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Territorial Allocation of Subsidies and Share of EU Structural Funds in the Czech Republic*

Daniel Franke [a], Karel Maier [a]

a Department of Landscape and Urban Planning, Faculty of Environmental Sciences, Czech University of Life Sciences Prague, Czech Republic
E-mail: franke@fzp.czu.cz, maier@fzp.czu.cz

Abstract

The aim of this article is to find out how the state and EU subsidies paid in the Czech Republic since 2000 have been translated into the territory. The methodology is based on obtaining a continuous time series of data on subsidies for the smallest possible territorial level and comparing the impacts on territorial cohesion, with particular reference to structurally affected regions on the one hand and the areas of Integrated Territorial Investments (ITI) and Integrated Plan for the Development of the Territory (IPRÚ) on the other. The results show that the share of subsidies has increased steadily over the period under review. Per capita funding does not differ much between regions and no significant difference was found between assistance to structurally affected regions and the rest of the territory in the different support themes, which are mainly transport infrastructure, agriculture and education.

Keywords: Subsidies, structural funds, allocation, structurally disadvantaged regions, Czech Republic

JEL Classification: R00, H20, C80

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1. Background

1.1 Territorial cohesion in EU policies

The territorial dimension of cohesion emphasises the placement of assistance, seeking for an optimum between effectiveness of support, making the place more viable and the social aspect, which requires increased support for places lagging behind. The effort is intended to strengthen competitiveness and to reduce regional disparities.

The concept of territorial cohesion is closely linked to the European Union's objective of avoiding large territorial disparities (Camagni, 2009; Nosek, 2017). The EU Cohesion Policy is anchored in the Treaty of Lisbon (EC, 2007a), which proclaimed social, economic and territorial cohesion as a shared responsibility of the EU and the Member States and as such an objective of EU policy. The EU Cohesion Policy is often credited with improving cooperation and coordination in the delivery of regional development policy through the application of multi-level governance enshrined in the partnership principle (Dąbrowski, 2014).

The ESPON Comparative Analysis of Territorial Governance and Spatial Planning Systems in Europe (COMPASS) project in 2016 (Nadin *et al*., 2018) was concerned with studying major changes in territorial governance and spatial planning systems and policies with special reference to the impact of the EU, especially Cohesion Policy. The project examined trends between 2000 and 2016. From the extensive survey among almost all European countries, it became obvious that the spatial development and regional policies in the countries of East-Central Europe have been increasingly driven by the EU structural funding since the EU accession.

The EU regions with per capita income of less than 75% of the EU average receive considerable transfers from the EU in the context of the EU Cohesion Policy (EC, 2007; Kamps *et al.*, 2009; Ferrara *et al*., 2017). The European Structural and Investment Funds (ESIF) accounted for 42.52% of overall public investment in the Czech Republic in 2017, similarly to Romania (44.86%) and Bulgaria (48.54%), but less than Poland (61.17%), Lithuania (74.36%) and Portugal (84.20%) (EC, 2022). As such, the EU's instruments for economic and social cohesion policies are central to support the economic growth and to promote economic integration in the less advanced economies of East-Central Europe (Hrůza *et al*., 2019). The Cohesion Policy is financed by three funds, namely the European Regional Development Fund (ERDF), the European Social Fund (ESF) and the Cohesion Fund (CF), which account for more than half of the budget of the Structural and Investment Funds for a substantial portion of public investment (OECD, 2020). These funds are allocated at the NUTS level 2 (NUTS 2). The NUTS classification divides each Member State into regions ranging from larger to smaller at three different levels (Solís-Baltodano *et al*., 2021).

Subsidies supporting social and economic development usually originate from the state budget, state funds, state financial assets and, in the case of EU Member States, from EU funds.

The proportion of EU support varies from region to region and from country to country, depending on the objectives of the EU Cohesion Policy.

