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Equality of the Czech Tax Assignment for Municipalities[1]

*Eduard BAKOŠ – Daniel NĚMEC – Petra DVOŘÁKOVÁ**

Abstract

The Czech tax sharing system essentially respects the basic principles described by contemporary theoretical approaches. The purpose of this paper is to examine how changes to its parameters influenced the municipal revenue distribution in relation to revenue equality and uniformity. We simulate different models of tax sharing with the full sample of Czech municipalities between 2010 and 2016. The impact of different parameterization is evaluated using the Gini coefficient. By comparing different scenarios, we conclude that the recent changes contribute to the equality of municipal tax revenue sharing per capita. Nevertheless, the conclusion should be interpreted in a broader context, e.g. concerning grants provided by the central government to municipalities.

Keywords: *tax sharing, tax revenues, municipalities, Gini coefficient*

JEL Classification: H71, H77, R51

Introduction

Reallocating tax revenue across government levels is based on the theory of fiscal federalism, which generally deals with issues of reallocating competences, financing, competition, cooperation, and redistributing of income and expenditure between different level of governments. Musgrave (1961; 1971; 1997a; 1997b) and Oates (1991; 1999; 2008) were pioneers in fiscal federalism, writing ground-breaking papers that raised many sub-questions about optimal fiscal decentralization. A more recent paper addressed the same issue (Aslim and Neyapti, 2017).

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There currently seems to be a shift from the original themes of establishing a system to the question of how to improve the system and make it more effective, especially in the sense of providing and financing public services. In this context, there is an important issue of the redistribution of revenues, addressing vertical and horizontal fiscal imbalances; this issue is discussed in different ways. The most important discussions address the issue from the point of view of tax assignment (Bird, 1999; McLure, 2001; Boadway, 2001; Sharma, 2012), intergovernmental relations (Dahlby, 2001; Bahl and Cyan, 2011), public expenditures of local governments, the possibility of influencing tax bases and tax rates, the mobility or immobility of the tax base, costs of tax administration, the crowding-out effect (Bahl and Cyan, 2011), and the influence of inter-municipal cooperation on local taxation (Breuillé, Duran-Vigneron and Samson, 2018). According to Wallis and Oates (1988), the determinants of the optimal degree of fiscal decentralization cover three classes of variables: conditions relating to the land area of the state and the size of its population, including the geographical distribution of the population, the level of income and wealth in the state, and the extent of public services, including their geographical distribution among the population.

Some authors highlight that higher-level governments share revenues from the taxes that they legislate and administer with lower-level governments. McLure (2001) notes that individual lower-level governments have no control over any fundamental questions about tax bases and rates, including the administration of taxes. From that point of view, according to McLure, tax sharing is a form of a grant, and not a method of tax assignment.

Boadway (2001) addresses the issue of inter-governmental relations, pointing out that the interdependency of national and subnational governments (including municipalities) in affecting redistribution and resource allocation is an unresolved issue in fiscal federalism. Dahlby (2001) states that according to Musgrave (1983), there are basic principles regarding tax assignment: middle and especially lower--level jurisdictions should tax those bases that require low mobility between jurisdictions, personal taxes with progressive rates should be used by those government levels within which a general base can be applied most efficiently, progressive taxation should be primarily central, taxes appropriate for stabilization policy should be provided by the central government, and tax bases that are distributed highly disproportionately among different levels of government should also be used centrally. Income taxes and user charges can be suitable at all levels. Dahlby (2001) also refers to many problems relating to the consensus view of tax assignment – e.g. the relation between expenditure and taxation decisions and the need for an appropriate balance between the public and the private sectors' claims on the economy.

As stated by Bahl and Cyan (2011), the economic theory of tax assignment leads to an assumption that the level of subnational government (SNG) taxes should more or less match the level of SNG expenditures that are characterized by local benefits. Moreover, these expenditures should be financed by taxes whose burden falls on the beneficiaries. This idea points toward residence-based individual income and payroll taxes, destination-based sales taxes, property and land taxes, and various forms of licenses and user charges as the best choices for local government taxes. It is up to the central government (or the constitution) to work out a tax assignment that secures the balance. Grants should be restricted to dealing with services pursuing national or regional priorities, and to equalization.

