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# COVID-19 AS A FACTOR INFLUENCING MUNICIPAL BUDGETS: A CASE STUDY OF CZECH CONDITIONS*

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**Abstract.** The COVID-19 pandemic has affected all areas of life, both private and public. The municipalities, which had to deal with increased expenses on the one hand and lower incomes on the other, were no exception. The presented research aims to quantify the impact of the COVID-19 pandemic on the budgets of selected cities in the Czech Republic. A total of 29 municipal budgets (municipalities) are evaluated in 2021 in comparison with their previous economies during the period of 2010-2020. 6 indicators are monitored (five of which are income ones) using a wide range of mathematical and statistical methods, e. g. Shapiro-Wilk test, Levene test, Kolmogorov-Smirnov text, and others. Based on the results obtained, there are no significant adverse impacts of the COVID-19 pandemic on the economy within the budget for the year 2021, both within the framework of total income and total expenditure. The research also did not show any fundamental differences in the management of evaluated cities, which, according to the applicable legislation, are divided into a multi-level system of administration, i.e. city districts or city parts, compared to cities with single-level management, i.e. cities with no territorial divisions.

**Keywords:** COVID-19 pandemic; Czech Republic; Expenditures; municipal budgets; revenues

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**JEL Classifications:** H61, H76

## 1. Introduction

Public administration in every democratic state faces a number of problems. One of the most prevalent is the decision on the security and method of financing public goods and services for the population in the entrusted territory. The expenditure side of each public budget is primarily limited by its revenue side. The article is focused on evaluating the impact of the COVID-19 pandemic on the income side of the economy of the 29 largest cities in the Czech Republic, which, except the cities of Třebíč and Česká Lípa, can be characterised as statutory cities. Statutory cities represent a specific type of municipality within the Czech Republic because they

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can be further subdivided into urban districts or parts based on the Act on Municipalities and their own decisions on the elected bodies within the framework of the internal regulation, the so-called statute. In practice, there is thus the possibility of a two-tier system of management for the given territory, which, according to Finzgar and Oplotnik (2013), should have its financial resources and a positive influence on the efficiency and effectiveness of the management in the given territory, this was already noted as important by Tiebout (1956) or Oates (1972). According to Daňková, Čepelová and Koreňová (2017), limited options when deciding on the use of financial resources are the result of an insufficient or non-existent effective evaluation system. This is also confirmed by Vavrek et al. (2020), who add that if public administration entities want to survive and prosper in a globalised and competitive world, they must change their thinking and aspire to make their management more efficient. Mazllami and Osmani (2014) stated that many endogenous and exogenous factors determine the success of fiscal reforms at the local and central levels. Neubauerová (2003) states that the application of fiscal decentralisation in each country depends on many suppositions, such as the size of the country, the number of levels within the government, and historical, legislative, social or economic aspects.

According to Slavinskaite (2020), fiscal decentralisation is higher in countries with high economic growth than in countries with lower economic growth, which Aristovnik (2012) already stated based on his statistical evaluations. According to Mazllami (2021), experience with transforming economies in Europe, including the Czech Republic, shows that the unavailability of financial resources often leads to inefficiency in providing public services to the population. On the contrary, Cuadrado-Ballesteros, Garcia-Sánchez and Prado-Lorenzo (2013) or Shin (2017) believe that fiscal decentralisation contributes to better development in the provision of public services in the administered territory by enabling the provision of goods and services in a more competitive environment and defacto at lower costs. What is essential for the evaluation is the income from which the affairs of the local governments are financed. According to Rodden (2002), higher dependence of local governments on transfers can worsen the fiscal management of the entire government sector. According to De Mello (2007), transfers can represent an additional expenditure of the central state administration spent on the development of the territory. Governatori and Yim (2012) state that it is ideal to finance a large part of expenses in the territory based on their income, specifically from the funds collected from taxes and fees. Sedmihradská and Bakoš (2016), Tománek (2017), Opera et al. (2022) also agree with this opinion regarding financing within the territory. (2022) or Vartasová and Červená (2023). The following 3 research questions can be formulated from the above:

RQ1: Has the impact of the COVID-19 pandemic manifested itself on the volume of finances managed by the individual cities in the evaluated sample?
RQ2: Is it necessary to assess the impact of the COVID-19 pandemic individually or aggregated?
RQ3: Is it possible to trace the difference in management between territorially divided and non-territorially divided statutory cities in the Czech Republic?

The first aims to evaluate absolute changes in city budgets and considers the time interval with which the given changes can be observed. The second research question is based on the assumption of the uniqueness of each city, its unique conditions in which it operates, and associated with it, the distinctive manifestation of changes in the budget's income structure. The third research question is focused on evaluating the differences between territorially divided and undivided cities in the Czech Republic. By answering these research questions, we assume the fulfilment of the aim of this study, which is to quantify the impact of the COVID-19 pandemic on the budgets of selected cities in the Czech Republic. The fulfilment of this aim is to answer 3 research questions, which should subsequently lead to the development of further and continuous research.

The article is structured as follows: The first section presents the problem (topic) that the article focuses on. The second section deals with the issue of local self-government in the Czech Republic and describes the currently valid legislation, the position of statutory cities and their competencies. The third section describes the methodology of my research. It describes the research sample, monitored indicators, period, and apparatus used for mathematical-statistical methods. The results of the analysis are presented in the fourth section. It is divided into two parts: in the first, the research sample is evaluated as a whole, and in the second, the cities are evaluated separately. The results are summarised and interpreted in the last (fifth) section.

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## 2. Literature review

As part of the literature review, the legislative anchoring of territorial self-government in the territory of the current Czech Republic is described first and then followed by a short historical journey into creating a specific group of cities that use the designated title of "statutory cities". These are subsequently used for the practical part of the article in accordance with the established aim of the article and according to the methodology described below for evaluation. Finally, the paper describes the specifics of their scope and possible budget and management approaches.