EC (2017) monitored the territorial aspect of the EU Cohesion Policy in the programming period 2014–2020. One of the conclusions of the report was that more attention needs to be given to monitoring and evaluating the outcomes of strategies. More work needs to be done at Commission, Member State and programme levels to improve the quality of monitoring data and application of evaluation methods.

A number of studies have looked at fund allocations based on different quantitative methods. The basic evaluation methods include various (spatial) econometrics. Mathematical procedures that assess the impact of structural funds on economic and social development are usually based on regression and simulation models (Porgo *et al*., 2019; Bătușaru and Bucur, 2018) where, in most cases, these methods are applied to large territorial units such as countries, NUTS 1 or NUTS 2 levels (Mohl and Hagen, 2010; Kolaříková *et al*., 2018). Other methods reported in the literature deal with the ex-ante territorial assessment of policy impacts: these are the structural equation model (SEM) (Jestl *et al*., 2020) and the territorial impact assessment (TIA) (Evers, 2011). Above all, quantitative evaluation methods require reliable and consistently acquired relevant data on assistance and its territorial destination. There are not many examples for the method used in this paper, which is based on the aggregation of cross-sectional data over a long period onto as detailed a spatial unit as possible. Several cases of autocorrelations and subsequent regressions are described in the framework of spatial econometrics, where smaller spatial units allow us to observe how they form clusters (Pumprlová, 2018). Within the literature, we most frequently encounter cross-sectional data processing methods as introduced by Moran, Geary and Getis (Griffith, 1987).

Based on many papers, it is important to monitor where subsidies from funds go and what positive impacts they bring. Becker *et al*. (2008) and Ramajo *et al*. (2008) concluded that the accessibility of Objective 1 funding increased the per-capita income by 1.8% relative to comparable regions; every euro spent on Objective 1 led to EUR 1.21 in additional GDP. Potluka *et al*. (2010) studied the environment for EU Cohesion Policy in the EU accession countries in the pre-accession and post-accession period. Later and related to the Czech Republic, Hrůza *et al*. (2019) studied the impact of EU funds on regional economic growth in the Czech Republic in the period 2004–2015. They concluded that the financial sources from the ESIF contributed on average by 1.96 pp annually to the growth rate of GDP in the Czech Republic.

There are also papers that deal with the relationship between regional disparities and financing of regional policy in the Czech Republic. Hájek *et al*. (2014) compared spatial coherence of national and European regional policies in Czechia and Slovakia in the programming period 2007–2013. They concluded that there was a higher financial allocation per capita in the Slovak areas of special interest than in the Czech structurally disadvantaged regions. They also discussed

aspects of the difference in terms of delimitation of the special interest areas, strategies in the programming documents and territorial absorption capacity. They emphasised different spatial aims of regional policies in the two countries: while Czech policy supported lagging regions, Slovak policy directed the support to growth poles. Following this argument, Novosák *et al*. (2015) concluded on the background of empirical data that the EU Cohesion Policy did not compensate for the structural disadvantage of Czech (micro) regions and the spatial coherence of EU Cohesion Policy and Czech national regional policy was missing.

In order to assess the effectiveness of public funds spent through development subsidies, it is crucial whether and to what extent a subsidy has actually brought about positive social and economic changes in the area concerned. Rodríguez-Pose and Fratesi (2004) reported that subsidies to transport infrastructure have weaker spatial effects even when large investments are involved; here it can certainly be argued that effects of transport infrastructure may have a delayed response. Support to agriculture has positive effects, but only for a limited area. The authors rank support to education and research as the most important in terms of effectiveness.

1.2 Regional development assistance in the Czech Republic

Similar to other countries of East-Central Europe that accessed the EU in 2004 and later, the Czech Republic has been a net receiver of European Structural and Investment Funds (ESIF) since its accession. According to the Ministry of Finance of the Czech Republic, the total subsidies in the period 2000–2020 made up CZK 5,730,150 million[2], *i.e.,* approx. € 220,390 million. About € 52,700 million, which is almost one quarter of the total subsidies, originated from the EU funds (MMR, 2022). The share of EU assistance in the period was dynamically changing: especially, it was much smaller in the programming period 2000–2006 as the Czech Republic joined the EU only in 2004.