Liberati (2011) writes about the golden rule for local tax financing, which is represented by the benefit principle of taxation. The golden rule means an equivalence between taxes paid and benefits received from local public spending.

We decided to examine the principles of tax reallocation, defined by theoretical approaches, for the Czech Republic. Recently, new criteria for tax redistribution have been introduced that try to take into account both the population size and its geographical distribution in the territory and also the public spending on the provision of public services (as defined by the number of pupils). The new criteria is the primary reason for this analysis of tax sharing in the Czech Republic.

The second point that needs to be mentioned is horizontal fiscal imbalance (HFI). HFI measures the redistribution of revenue at the same level of government. According to Sharma (2012), SNGs have differing abilities to raise funds from their tax bases, and this fact creates space for horizontal fiscal disparities. Di Liddo, Longobardi and Porcelli (2016) highlighted the issue of measuring HFI and discussed the possible benefits and drawbacks of particular approaches. They also invented new methods for measuring HFI. We did not measure the fiscal capacity of all the municipalities in the Czech Republic because the data about their revenues are very fragmented and to collect them all would be very time-consuming. However, good data are available on tax assignment, which is the main and the most important part of the municipalities' revenues.

Therefore, the primary aim of the paper is to *examine how the changes of parameter influenced the distribution of municipal revenues during a selected period in terms of the revenue equality and uniformity.* To fulfil the main goal of the paper, we formulated research questions: *To what extent is the system of tax redistribution in the Czech Republic uniform and egalitarian? How do partial changes in the system contribute or not contribute to changing the concept of equality of the municipalities?*

To meet the main goal of the paper, we formulated the following propositions:

Proposition 1: The current system of tax sharing in the Czech Republic respects the basic theoretical principles of fiscal federalism.

This proposition is based on applying the theoretical principles of tax assignment to the real redistribution of tax revenues of municipalities in the Czech Republic.

Proposition 2: The recent changes in the tax sharing system contribute to the uniformity of tax revenue distribution between different groups of municipalities (considering the number of their inhabitants).

This proposition takes into account the current parametric changes in the system and compares their impact on individual groups of municipalities in terms of balancing revenues between municipalities.

Proposition 3: The present system of tax assignment is robust to the parametrical changes, which means that alternative tax assignment settings exhibit similar dynamics of tax revenues.

The last proposition focuses on alternative options of parametric changes and compares their dynamics. From this perspective, the robustness of the system against changes will be tested. The paper evaluates the alternative tax assignment settings using the Gini coefficient, which measures inequality in tax revenues per capita, and through computing the share of municipalities and share of inhabitants with the expected raised (or unchanged) tax revenues. The paper follows a three-step structure. First, it provides a brief overview of the tax assignments at the SNG level in the Czech Republic. Second, individual scenarios are defined together with detailed descriptions of the relevant data sources and the method applied. Finally, the paper presents the obtained results and compares the tested scenarios in detail.

1. Tax Assignment in the Czech Republic

According to the OECD (2016), there are three main sources of revenues for SNGs, including municipalities: taxes, grants, and subsidies. Revenues are derived from local public service charges (e.g. tariffs and fees) and property (the sale and operation of physical and financial assets). The share of tax revenue in SNG revenue varies widely from one country to another. There is a particularly significant share in several federal countries, where tax revenues arise both from tax sharing arrangements between the federal government and SNGs (more usually based on personal income tax, but also on company income tax and value--added tax) and from own-source taxation (e.g. Germany, Switzerland, the United States, Canada).

The Czech Republic belongs to a group of countries that respect the principles of tax-sharing arrangements. This assertion is based on studies concerning the Czech tax assignment and associated issues; such studies are rather rare. Nevertheless, a few studies have analyzed the Czech tax assignment system from various points of view, including Jílek (2006); Tománek (2008; 2015; 2016); Provazníková and Petr (2010), and Koťátková Stránská (2012).