### 2.1 Legal regulation of municipalities in the Czech Republic

The position and powers of territorial self-government in the Czech Republic are enshrined in Constitutional Act No. 1/1993 Coll., the Constitution of the Czech Republic, specifically in Chapter Seven, which deals with territorial self-government. Article 99 of the Constitution states that the Czech Republic is divided into basic territorial self-governing units, among which we rank municipalities and higher territorial self-governing units, where we rank regions. Act No. 128/2000 Coll mainly governs the functioning of the municipalities in the Czech Republic. Several legal regulations further control municipalities and their management. Amongst the most important ones, it is possible to mention in particular Act No. 250/2000 Coll., budgetary rules of territorial budgets, as well as Act No. 320/2001 Coll., financial control in public administration and on the amendment of specific laws and Act No. 420/2004., the review management of territorial self-governing units and voluntary associations of municipalities. From the point of view of local government revenues directly affect the budgetary determination of taxes (Act No. 243/2000 Coll.).

A basic overview of the economy of each municipality in the Czech Republic is shown by its accounting, which municipalities must keep according to Act No. 563/1991 Coll. on accounting. The primary management tool of each municipality is its budget, which is compiled for the calendar year; each municipality compiles it in a uniform structure according to the valid budget composition. All municipalities in the Czech Republic are public corporations, have their property, act in their name in legal relations, and bear the responsibilities resulting from these relations. The most crucial target of every municipality is to care for its territory's all-round development and its citizens' needs. When performing tasks, municipalities also must protect the public interest. At the same time, the Act on Municipalities in force allows certain municipalities to have their specific status, among which we include mainly statutory cities and also the capital city of Prague, which is governed by a separate law (Act No. 131/2000 Coll. on the capital city of Prague). Kočí (2012) notes that statutory cities in the Czech Republic are also municipalities, so they must fully comply with the rights and obligations arising from the applicable regulations regarding municipalities in the Czech Republic.

### 2.2 Statutory cities on the territory of the Czech Republic

If we look through history, the legal institute of statutory cities was established after 1848, when a new arrangement was introduced in the territory of the then-known Austria-Hungary based on the newly adopted constitutionality. After 1848, there were gradual changes in the administration, which then passed to the newly established authorities. Statutory cities were a group of municipalities that were determined in the historical lands of Austria-Hungary by a provisional municipal law. In 1850, Prague, Brno, Olomouc and Opava had their legal regulations, the so-called Statutes, which regulated their status and powers separately, in addition to the provisional municipal constitution that applied to other municipalities. However, according to the municipal law of the Reich, it was assumed that other cities could also apply for their status in addition to the already designated statutory cities. The number of statutory towns in the territory increased rapidly, and by 1918, they included Prague, Liberec, Brno, Jihlava, Olomouc, Znojmo, Uherské Hradiště, Kroměříž, Opava and Frýdek. In the years 1923-1924, the cities of Znojmo, Jihlava, Uherské Hradiště, Kroměříž and Frýdek became their own municipalities, and the jurisdiction of the political office was removed from the cities of Liberec and Opava. In 1941, the statutory cities of Pilsen and Ostrava were established.

Exner (2004) states that over time, statutory cities in the territory of the present-day Czech Republic were created and dissolved in various ways until 1949 when the 7 statutory cities operating at that time in the then territory of the Czech Republic, which included Prague, Pilsen, Liberec, Brno, Ostrava, Olomouc and Opava

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officially ceased to exist. From 1949 to 1967, only the capital, Prague, had a privileged position among cities. In 1969, Brno, Pilsen and Ostrava joined Prague, but the term statutory city was not officially used. The term statutory city was returned to the municipal establishment in 1990 by Act No. 367/1990 Coll., Czech National Council on Municipalities. The first valid Act on Municipalities after 1990 regulated statutory cities in § 3 and stipulated that the cities of České Budějovice, Plzeň, Karlovy Vary, Ústní nad Labem, Liberec, Hradec Králové, Pardubice, Brno, Zlín, Olomouc, Ostrava, Opava and Havířov are cities with a special status. The 1990 law also allowed for the expansion of the number of statutory cities; it stated that a statutory city is also any other city that is designated by the Presidium of the Czech National Council on the proposal of the government or the proposal of such a city, after the government's statement.

According to the currently valid Act No. 128/2000 Coll. on municipalities, statutory cities are regulated in § 4 and are the cities listed in the law. According to Svoboda (2017), a specific feature of statutory cities is the possibility of dividing the city into city districts or city parts, which, presupposes a two-tier system of city administration. However, the division of the city is not their responsibility. In practice, most statutory cities in the Czech Republic are not divided into city districts or parts but can specify their internal conditions in more detail by statute. Koudelka, Průcha and Zwyrtek Hamplová (2019) state that the legislation of the Czech Republic considers statutory cities as cities of particular importance; a municipality cannot acquire the status of a statutory city in any other way than by law, while none of the valid laws of the Czech Republic regulates the exact criteria to which the prerequisites for obtaining the status can be assessed to become a statutory city. In 2000, the number of cities authorised to use the term statutory city expanded to include the cities of Jihlava, Kladno and Most; in 2003, the cities of Karviná, Mladá Boleslav and Teplice. The cities of Děčín, Frýdek-Místek, Chomutov and Přerov joined in 2006 and Jablonec nad Nisou and Prostějov in 2012. The youngest statutory city in the Czech Republic is Třinec, which was included in the list of statutory cities in 2018 and is also the smallest statutory city in 2023, according to the permanent number of residents living in the city. As of January 1, 2023, 26 statutory cities and, in fact, also the capital city of Prague, have a specific status in the Czech Republic in the Act on Municipalities. These are cities with at least 35,000 inhabitants. They are larger than 35,000 per population. Residents of the towns of Třebíč and Česká Lípa, for this very reason, were included in the evaluation below, together with the other statutory cities.