In order that the ESIF resources should be directed to the appropriate places that qualify for the assistance, Czech National Strategy of Regional Development 2008–2014, Czech National Strategy of Regional Development 2014–2020 and also Czech National Strategy of Regional Development 2021+ identify structurally disadvantaged NUTS 2 regions of Northwest (NUTS 3 regions of Karlovy Vary and Ústí nad Labem) and Moravia-Silesia. These regions need preferred assistance to overcome their structural deficiencies stemming from declining mining and heavy machinery industry, and high levels of environmental pollution and land deterioration. Besides, in the whole period 2000–2020, all the NUTS 2 / NUTS 3 regions except the Capital City of Prague were classified as less developed regions and as such they were assisted from the European Regional Development Fund.

2 Exactly: CZK 5,730,150,272,776.

In terms of potential for development and growth, the regions were in line with the implementation of regional policy within the Strategy of Regional Development, areas for Integrated Territorial Investments (ITIs) (Ouředníček *et al*., 2014) and the Integrated Plan for the Development of the Territory (IPRÚ) (MMR, 2016). The IPRÚ represents a tool for regional development for areas located outside metropolitan areas and nationally important agglomerations, which in turn use ITIs. Both cases are instruments of an integrated approach using European Structural and Investment Funds (MMR, 2016; Ouředníček *et al*., 2020; Košťálová and Bednaříková, 2019). However, actual development trends vary among the particular areas. Those situated in the structurally disadvantaged NUTS 2 regions rather show signs of decline: population decrease, ageing, brain drain as a result of out-migration of young, educated people, *etc.* (Maier and Franke, 2015; Maier and Franke, 2017). The designation of areas for ITIs and IPRÚ thus relates more to an attempt to set up an efficient absorption of ESIF rather than to actual development.

The projects assisted by the EU structural funds through ESIF typically have to be tested *ex ante* using cost-benefit analysis to prove their effectiveness and to demonstrate their benefits for the community concerned. For ex-post evaluation, the public investments assisted by ESIF are monitored and their expenses are available in public registers, with the share of EU contributions as well as their territorial destination in terms of the receivers of assistance. However, the territorial aspect of the ESIF expenses has not been systematically monitored so far.

2. Objective

The above-mentioned research papers studying the earlier relationship between regional policies that supported the less developed Czech regions and the structural support direction provide a background for the presented research. It updates the previous findings, with a longer time horizon allowing us to monitor the development of Czech regional policy over time and against the background of changes in the direction of EU structural funds. The analysis aims at assessing the territorial distribution of state and EU assistance in the Czech Republic at the level of NUTS 3 regions and, wherever possible, also at the level of districts as smaller territorial units. The territorial targeting of support can help identify the extent to which support is directed to structurally disadvantaged regions in order to increase their competitiveness, or to areas of Integrated Territorial Investments (ITIs), where resource use can be expected to be most efficient (Ferry, 2019). The evidence of territorial targeting of subsidies can shed light on how the use of the EU structural funds contributes to reducing regional disparities, or possibly whether it contributes to a place-based approach that should be implemented by regional policy and spatial planning.

The survey covers the period 2000–2020, *i.e.,* almost the whole period of EU assistance in the Czech Republic. An analysis of the special-purpose subsidies enables easier identification of the types of interventions that should be carried out in different regions, with a special focus on the structurally disadvantaged regions.

3. Methodology

Three publicly accessible sources of data are used, each with its specific limitations for the analysis:

(1) the Central Register of Subsidies (originally CEDR, now IS ReD) managed by the Ministry of Finance (MFČR, 2022);

(2) data on transport and other projects from the Ministry of Regional Development;

(3) the State Agricultural Intervention Fund (Státní zemědělský intervenční fond, SZIF) provides data on agricultural subsidies.