An extensive report for the Ministry of Finance conducted by the University of Economics in Prague (2009) was prepared with a view to meeting needs arising from practice. The report suggested that the number of shared taxes should be increased because there is no objective reason for not sharing all the tax revenue among the existing levels of government. On the contrary, sharing the revenue would help to balance individual budgets in cases of unexpected economic developments or external influences. Sharing the revenue would also mean lowering the need for grants paid to self-governing territorial units at the central level. In regards to the tax assignment system, the report supported the idea of modifying the existing criteria and adding several new criteria, including per capita principal, the mobility of citizens, cadastral area, and regionalization. Although the report was accurate, politicians and the public rejected its results (with a few exceptions) and only a limited number of its proposals were put into practice. The reasons for this rejection can be traced historically: a relatively conservative development of tax sharing in the Czech Republic and a general reluctance to make significant changes in this area due to the impact on a wide group of municipalities and inhabitants.

1.1. Tax Assignment at the Municipal Level

The Czech tax sharing legislation is represented by the Act on Budgetary Allocation of Tax Revenues to Territory Self-governing Units and Selected State Funds (Act No. 243 from the year 2000 on tax assignment), which has been in effect since 2001. The Act sets the rules for the redistribution of tax revenues among public budgets, i.e. the nation, regions, and municipalities. The Act has been updated several times during the period of its legal force; the last update was introduced in 2017.[2] In the meantime, additional changes were prepared and discussed. According to the valid legislation, municipalities get the share of tax revenue as shown in Table 1.[3]

[2] Act No. 260/2017 Coll. (effective from January 1, 2018) means increasing the pupil criterion from 7 to 9% for each municipality, and also raising the share of VAT for municipalities to 23.58% of total VAT revenues.

[3] Act. No. 187/2016 Coll. introduced „gambling tax“ which is also redistribute part of revenues from „gambling“ to municipalities. Tax yield from this tax represents only a few percent of the total income of municipalities.

T a b l e 1

Tax Sharing at the Municipal Level

Tax	The share of total tax revenue to municipalities (%)
Value-added tax	23.58
Corporate income tax	23.58
Corporate income tax (as a tax paid by municipalities)	100
Personal income tax (payroll tax)	23.58
Personal income tax (self-employed)	23.58*
Personal income tax (tax payable by deduction)	23.58
Real estate tax	100**

Note: * from 60% of total tax revenue only; ** by the location of the property.

Source: Act No. 243/2000 Coll.

A few years ago, municipalities received another 30% of the yield from personal income tax based on the individual place of residence. This tax revenue was linked directly to the municipality, and it served as a motivation for promoting business activities within the given municipality (Provazníková and Petr, 2010). Technical problems with distributing this tax yield resulted in the abolition of the motivation element and its incorporation into the remaining national yield. Of the tax yield, 40% (10% + 30%) belongs to the state and the other 60% of the yield is assigned to be redistributed among the national, regional, and municipal budgets. Besides these shared taxes, municipalities obtain 100% of tax revenues from the real estate tax and the corporate income tax paid by municipalities themselves (see Table 1).

The specific amount from the national gross tax yield (value-added tax + corporate income tax + personal income tax) is redistributed to each municipality based on four key criteria (Act 243/2000 Coll.): cadastral area of the municipality; simple number of inhabitants; modified number of inhabitants according to gradual transition coefficients which take into account municipality size; and a recently added criterion – the number of pupils. The cadastral area of the municipality is defined as the share of the municipality area in the total of the Czech Republic's municipality area. The weight of this criterion is 3%. The reason for introducing this criterion was to compensate for lower population density (Provazníková and Petr, 2010). The simple number of inhabitants represents the share of the municipality inhabitants in the total number of the population of the Czech Republic. The weight of this criterion is 10%. The modified number of inhabitants according to gradual transition coefficients is a very important criterion that prevents abrupt changes in the amount of tax revenue as a result of population changes in the municipality. Its essence lies in the gradual increase of tax revenues by coefficients that reflect the population increase in each category of municipality size (see Table 2).