### 2.3 Scope and management of the statutory cities in the Czech Republic

Průcha (2011) states that the competence of statutory cities is based on the mixed public administration model in the Czech Republic. It is a German model, originally Prussian, then later Austrian, the essence of which lies in the joint exercise of territorial self-government and territorial state administration by territorial self-governing corporations. Provazníková (2015) states that one territorial administrative unit carries out state administration and local self-government of municipalities in the Czech Republic. If self-government bodies carry out state administration, it is a transfer or state administration carried out in a delegated capacity. For the article, the independent competence of the municipalities is vital because exercising this is the purpose of its functioning. According to Kočí (2012) or Koudelka, Průcha and Zwyrtek Hamplová (2019), matters that are in the interest of the municipality and its citizens can be included in the independent jurisdiction of municipalities if the laws are not entrusted to the jurisdiction of other authorities. Hendrych, Kavěna and Pavlík (2014) state that within the scope of independent competence, these are, for example, activities that are associated with one's own budgeting and meeting housing needs, the protection and development of health, transport, communications, with the protection of public order, with upbringing, and education etc. Provazníková (2015) states that the independent jurisdiction of municipalities is defined within the laws by an exemplary enumeration. Almost everything that impacts the territorial unit's economy and is financed from its budget can be included in the separate jurisdiction. Statutory cities are governed by the same laws as other cities or municipalities in the Czech Republic. The territorial budget is created and used on the principle of irreversibility, non-equivalence, and non-voluntariness. The budget, including the entire budget process, is a tool for municipalities to secure and finance municipal policy. Municipalities manage their property, establish organisations, and provide public goods and services for their citizens. Each municipality has its property and financial resources, which it manages independently but follows the laws. Hejduková (2015), Varadzin and Bečica (2016), and Papcunová et al. (2021) state that in their management, municipalities must use the entrusted property to them economically and efficiently.

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## 3. Research methodology

Public budgets in the Czech Republic operate on the uniformity principle of income and expenditure. To ensure uniformity and clarity within the budget system, the Ministry of Finance of the Czech Republic issues a binding budget composition, which makes it possible to compare individual territorial budgets from different points of view and analyse their income and expenditure over time. Following the above, the article aims to evaluate the impact of the COVID-19 pandemic on 6 variables from a sample of 29 largest cities in the Czech Republic. The primarily monitored criteria are the total income (P1) and total expenditure (V) of the city, which is further divided according to the classification of the budget structure for income, i.e., tax (P1), non-tax (P2), capital (P3) income and received transfers (P4). For the article, the expenditure side of urban management is not further broken down, as the income received in the pursuit of balanced management limits realised expenditures.

### 3.1 Methodology for the selection of evaluated cities in the Czech Republic

The article evaluates the 29 largest cities in the Czech Republic with more than 35,000 residents (see Appendix 1). The term statutory city is not used in the evaluated sample of cities for the towns of Třebíč and Česká Lípa. Based on separate laws, the capital city of Prague has a specific position. On the basis of the issued statute, statutory cities can be divided into city districts or city parts. Kopecký (2017) states that the city districts and parts of a statutory city, which are divided territorially, must have their boundaries defined. From a legal point of view, the designations "city districts" or "city parts" are comparable, and there is no difference between them. It only depends on the city's municipal council which designations it chooses in terms of territorial division and if it decides to divide the city's territory at all. In the year 2023, only eight cities are territorially divided in the Czech Republic. These are the statutory cities of Brno, Ostrava, Opava, Pilsen, Ústí nad Labem, Pardubice, Liberec and, in fact, the capital city Prague, which has a specific status based on a separate law. The geographical distribution of divided and undivided statutory cities in the territory of the Czech Republic, respectively, and within the individual regions of the Czech Republic is presented in Figure 1.


**Figure 1.** Statutory cities in the Czech Republic by type of internal division, 2023

*Source:* Ministry of the Interior of the Czech Republic

Figure 1 shows that out of the 27 cities mentioned that can be divided into city districts or city parts, only 8 cities used this option. Svoboda et al. (2017) state that since 1992, no statutory city has decided to divide territorially. The most significant number of statutory cities is located in the Moravian-Silesian Region (Ostrava, Havířov, Opava, Frýdek-Místek, Karviná and Třinec) and the Ústí Region (Ústí nad Labem, Most, Chomutov, Teplice and Děčín). There is more than one statutory city in the region of Middlebohemia region (Kladno and Mladá Boleslav), Liberec region (Liberec and Jablonec nad Nisou) and Olomouc region (Olomouc, Přerov and Prostějov). There is only one statutory city in the remaining eight regions of the Czech Republic, which is the city that is also the seat of the given region (Brno, Zlín, Jihlava, České Budějovice, Plzeň, Karlovy Vary, Pardubice and Hradec Králové).

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The smallest territorially divided statutory city in the Czech Republic, in terms of population and area, is the statutory city of Opava, which has approximately fifty-seven thousand inhabitants and an area of 9,057 ha. From these two points of view, it is indeed the smallest statutory city, but as far as city districts are concerned, it doesn't have the fewest. It can be stated that the number of city districts or city parts does not depend on the size (in terms of the number of permanent residents or the surface area) of the city. The most populous, territorially divided city in the Czech Republic is the capital city, Prague, which is also the largest in terms of area. Olomouc is the most populated, territorially undivided statutory city in the Czech Republic, with more than one hundred thousand inhabitants.

All territorially divided cities have been statutory cities since 1990. Within the evaluated sample of cities, statutory cities that are not territorially organised were supplemented by the towns of Třebíč and Česká Lípa, which have a larger population than the smallest of the statutory cities, which since 2018 is Třinec. Practically speaking, statutory cities in the territory of the Czech Republic adopt a statute only if they decide to divide territorially and at the same time if the representative and executive bodies of city districts or city parts are established (Koudelka, Průcha and Zwyrtek Hamplová, 2019). Territorially undivided statutory cities, which are Kladno, České Budějovice, Karlovy Vary, Jablonec nad Nisou, Hradec Králové, Jihlava, Zlín, Olomouc, Přerov, Chomutov, Děčín, Frýdek-Místek, Havířov, Most, Teplice, Karviná, Mladá Boleslav, Prostějov and Třinec are therefore no different from the towns of Třebíč and Česká Lípa.