The Central Register of Subsidies (IS ReD) collects data on special-purpose subsidies provided from the state budget. The data are collected by subsidy providers (ministries, agencies) and transmitted to the General Financial Directorate for further processing. The IS ReD information system contains records on subsidies that have been provided by the state budget and European Union funds since 1999. Thus, it includes subsidies for three completed planning periods, but EU resources cannot be distinguished from other subsidies. The data were downloaded from the source as an open dataset (MFČR, 2022), as well as from reports that contain distribution of subsidies by legal form of beneficiaries or by region. From this database, twenty largest beneficiaries are studied in particular.

The Ministry of Regional Development collects data on individual projects and their local implementation with the support of ESIF. These data make it possible to distinguish the territorial destination of projects and also the amounts transferred from EU structural funds can be recognised from total subsidies. Operations can be followed for the particular EU programming periods, *i.e.,* for the years 2004–2006, 2007–2014 and 2014–2020. For the purpose of evaluation of local implementations, these three periods were merged into a single DBF table, with the use of the ZIP code of each beneficent included in the source database. Amounts for projects that have multiple locations of implementation were adjusted according to the local impact (*e.g.,* length of infrastructure in the area). Upon merging the datasets, the Company ID numbers (IČO) and financial details of the project were also preserved. The territorial allocation of the data on linear (*i.e.,* transport) infrastructure investments was estimated by the length of the infrastructural lines relevant to the NUTS 3 regions.

The subsidies provided by the State Agricultural Intervention Fund (SZIF) constitute a separate chapter in the funding structure. A list of subsidy recipients is currently available on the SZIF website (SZIF, 2022) only for the last three fiscal years, specifically for the years 2017, 2018 and 2019.

All statistical and localization methods are developed in a GIS environment using spatial autocorrelation tools. Specifically, the Moran's index method (Moran, 1950; Griffith, 1987) and cluster analysis and outlier analysis Local Moran's I by Anselin (1995) were used at the NUTS 3

and NUTS 4 spatial levels. The zero value of the Moran's index in the middle of the graph represents a completely random distribution regardless of the data neighbourhood. To the left of the zero value are negative Moran's index values, where areas with similar characteristics repel each other. Positive values of Moran's index are situated to the right of the zero value, where areas with similar characteristics attract each other and form clusters. Given a set of weighted features, we identify statistically significant hot spots, cold spots and spatial outliers using Anselin's local Moran's index statistics. The statistical significance of the results was assessed using *z*-scores and *p*-values. A *p*-value lower than 0.05 indicates that the analysed distribution of values in the area is not spatially neutral and it is not the result of a random process.

4. Outcomes

Owing to the heterogeneous nature of the data available in public databases, two lines of analysis were elaborated: an overview and evaluation of drawing by main beneficiaries broken down by regions (NUTS 3) and drawing by the rest of legal entities and their registered offices broken down by districts (NUTS 4). The reason why the main beneficiaries were analysed by regions was regional governance, which prevents subdivision into smaller territorial units, and also the fact that the territorial impact of investments in motorways and main railway lines, which make up for another major flow of subsidies, is at a higher than district level.

4.1 Beneficiaries of subsidies

Subsidies by legal status of beneficiaries

The data from the IS ReD database of the Ministry of Finance was used for these analyses. The database distinguishes the beneficiary's legal form. Table 1 shows all the main beneficiary legal forms with a total amount drawn and a share of total subsidies.