The only exceptions to this criterion are four big cities – Prague, Brno, Ostrava and Plzeň. These municipalities have their coefficients (see Table 3). The weight of this criterion is 78%. The last criterion takes into account the number of compulsory-educated pupils in the municipality; the weight is 9%. After the introduction of this criterion, the relevant grants to pupils from the state budget were abolished.

T a b l e 2

Gradual Transition Coefficients and Gradual Transition Multiple (2013 – present)

Municipalities with the number of inhabitants from – to	**Gradual transition coefficients**	**Gradual transition multiple**
0 – 50	1.0000	1.0000 x number of inhabitants in the municipality
51 – 2,000	1.0700	50 + 1.0700 x number of inhabitants in a municipality that is above 50
2,001 – 30,000	1.1523	2,136.5 + 1.1523 + x number of inhabitants in a municipality that are above 2,000
30,001 and more	1.3663	34,400.9 +1.3663 x number of inhabitants in a municipality that is above 30,000

Source: Act 243/2000 Coll.

The used criteria underwent historical development that gradually corresponded with the required changes in the tax sharing system at both the national and the sub-national levels. For example: over time there were changes in the number of municipality classes (gradually it fell from 14 classes to 4) and in the size of municipality classes (the first category was reduced from 300 to 50 inhabitants; the second category from 5,000 to 2,000 inhabitants) and also in the amount of gradual transition coefficients (especially in the last category for large cities). The reasons can be found in a better system setting that considers not only the tax revenues of municipalities but also public service in the form of municipal public spending.

T a b l e 3

Coefficients for Prague, Brno, Ostrava, and Plzeň

Municipalities	**Gradual transitions coefficients**
Prague	4.0641
Brno	2.2961
Ostrava	2.2961
Plzeň	2.2961
Other municipalities	1.0000

Source: Act No. 243/2000 Coll.

It should be noted that income from shared national taxes represents on average 60% of the total income of municipalities. Municipalities can (and do)

receive other income through subsidies (grants), non-tax revenues such as loans, rental income, local charges (in some countries as local taxes), and other sources. The main part of this 40% of municipal revenues is subsidies, which represent redistribution between particular levels of government. Municipalities receive subsidies both from the central level (government) and from the regional level (regions) that usually cover activities that municipalities carry out for the benefit of the state.

2. Data and Methods

We use data for all the municipalities that are available as an appendix to the Act No. 243/2000 Coll. in the period from 2010 to 2016 to evaluate the impact of changes in the legislative framework on the redistribution of the national gross shared taxes yield. Additionally, we use share indicators of the national gross shared taxes yield, i.e. the sum of all major taxes – VAT, personal income tax (without 1.5% of payroll tax within the personal income tax, which has a negligible influence on the tax base of municipalities), and corporate income tax according to four main criteria – cadastral area of the municipality, simple number of inhabitants, modified number of inhabitants according to gradual transition coefficients, and the number of pupils. Our computations are based on the following scenarios that take into account real tax sharing, hypothetical changes in parameters that were used in particular years, and the possible influence of the number of pupils as a new variable influencing the tax sharing in recent years as well as the implementation of the number of employees directly into the tax sharing formula:

A. An original (baseline) scenario in which tax shares of municipalities are computed for all years using the system parameters valid in these years (i.e. one set of parameters for 2010, 2012, and 2013 and another set of parameters for 2013 and 2014).

B. A scenario in which the parameters of the tax sharing system from 2014 are applied. In this case, the number of pupils from 2012 is used for 2010 and 2011 to compensate for the lack of data for these years.

C. A scenario in which the parameters of the tax sharing system from 2014 are applied without the criterion of the number of pupils. The weights for the remaining criteria are defined by the weights valid in 2010 (3% for the number of inhabitants, 3% for the cadastral area, and 94% for the criterion based on gradual transition coefficients).