### 3.2 Methodology of period evaluation, evaluated indicators and research questions

Private and public sector organisations were significantly affected by the COVID-19 pandemic in 2020 and 2021, the consequences of which are still visible today in many public budgets, not only within EU countries. An example can be the work of Botta, Caverzasi and Russo (2020) or Cantó et al. (2021), which states that governmental institutions reacted differently to the significant economic situation. Foremny, Sorribas-Navarro and Castelló (2020) or Conte et al. (2020) note that the government levels implemented several measures, most often they involved various forms of financial assistance to vulnerable groups of the population, entrepreneurs and companies through various tax breaks, which had a negative impact on the income side of public budgets.

Heald and Hodges (2020) stated that a consequence of the difference in income and expenditure is increasing indebtedness, which is a result of the struggle with the effects of the pandemic on the private and public sectors. Mura et al. (2014) already stated in their paper that the long-term development trend in public finances can reverse at any time. The COVID-19 pandemic has shown the importance of management, control, and efforts to eliminate the effects of negative impacts on public budgets. The consequences of COVID-19 automatically increased the pressure to increase spending on all government levels and, at the same time, had negative effects on the revenue side of public budgets.

As part of the paper, the incomes of all statutory cities in the Czech Republic and the towns of Třebíč and Česká Lípa are evaluated. Twelve consecutive years within the monitored period of 2010-2021 are evaluated.

In the article, the evaluated cities are ranked in descending order according to the permanent population as of 2021, and these are all cities in the Czech Republic with more than 35,000 inhabitants. The towns of Česká Lípa and Třebíč were included in the analysis for the reason that their number of permanent residents is higher than that of the smallest statutory city in the Czech Republic, which is the city of Třinec. At the same time, the catchment area of all the mentioned cities within the territorial division according to municipalities with extended scope differs from other areas in the Czech Republic in terms of the number of inhabitants by more than 20 thousand from the next largest municipality with extended scope, which is the area of town Tábor. In terms of the population represented, the selected sample of cities makes up 35.8% of the total population of the Czech Republic.

The main monitored criteria represent the city's total income and expenditure, which are further broken down according to the type classification of the budget structure for income into tax, non-tax, capital income and received transfers. The further breakdown of expenses is not used within the article, as it will be the result of another of the articles being prepared. The following budget indicators are evaluated within the article:

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- total income (P)
- tax revenue (P1)
- capital income (P2)
- non-tax revenues (P3)
- received transfers (P4)
- total expenses (V)

In most cases, we work with absolute total values due to the intention of the article, which is to point out the impact of the COVID-19 pandemic on the amount of financial resources managed by the cities. Each city's budget and realised expenditures are limited by the income they have just received in pursuing a balanced economy.

### 3.3 Methodology of data processing

The data on the economy of 29 cities in the Czech Republic (see Appendix 1) came from the publicly available database IISSP-Monitor, which is maintained by the Ministry of Finance of the Czech Republic and processed using selected mathematical and statistical methods. In the first step, the data is transformed from absolute values to relative values, year-on-year changes are also expressed using relative values or indices. In the majority of cases, we work with absolute total values due to the intention to show the impact of the COVID-19 pandemic on the amount of financial resources with which the evaluated cities managed during the given years. The budgets of cities and their expenditures are limited by the revenues obtained in the pursuit of a balanced economy.

The distribution function of the obtained data and the results for individual years, or subjects, are evaluated from the point of view of their mutual relationship (correlation), dispersion, mean value and also the already mentioned distribution function, as used, for example, by Bečica et al. (2021), Mokrá et al. (2021), Vavrek, Bečica (2022) or Vavrek (2024a, 2024b). For this purpose, it is gradually used:

- Shapiro – Wilk test

$$SW = \frac{(\sum u_i x_i)^2}{\sum u_i^2 \sum (x_i - \bar{x})^2}$$

where: $u_i$ - constant
$x_i$ - value of the i-th statistical unit
$\bar{x}$ - average value of the variable

- Kendall's coefficient

$$r_K = \frac{n_c - n_d}{n(n-1)/2}$$

where: n - number of observations of a pair of variables
$n_c$ - number of concordant pairs of the pair
$n_d$ - number of discordant pairs of a pair

- Levene test

$$W = \frac{(N-k)}{(k-1)} \frac{\sum_{i=1}^{k} N_i (Z_{i} - Z_{..})^2}{\sum_{i=1}^{k} \sum_{j=1}^{N_i} (Z_{ij} - Z_{i.})^2}$$

where: k - number of values ot the monitored category
N - number of observations or file range
$N_i$ - number of observations in i-th group
$Y_{ij}$ - measured value of the j-th unit of the i- th group
$\overline{Y_i}$ - average value of the i-th group
$\tilde{Y}_i$ - median of the i-th group
$Z$ - average of groups $Z_{ij}$
$Z_i$ - average $Z_{ij}$ for i-th group

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- Kruskal-Wallis test

$$Q = \frac{12}{n(n-1)} \sum_{i=1}^{I} \frac{T_i^2}{n_i} - 3(n+1)$$

where: n - number of observations, or file range
$n_i$ - number of observations in the i-th group
$T_i^2$ - total number of ranks in the i-th group

- Kolmogorov-Smirnov test

$$D_{n_1,n_2} = \underset{-\infty < x < \infty}{sup} \left| F_{1,n_1}(x) - F_{2,n_2}(x) \right|$$

where: $F_{1,n_1}(x)$ - empirical distribution function of the first sample
$F_{2,n_2}(x)$ - empirical distribution to the second choice

All analyses are processed in MS Office Excel, Statistics 14, and Statgraphics 19.

## 4 Results

The obtained results and their processing can be divided into two parts. In the first part, we deal with absolute changes in the budgets of the research sample, emphasising changes in 2021; see the first subsection. In the second part, we deal with the results at the level of the individual evaluated cities to verify the results obtained from the first part of the presented research.