Table 1: Legal status of funding beneficiaries (2000–2020)

Legal status	Total amount drawn (CZK million)	Share in total funding
Unspecified	2,531,181	45.0%
Educational legal entities	602,358	10.7%
State or national corporations	81,825	1.5%
Individual persons / entrepreneurs	68,716	1.2%
State funds	368,877	6.6%
Funded organizations	723,280	12.9%
Railway companies	383,615	6.8%
Municipalities, municipal organizations and associations of municipalities	631,802	11.2%
Other forms	227,328	4.05%
Total	*5,618,982*	*100%*

Source: Own calculations based on IS ReD database (MFČR, 2022)

Largest beneficiaries by use of aid

The specific and precise utilization of subsidies is monitored at the regional level for projects, among which several groups can be specified that are important for territorial development and for which local implementation linked to the beneficiary's Company ID (IČO) is available in the datasets. The most important receivers among these groups are budgets of regional territorial governance, state agencies responsible for development of transport infrastructure and public higher education institutions.

Twenty largest beneficiaries received CZK 3,377,752 million in the period 2000–2020, and they accounted for approximately 60% of the total subsidies. Among them there are budgets of governance regions (NUTS 3), investment in transport infrastructure (through Directorate of Roads and Motorways, Railway Administration and State Fund for Transport Infrastructure), agriculture (State Agricultural Intervention Fund), technical infrastructure and support to research, science and higher education.

As the data from the IS ReD were collected for the programming periods, they allow comparison of average yearly subsidies to major beneficiaries in the field of regional budgets,

transport investments, higher education facilities and agricultural holdings. This suggests that regional budgets and transport were dominant beneficiaries, followed at a certain distance by universities and agricultural holdings (Table 2). The rest of the beneficiaries received subsidies totalling CZK 2,352,398 million.

Table 2: Largest beneficiaries' average yearly support

	Total subsidy 2000–2020 [CZK million]	Average subsidy / year [CZK million]	Average subsidy / year per capita as of 2020 [CZK]
Regional budgets	1,847,929	92,396	8,640
Transport (Directorate of Roads and Motorways, Railway Administration and State Fund for Transport Infrastructure)	965,857	48,293	4,516
Universities	638,337	31,917	2,984
Agriculture (State Agricultural Intervention Fund)	272,217	13,611	1,273

Source: Own calculations based on IS ReD database (MFČR, 2022)

Budgets of regions

Regions (NUTS 3) are among the largest beneficiaries of subsidies, headed by the Moravian-Silesian Region and the Capital City of Prague. The regions of Vysočina, Liberec and Karlovy Vary utilized the relatively lowest amounts; the Karlovy Vary Region is the only region that is not among the 20 largest beneficiaries of subsidies.