D. A scenario in which the parameters of the tax sharing system from 2010 are applied.

E. A scenario in which the parameters of the tax sharing system from 2010 are applied and a new criterion of the number of pupils is added. In this case, the number of pupils from 2012 is used for 2010 and 2011 to compensate for the lack of data for these years. The weights for the criteria correspond to those valid in 2014.

F. A scenario in which the tax sharing system is based on the number of inhabitants only.

G. A scenario in which the tax sharing system is based on the cadastral area of the municipality only.

H. A scenario in which the tax sharing system is based on the number of pupils only (in this case, the number of pupils from 2012 is used for 2010 and 2011 to compensate for the lack of data for these years).

I. A scenario in which the tax sharing system is based on the modified number of inhabitants according to gradual transition coefficients only.

J. A scenario in which the tax sharing system is based on the number of employees in the municipality.

Scenario A represents the historical development of the tax assignment framework, and it serves as a benchmark for the remaining scenarios. Scenario B and scenario C make it possible to evaluate the real parameter changes from the past. Comparing the resulting dynamics in tax revenues and their relative shares makes it possible to assess both the robustness of the actual tax assignment framework and the possible tendencies to equalize the redistribution of tax revenues. The rest of the scenarios simulate the impact of possible changes in the weights assigned to the existing indicators in the tax assignment formula as well as the impacts of introducing new indicators into the formula (scenario J).

For all these scenarios, the shares of all the municipalities on the national gross shared taxes yield are simulated and compared with the original shares. For the original scenario (scenario A), the results are compared with the values valid for 2010. To be more specific, we are focusing on the following statistics:

1. Weighted Gini coefficients that express the inequality in the distribution of shared taxes. The Gini coefficient (as defined by Dorfman, 1979) is one of the most used statistics for measuring inequality (see Di Liddo, Longobardi and Porcelli, 2016). It is computed using the weights representing the share of municipality inhabitants in the total population of the Czech Republic. This measure represents inequality among the municipalities better than the unweighted Gini coefficients that would treat the municipalities as the basic units, which would lead to unreliably high values of inequality due to the existence of a large number of low-populated municipalities sharing only a small part of taxes and a small number of highly populated cities (e.g. Prague) sharing an important part of shared taxes.

2. Average relative change in the share of individual municipalities on gross shared taxes and the standard deviation (as a measure of the volatility of these changes). The means and standard deviations are computed as weighted statistics where weights remain the same as in the case of computation of the Gini coefficient. Average values greater than one means that on average more municipalities (inhabitants of these municipalities) would share more taxes in the simulated scenario than in the original scenario. We compute the mean changes for all municipalities and mean changes in corresponding deciles defined by the number of inhabitants (it means that the first decile represents 10% of the population of the Czech Republic).

3. A number of municipalities that receive an increased share of shared taxes in the simulated scenario (compared to the baseline scenario). In this case, deciles are defined by the number of municipalities.

4. The share of inhabitants living in the municipalities that receive an increased share of shared taxes in the simulated scenario (compared to the baseline scenario). In this case, deciles represent the population of the Czech Republic.

Our statistics can evaluate the effect of simulated changes on inequality in tax revenue redistribution, the effects on particular groups (deciles) of municipalities defined by their size (number of inhabitants), and the effects on the population of the Czech Republic grouped into the corresponding deciles by the size of municipalities.