### 4.1 Evaluation of changes for the entire research sample of evaluated cities

From the perspective of the development of the total income of the research sample (Fig. 2), we do not observe changes in the established trend. The graph captures the median with 95% confidence intervals. From the point of view of dispersion, the results for the year 2021 are without statistically significant differences compared to those achieved for the previous 5 years.

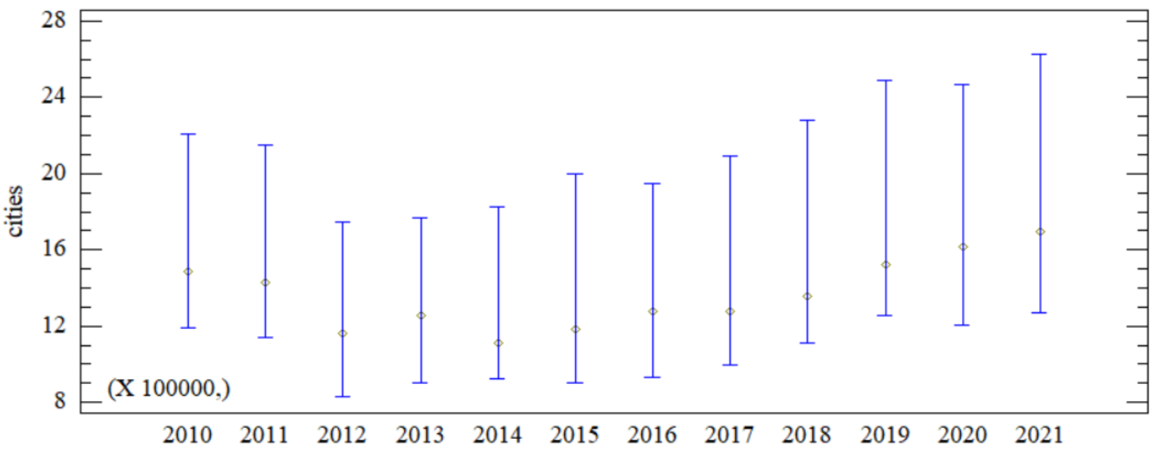


**Figure 2.** Development of total incomes in the period 2010 – 2021 (absolute values)

*Source:* Own processing

A similar conclusion can also be made when comparing the mean values, in which case we can state agreement across the entire evaluated period of 12 years. At the same time, the mutual links quantified using correlation analysis (Kendall coefficient) persist. When comparing the absolute total incomes of 29 cities, it is impossible to identify the impact of the COVID-19 pandemic.

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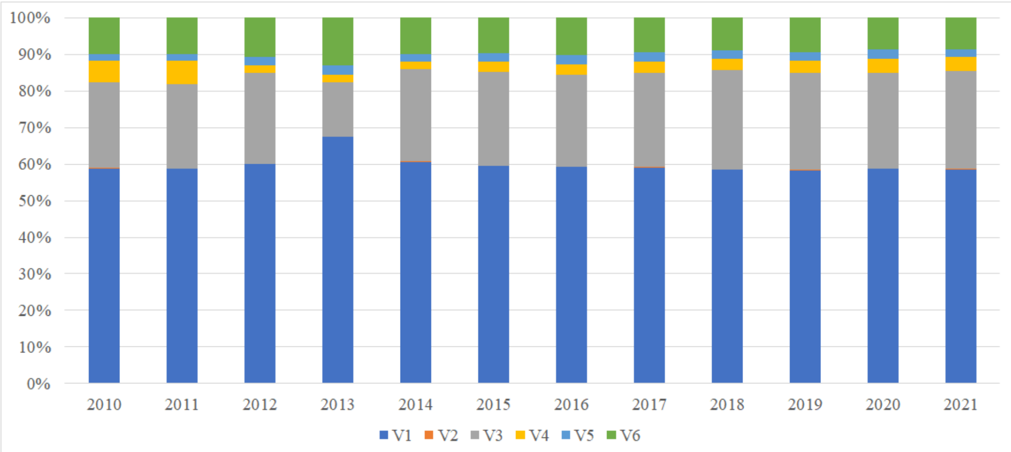
When looking at the total expenditures of the cities in the research sample (Figure 3), we note their identical trend with total incomes. However, this is due to legal regulations and the need for a balanced economy. So, we took a closer look at the structure of these expenditures according to sector breakdown, see legend.




Legend: V1: Services for the population; V2: Agriculture, forestry, and fisheries; V3: Industrial and other sectors of the economy; V4: Social Affairs and Employment Policy; V5: State security and legal protection; V6: General public administration and services

**Figure 3.** Development of total expenditures in the period 2010 – 2021 (relative values)

*Source:* Own processing

Group V1: Services for the population have a dominant representation in expenditures, followed by expenditures of group V3: Industrial and other sectors of the economy. The results over time, and especially when compared to 2021, do not show changes that could be clearly attributed to the impact of the COVID-19 pandemic. For this reason, in the next part of the article, we deal with revenues and its classification.

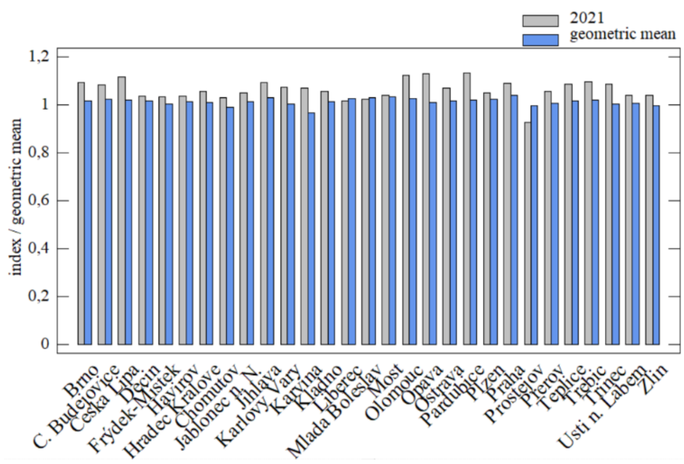



**Figure 4.** Interannual changes in the development of total incomes in the period 2010 – 2021 – individual cities

*Source:* Own processing

From the point of view of the individually evaluated cities that are part of the research sample (Fig. 4), the trend when comparing the results in 2021 with the previous period is quite similar. In 26 out of 29 cases, the change in the absolute income of cities in 2021 was higher than the geometric mean for the entire monitored period. The exceptions were Liberec, Mladá Boleslav and Prostějov. The most significant increase in income in 2021 is observed in Pardubice, Opava, Olomouc and Česká Lípa (in all cases an increase of more than 10%). At the same time, these cities belonged to those where the differences in the average change over a period of 12 years

