criterion of built-up area in the municipality strengthens the incomes converted per one inhabitant in four large towns more than in case of application of the criterion of cadastral acreage were incomes converted per one inhabitant of other municipalities (the median value) are significantly higher than with use of the criterion of built-up area in the municipality.

So, the results show that in comparison of the criterion of cadastral acreage of the municipality with the limiting condition and the criterion of built-up area in the municipality (in m<sup>2</sup>) the extreme values decreases in redistribution within both applied criteria, however, in the built-up area in the municipality better homogeneity appears in the framework of redistribution of means converted per one inhabitant. Generally it is possible to state, that with application of the criterion of built-up area in the municipality, means are redistributed rather in favour of bigger residential units while in the cadastral acreage of the municipality it is rather on the contrary. So, it would be possible to use the criterion of built-up area in the municipality for example for a slight strengthening of incomes from shared taxes rather in favour to bigger residential units. Eventually, the criterion of built-up area in the municipality could be used in its inclusion in calculations in shared taxes for a possible influence on the currently applies criteria and their weights, mainly in conversion of inhabitants of particular municipalities and four large towns (Prague, Brno, Ostrava, Plzeň) when the current disproporti-

on between other municipalities, in whose calculation of share in relation to the number of inhabitants a coefficient 1 is applied, and in four large towns, which have still own height of adjusted coefficient for the conversion of inhabitants, higher coefficient is applied, could be removed at least partially. The application and implementation of the criterion of built-up area in the municipality in the current calculations of shares of particular municipalities in the shared taxes could come to a slight decrease of these conversion coefficients for the number of inhabitants in four large towns without a significant decrease of income of these four large towns from shared taxes because this step could be partially compensated just by implementation of the criterion of built-up area in the municipality (in m<sup>2</sup>) which predicates allocation of bigger amount of means from shared taxes, as above mentioned calculation show, rather in favour of bigger residential units. By this step the current requirements of other municipalities for their decrease could be met at least partially, in relation to these conversion coefficients.

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