3. Results and Discussion

The results of our simulations are presented in Tables 4 to 6. Table 4 shows changes in the inequality of the tax redistribution. The baseline scenario (scenario A) proves that changes in the parameterization of the tax sharing lowered considerably the inequality of tax distribution among the municipalities (considering the number of inhabitants in the municipalities). These results may be in contradiction to the intention to have a tax sharing system that takes into account the size of public services provided by the municipalities (that might be approximated, e.g. by the size of municipalities or the number of employees in the municipality). One important factor standing behind this decrease was the implementation of the number of pupils into the system of tax sharing. As scenario E suggests, a significant decrease in inequality (compared to the tax sharing system of 2010) could be achieved by implementing this criterion into the framework defined by the parameters of 2010 as well. It is not surprising that the criterion based on the number of inhabitants only (scenario F) leads to the lowest possible value of the Gini coefficient. Another possibility to lower inequality may be

achieved by implementing only the criterion of the number of pupils into the tax sharing framework. Another decisive factor of equalizing the tax shares among the municipalities was the change in the gradual transition coefficients for municipalities with more than 30,000 inhabitants (a decrease from 1.7629 to 1.3663). Looking at the changes of the Gini coefficients in the 2010 – 2016 period reveals that all the hypothetical systems (except the one based on the number of employees in the municipality) are stable, with negligible volatility.

T a b l e 4

Weighted Gini Coefficients and Alternative Tax Sharing Scenarios

Year	Scenario									
	A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*
2010	0.2892	0.2219	0.2604	0.2892	0.2455	0.0000	0.6700	0.2096	0.3177	0.3025
2011	0.2894	0.2222	0.2606	0.2894	0.2459	0.0000	0.6691	0.2107	0.3178	0.3105
2012	0.2881	0.2213	0.2594	0.2881	0.2450	0.0000	0.6614	0.2115	0.3169	0.3136
2013	0.2216	0.2216	0.2596	0.2883	0.2453	0.0000	0.6609	0.2098	0.3169	0.3190
2014	0.2215	0.2215	0.2596	0.2880	0.2452	0.0000	0.6604	0.2073	0.3166	0.3224
2015	0.2224	0.2224	0.2603	0.2887	0.2460	0.0000	0.6606	0.2070	0.3173	0.3233
2016	0.2230	0.2230	0.2607	0.2891	0.2465	0.0000	0.6613	0.2075	0.3176	0.3244

Source: Own calculation.

T a b l e 5

Comparison of Changes in Tax Sharing among the Municipalities

Year	Mean weighted change (weighted std. deviation in parenthesis)									
	A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*
2010	1.000 (0.000)	1.060 (0.132)	1.019 (0.086)	1.000 (0.000)	1.043 (0.081)	1.271 (0.432)	1.442 (2.175)	1.302 (0.806)	0.977 (0.075)	1.138 (0.794)
2011	1.000 (0.016)	1.060 (0.132)	1.019 (0.086)	1.000 (0.000)	1.043 (0.081)	1.272 (0.432)	1.442 (2.171)	1.301 (0.806)	0.977 (0.075)	1.134 (0.799)
2012	1.003 (0.036)	1.060 (0.131)	1.019 (0.086)	1.000 (0.000)	1.043 (0.081)	1.269 (0.429)	1.454 (2.139)	1.297 (0.800)	0.977 (0.074)	1.128 (0.806)
2013	1.063 (0.151)	1.000 (0.000)	0.969 (0.071)	0.959 (0.119)	0.992 (0.069)	1.173 (0.331)	1.277 (1.910)	1.180 (0.622)	0.942 (0.169)	1.076 (0.734)
2014	1.065 (0.156)	1.000 (0.000)	0.969 (0.070)	0.959 (0.118)	0.992 (0.069)	1.173 (0.331)	1.277 (1.909)	1.180 (0.618)	0.942 (0.169)	1.073 (0.725)
2015	1.063 (0.160)	1.000 (0.000)	0.969 (0.070)	0.959 (0.118)	0.992 (0.069)	0.174 (0.333)	1.279 (1.913)	1.178 (0.619)	0.942 (0.168)	1.071 (0.721)
2016	1.063 (0.166)	1.000 (0.000)	0.969 (0.070)	0.959 (0.118)	0.992 (0.069)	1.175 (0.333)	1.280 (1.918)	1.177 (0.620)	0.942 (0.168)	1.070 (0.731)

Source: Own calculation.