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and the change in the last year were the highest. Thus, the COVID-19 pandemic did not affect the number of finances managed by the cities of the research sample. Amongst the mentioned cities, there are both territorially divided cities and also territorially undivided ones, i.e., it can be confirmed that the city's division into city districts or city parts does not directly affect the results of its management.

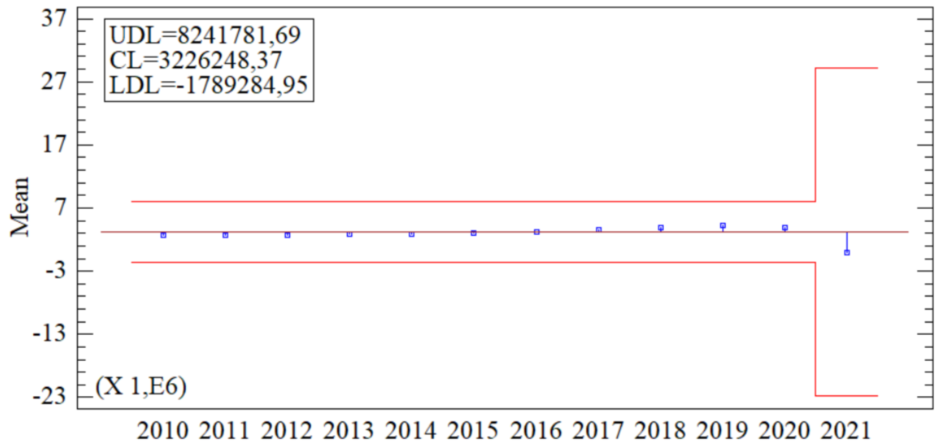


**Figure 5.** Development of tax incomes in the period 2010 – 2021 (absolute values)

*Source:* Own processing

What was not demonstrated in the total absolute income of the cities in the research sample can be observed in the case of tax income, for which we observe a lower value in 2021 compared to the 12-year average (see Figure 6). The homoscedasticity of the results was confirmed again, but this time in connection with the differences in mean values. However, it is impossible to determine from these results whether the change is due to the year 2021 or the development trend for the monitored period, which is discussed in the text below.

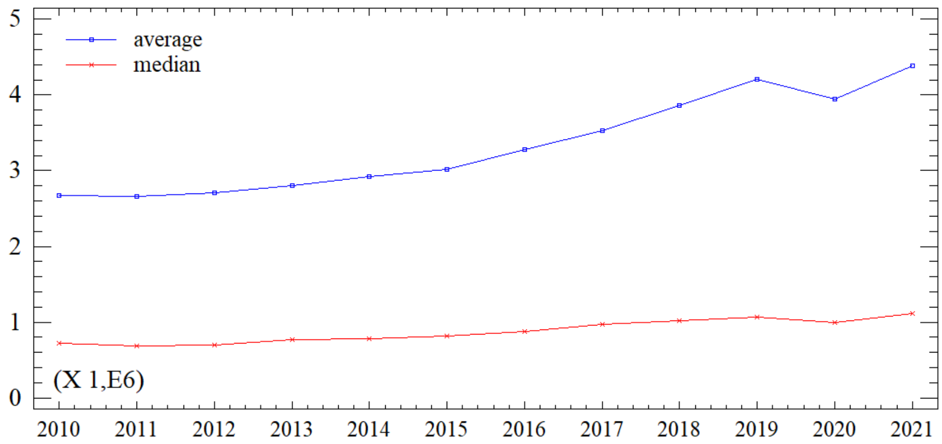


**Figure 6.** Development of average/median of tax incomes in the period 2010 – 2021 (absolute values)

*Source:* Own processing

As the results in this graph (Figure 6) indicate, behind the differences between individual years, it is necessary to look at the overall development of tax revenues of the research sample, not the impact of the COVID-19 pandemic. The increase in tax revenues at at least 6.25% is also uniform, which is the case of Liberec. On the contrary, Jihlava recorded the highest year-on-year increase (14.15%). When comparing the average value and the median in 2021, it is possible to observe a higher growth in the case of the first of the mentioned median values, which may indicate a change only in the units of the evaluated subjects. These results indicate differences in the impact of the COVID-19 pandemic on the amount of funds each entity manages. Of course, changes can also be caused by other factors, which can be the subject of further research.

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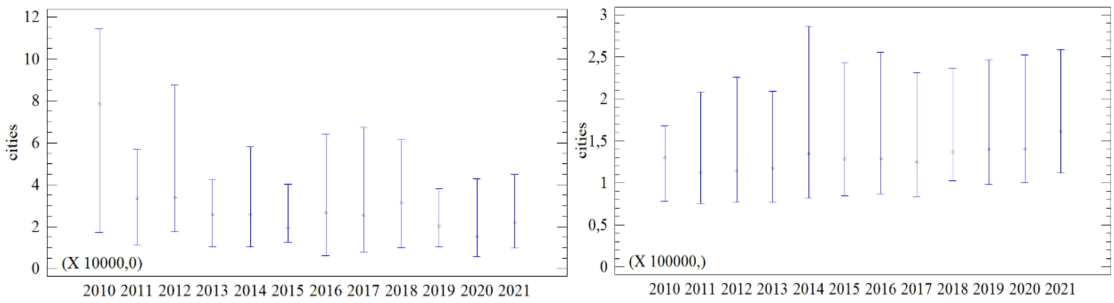


**Figure 7.** Development of non-tax (1.) and capital (2.) incomes in the period 2010 – 2021 (absolute values)

*Source:* Own processing

In the case of non-tax income (Figure 7, or graph on the left) as well as capital income (Figure 7, or graph on the right), the impact of the COVID-19 pandemic on absolute results was not demonstrated, which can be visually identified from the mentioned pair of graphs, see Fig. 7. We came to similar conclusions in the case of the last monitored variable, i.e., received transfers. What is interesting, however, is that the given situation is not the result of uniform development across the individual evaluated cities. In the case of non-tax revenues, a year-on-year decrease in 2021 can only be observed in the case of 7 cities, namely Č. Budějovice, Karlovy Vary, Karviná, Most, Opava, Prostějov and Ústí n. Labem. The same is true of capital income, which saw a year-on-year increase in 22 out of 29 cities in the last evaluated year. The opposite situation, i.e., the majority group of cities with a negative change in 2021, is also observed in the case of accepted transfers. The heterogeneity of the impact supports the idea of the need for more in-depth research focusing on specific cities and the factors influencing the results obtained.

### 4.2 Evaluation of changes for individual evaluated cities

Out of the total sample of 29 evaluated cities, 28 had a higher volume of finances in 2021 than in the previous year, see Figure 8.

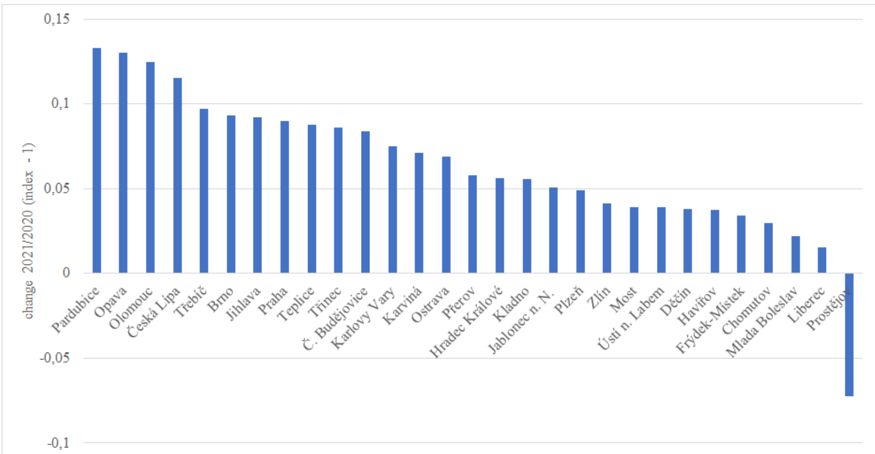


**Figure 8.** Year-on-year change in total income at the level of individual evaluated cities

*Source:* Own processing

From Fig. 8, it is evident that the only exception is the city of Prostějov, in which case we observe a decrease of approx. 88,228 thousand. CZK. In 4 cities, the increase is over 10%, supporting the idea that the general budget will not be affected by the COVID-19 pandemic 2021. These cities include Pardubice (+13.30%), Opava (+13.02%), Olomouc (+ 12.49%) and Česká Lípa (+11.52%). Of the four cities mentioned, only Opava is territorially divided according to the valid statute; the other three are undivided.

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**Table 1.** Evaluation of changes in 2021 in individual evaluated cities (revenues according to type)

| Revenue's type | P | P1 | P2 | P3 | P4 |
|---|---|---|---|---|---|
| Increase | 28 | 29 | 22 | 21 | 8 |
| Decrease | 1 | 0 | 7 | 8 | 21 |

*Source:* Own processing

Looking at the individual revenues of the general budget by type and changes in 2021, we note uniformity only in the case of tax revenues, for which, in all cases, we observe an increase at the level of 6.25-14.15%. Therefore, it is possible to look for the rise in total income primarily in the increase in tax income, which makes up most of every general budget in the Czech Republic. However, it is also not clear-cut for other incomes, while we can state that the manifestation of the COVID-19 pandemic may be primarily a drop in received transfers in some cases by up to 28% of the value in the previous year.

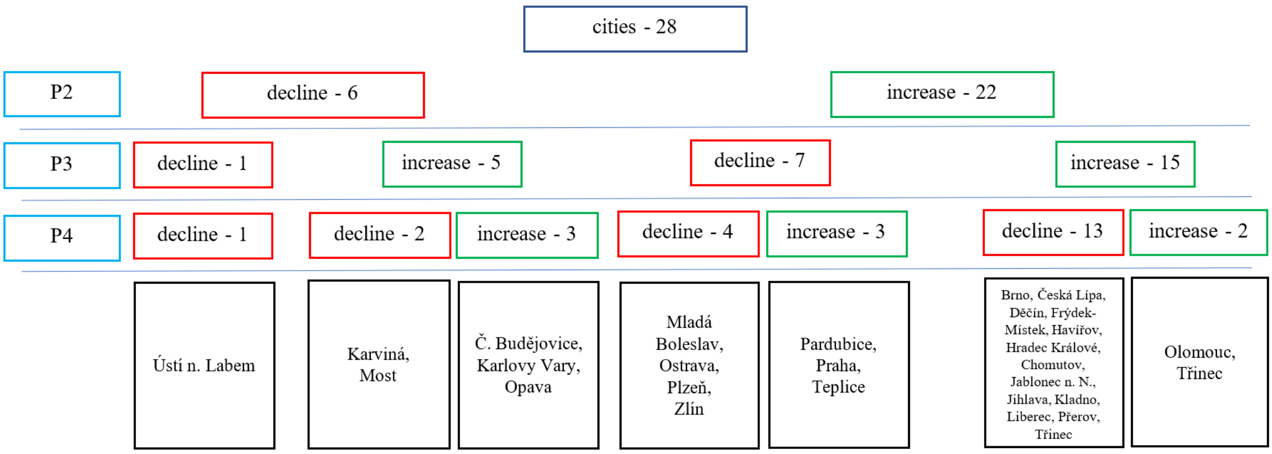


**Figure 9.** Classification of municipalities based on changes in incomes by type in 2021

*Source:* Own processing

In the graphic classification of cities, Prostějov is absent, as it was the only city that recorded a decrease in total revenues and took into account tax revenues, since in all 29 cases, an absolute increase in the volume of finances is recorded. The group of 13 cities in which the increase in non-tax and capital income is accompanied by a decrease in the volume of received transfers can be identified as the most numerous.