A better look at the extent of changes in the tax shares distribution can be found in Table 5 and Table 6. Implementing the parameterization of 2014 to the 2010 – 2012 period led to an average increase in the shared tax revenues by 6% (see column B of mean change). It should be noted that these results incorporate only a part of the total revenues of the municipalities (a part of the national gross

shared taxes yield). But it is perhaps the most important part of the revenues for most of the municipalities, and it is exactly the part of revenues that is influenced by the tax assignment framework discussed in this paper.

More exactly, Table 6 shows that 6,213 of 6,245 municipalities (covering 63.8% of the population) would have increased revenues in 2010. On the other hand, implementing the system of 2010 within the conditions of 2014 (scenario D) would have increased revenues of 32 (most populated) municipalities covering 35.7% of the Czech population.

T a b l e 6

Comparison of Changes in Tax Sharing among the Municipalities

Year	Tax sharing increase – the number of municipalities with increased or unchanged tax revenues (population share with increased or unchanged tax share in parenthesis)									
	A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*
2010	6,245 (1.000)	6,213 (0.638)	6,129 (0.487)	6,245 (1.000)	3,301 (0.736)	6,131 (0.799)	5,791 (0.369)	2,492 (0.684)	128 (0.510)	1,301 (0.528)
2011	3,578 (0.426)	6,214 (0.639)	6,130 (0.489)	6,246 (1.000)	3,302 (0.736)	6,134 (0.799)	5,785 (0.370)	2,485 (0.684)	127 (0.507)	1,242 (0.549)
2012	4,276 (0.420)	6,214 (0.642)	6,129 (0.491)	6,246 (1.000)	3,302 (0.735)	6,242 (0.801)	5,789 (0.374)	2,464 (0.681)	126 (0.502)	1,169 (0.514)
2013	6,004 (0.605)	6,248 (1.000)	2,978 (0.269)	32 (0.358)	117 (0.507)	6,108 (0.798)	5,645 (0.342)	2,190 (0.658)	36 (0.370)	920 (0.514)
2014	5,975 (0.599)	6,248 (1.000)	2,959 (0.268)	32 (0.357)	118 (0.507)	6,108 (0.799)	5,637 (0.342)	2,194 (0.659)	37 (0.371)	918 (0.509)
2015	5,938 (0.591)	6,248 (1.000)	2,964 (0.270)	32 (0.357)	118 (0.507)	6,114 (0.798)	5,634 (0.342)	2,186 (0.658)	35 (0.366)	888 (0.505)
2016	5,878 (0.583)	6,254 (1.000)	2,974 (0.271)	32 (0.357)	117 (0.505)	6,115 (0.798)	5,642 (0.343)	2,171 (0.656)	37 (0.370)	886 (0.505)

Source: Own calculation.

A detailed view of the distribution of simulated changes among the municipalities was computed as well, and the results may be found in Appendix A and Appendix B.[4] The table in Appendix A shows the average increases (including standard deviations in parenthesis) of tax sharing for the municipalities among the deciles defined by the number of inhabitants of the Czech Republic. The influence of tax sharing changes differs among individual villages and cities when considering the level changes of the shared tax revenues. In our analysis, we are thus focusing on the aggregate relative (proportional) impacts of alternative tax sharing assignments within specific groups of municipalities based on population deciles. These groups represent the sizes of the towns and villages. Deciles are constructed in such a way that, for example, the first decile consists of 10% of the Czech population living in the smallest villages. It is obvious that only scenarios A, B, F, and G increase average revenues for small municipalities.

[4] Appendices are available on: <https://www.sav.sk/journals/uploads/0423114304%2019%20Bakos%20+%20S-appendix.pdf>.

This increase is considerably larger in the actual tax sharing framework (scenario A) and within the hypothetical system based directly on the number of inhabitants (scenario F), and it is exceptionally high in scenario G (tax sharing system based on the cadastral area of the municipality only). Scenario C proves that omitting the criterion of the number of pupils would have increased revenues for the five largest cities (the 9th and the 10th decile) in 2013 and 2014 (by 5% and 10% respectively), while the revenues of the smallest municipalities (the 1st decile) would have remained the same. The same results may be obtained considering the number of municipalities with increased tax share induced by the simulated scenario (see Appendix B). The number of municipalities with increased tax is computed using the deciles based on the number of municipalities sorted in ascending order by the number of inhabitants. The share of inhabitants is expressed within the decile based on the population of the Czech Republic.