Only in the case of the cities of Olomouc and Třinec can we see and state an increase across each of the incomes by type. From the point of view of territorial division or non-division of the city into city districts or city parts, no quantifiable difference can be traced between the evaluated cities.

## Conclusions

The presented research aimed to quantify the impact of the COVID-19 pandemic on the budgets of selected cities in the Czech Republic. It was fulfilled through 3 research questions:

RQ1: Has the impact of the COVID-19 pandemic manifested itself on the volume of finances managed by the individual cities in the evaluated sample?
RQ2: Is it necessary to assess the impact of the COVID-19 pandemic individually or aggregated?
RQ3: Is it possible to trace the difference in management between territorially divided and non-territorially divided statutory cities in the Czech Republic?

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The results mentioned above of our analysis allow us to state that all research questions have been answered, and thus, the aim of this research has been fulfilled. Their novelty lies in the topicality of data used and the sample of 29 largest cities in the Czech Republic, which are not often the subject of independent research. The COVID-19 pandemic did not affect the total income of the 29 cities that were part of the research sample. However, the impact must be perceived at the level of individual subjects, while differences can be observed in tax, non-tax, capital income, and received transfers. From our point of view, it is not possible to perceive the impact of the COVID-19 pandemic in aggregate, as each city dealt with it differently and in its own way. The research carried out brought more questions than answers. The issue of the time interval in which the impact of the COVID-19 pandemic can be monitored must be added to the central theme. A one-year gap may not be enough, which can be helped by the continuation of the started research in the form of an extension of the monitored timeline by 2022. It should be noted here that the presented research works with the latest available data and the proper extension of the timeline by data for the year 2022, respectively, with the inclusion of a time gap of 1 or 2 years to quantify the impact of the COVID-19 pandemic will be the subject of further research. The second question is the accurateness of the assessment of the impact of the COVID-19 pandemic in aggregate. The research results did not reflect (partial) trends across individual entities or in the division into territorially divided and undivided cities. Thus, the question of correct identification of subjects for further research and quantification of the impact of the COVID-19 pandemic in the form of case studies is pressing. One possibility is the classification of cities captured in Figure 8, which divides cities based on changes in 2021. However, from the view of individual results, we can mark received transfers as the group of incomes potentially most affected by the COVID-19 pandemic. However, this assumption, like the entire research, needs to be interpreted with caution, and the above conclusions should first be verified by extending the timetable or by a closer analysis of expenditures within the city budgets or in the created groups.

We firmly believe that the results obtained can be used for further research into the impact of the COVID-19 pandemic on the management of local self-government entities, not only in the Czech Republic. Our findings can be used to set newly prepared legislation intended to reduce the deficit of public finances as a starting point or benchmark for more comprehensive research in the given area.

**Appendix 1.** Alphabetical list of evaluated cities in the Czech Republic, 2021

| City | Inhabitants in 2021 | The area of the territory (km$^2$) | Region | Structure |
|---|---|---|---|---|
| Brno | 382 405 | 230.18 | South Moravian region | 29 (P) |
| České Budějovice | 94 229 | 55.60 | South Bohemian region | - |
| Česká Lípa | 37 361 | 66.10 | Liberec region | - |
| Děčín | 47 951 | 117.70 | Ústí region | - |
| Frýdek-Místek | 55 006 | 51.56 | Moravian Silesian region | - |
| Havířov | 70 165 | 32.08 | Moravian Silesian region | - |
| Hradec Králové | 92 683 | 105.69 | Hradec region | - |
| Chomutov | 48 349 | 29.25 | Ústí region | - |
| Jablonec n. N. | 45 317 | 31.38 | Liberec region | - |
| Jihlava | 51 125 | 87.87 | Vysočina region | - |
| Karlovy Vary | 48 319 | 59.08 | Karlovy Vary region | - |
| Karviná | 50 902 | 57.52 | Moravian Silesian region | - |
| Kladno | 68 896 | 36.97 | Central Bohemian region | - |
| Liberec | 104 261 | 106.09 | Libere region | 1 (D) |
| Mlada Boleslav | 44 506 | 28.90 | Central Bohemian region | - |
| Most | 65 341 | 86.94 | Ústí region | - |
| Olomouc | 100 514 | 103.33 | Olomouc region | - |
| Opava | 55 996 | 90.61 | Moravian Silesian region | 8 (P) |
| Ostrava | 284 982 | 214.23 | Moravian Silesian region | 23 (D) |
| Pardubice | 91 755 | 82.66 | Pardubice region | 8 (D) |
| Plzeň | 175 219 | 137.67 | Pilsen region | 10 (D) |
| Praha | 1 335 084 | 496.21 | Prague | 57 (P) |
| Prostějov | 43 381 | 39.04 | Olomouc region | - |
| Přerov | 42 451 | 58.45 | Olomouc region | - |
| Teplice | 49 705 | 23.78 | Ústí region | - |
| Třebíč | 35 107 | 57.59 | Vysočina region | - |
| Třinec | 35 006 | 85.36 | Moravian Silesian region | - |
| Ústí n. Labem | 91 982 | 93.97 | Ústí region | 4 (D) |
| Zlín | 74 478 | 102.83 | Zlín region | - |

*city districts (D) or city parts (P)

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