We stated three propositions in this context. The first proposition was connected with the settings of the Czech tax assignment system as a whole. We found that the current settings essentially meet the theoretical requirements of a tax-sharing system provided by fiscal federalism theorists. We can claim that the Czech settings are consistent with the principles formulated by Musgrave (1983) and Wallis and Oates (1988).

We introduced a set of scenarios to test propositions 2 and 3. The baseline scenario (scenario A) proved that the changes in the parameterization of the tax sharing lowered considerably the inequality of tax distribution among the municipalities (considering the number of inhabitants in the municipalities). Hence, proposition 2 was verified. One key factor behind this shift was the implementation of the number of pupils into the system of tax sharing. It was also one of the key arguments that the Czech Ministry of Finance used to advocate the changes in tax sharing. Nevertheless, this must be considered in the context of complete municipal financing – the implementation of this criterion caused a decrease in subsidies per pupil generally.

Proposition 3 was also proved by computing other scenarios using different parameter settings. The present system of the Czech tax assignment is robust to the parametric changes. Propositions 2 and 3 indicate the uniformity and equality of the system. Municipalities are financed not only by shared tax revenues (although that is the most important source of financing) but also by other revenues – non-tax revenues, grants, loans, etc. From this perspective, our results do not prove equalization in total revenues between the Czech municipalities.

In addition, this equalization could be unbalanced by proposals of some experts to reform tax assignment in relation to providing public services (University of Economics, 2009). They suggest to introduce new taxes as shared taxes

(excise duties) or to reform existing tax-sharing system by introducing new form of cooperation (communities) in the public administration similar to voluntary municipal associations (Ministry of Interior, 2005; Jetmar, 2018). Experience from other countries (e.g. France) shows that inter-municipal cooperation as a part of public administration can affect tax base and contribute to HFI (Breuillé, Duran-Vigneron and Samson, 2018).

Conclusions

The paper was focused on equality in financing municipalities, particularly from tax assignments. The objective of the paper was to prove the uniformity and equality of tax redistribution in the Czech Republic. The partial goal was to discuss possible parametric changes in the system and the influence of these changes on the system stability. We did not measure fiscal capacity at all, and we did not focus primarily on the HFI in general. HFI is often solved by balancing revenues through support (e.g. equalization grants) from the higher level of governments or by using compensating coefficients, which exist in Austria (Schneider, 2002), but not in the Czech Republic if we omit the population size coefficients. We concentrated on the evidence proving that a particular change (e.g. introducing new criteria) assists in lowering the inequality of tax distribution. Our results show that although alternative tax assignment settings exhibit considerable differences in the level of inequality of tax revenue redistribution (measured by the Gini coefficients), the resulting inequality remained almost stable in the years under our study with some negligible marks of its increase. This, together with grants, subsidies, and municipality revenues could be the subject of a fiscal capacity measurement and analysis of the HFI in the future. In this sense, the objective of the paper was met, and the research question answered.

An overall picture of balancing the municipality finances should consider not only the tax assignment according to given criteria like the cadastral area of the municipality or the number of inhabitants but also the municipality's expenditures, which reflect the provision of public services. A study that took this perspective into account was conducted by researchers from the University of Economics, Prague (University of Economics, 2009), but their proposals have been only fractionally transferred into Czech practice. The importance of the provision of public services has recently increased consideration of inter-municipal cooperation. Cooperation can influence the tax base of municipalities, as was demonstrated in a specific case in France by Breuillé, Duran-Vigneron and Samson (2018). It can lead to differences between municipalities because of raising the tax base. Therefore it could be the subject of further research in the study of balance and equality of revenues between municipalities.

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