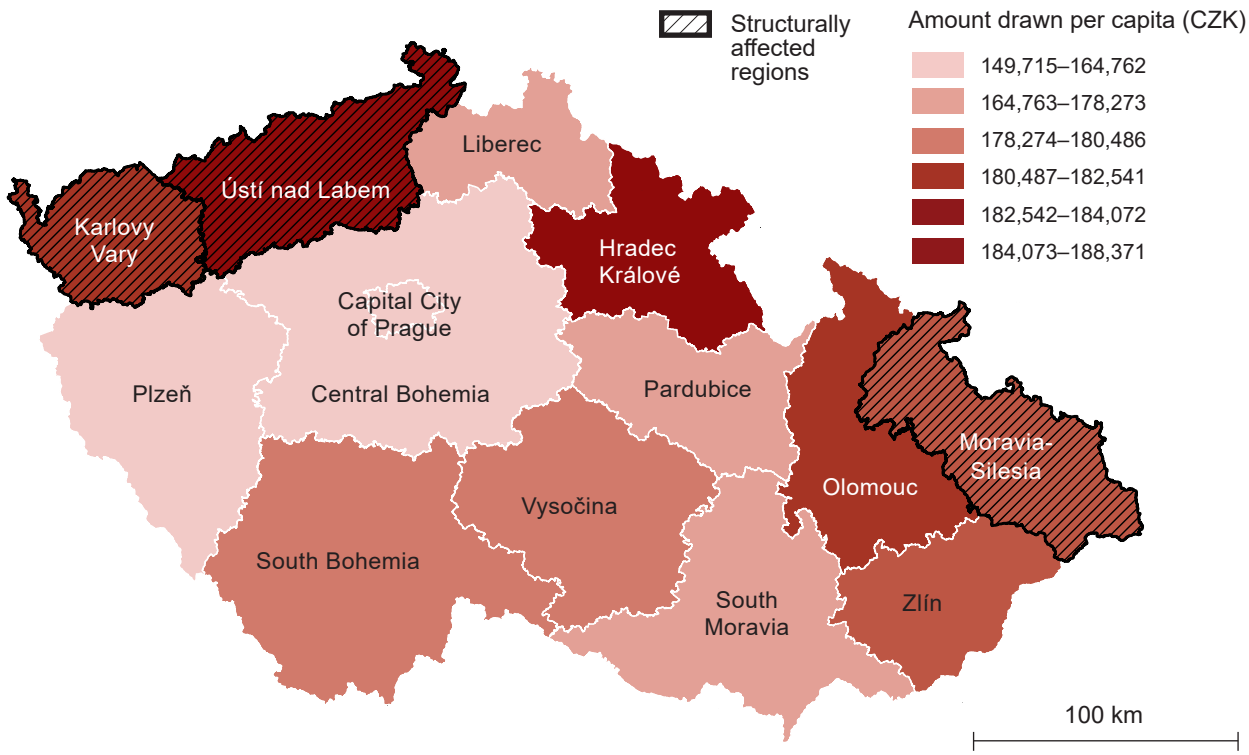
With respect to population of the regions, the highest subsidies per capita were provided to the NUTS 3 region of Hradec Králové, with the structurally disadvantaged regions of Ústí nad Labem, Karlovy Vary and Moravia-Silesia also among those with highest amounts per capita. However, the amounts directed to the structurally disadvantaged regions are not significantly higher than those for other regions. Significantly fewer funds per capita were directed to Central Bohemia, the Capital City of Prague and Plzeň regions (see Table 3 and Figure 1).

Table 3: Assistance to regional budgets (2000–2020)

Region (ordered by per-capita subsidies)	Total amount drawn (CZK million)	Population (as of 2020)	Amount drawn per capita (CZK)
Hradec Králové	103,857	551,343	188,371
Ústí nad Labem	153,555	819,713	187,328
Karlovy Vary	54,178	294,331	184,072
Olomouc	116,087	631,836	183,730
Zlín	106,213	581,862	182,541
Moravia-Silesia	217,763	1,198,534	181,691
Vysočina	92,015	509,817	180,486
South Bohemia	115,669	643,408	179,775
Pardubice	93,246	523,054	178,273
Liberec	78,722	443,842	177,366
South Moravia	198,212	1,192,698	166,188
Plzeň	97,286	590,461	164,762
Capital City of Prague	213,294	1,325,280	160,943
Central Bohemia	207,832	1,388,185	149,715
Regions total	*1,847,929*	*10,694,364*	*172,795*

Source: Own calculations from the Czech Statistical Office (CZSO, 2022) and IS ReD database (MFČR, 2022)

Figure 1: Amount of assistance per capita to NUTS 3 regions (2000–2020)



Source: Own calculations from IS ReD (MFČR, 2022) and Ministry of Regional Development database (MMR, 2022)

Subsidies targeted at regional budgets can be evaluated over three planning periods. Table 4 shows the direction of funds to the NUTS-3 regions in the individual periods 2000–2006, 2007–2013 and 2014–2020. The flow of funds to structurally disadvantaged regions was uneven in the individual periods. While in the regions of Moravia-Silesia, Ústí and Labem and Karlovy Vary the increase between 2000–2006 and 2007–2013 was by about 40%, there was significantly smaller growth between the second and third periods, only by about 18%. The other regions were seeing a more dynamic increase in all the periods. The increase was on average by 10% more than in the disadvantaged regions, especially in the Central Bohemian Region.

Table 4: Change in assistance to regional budgets in particular periods

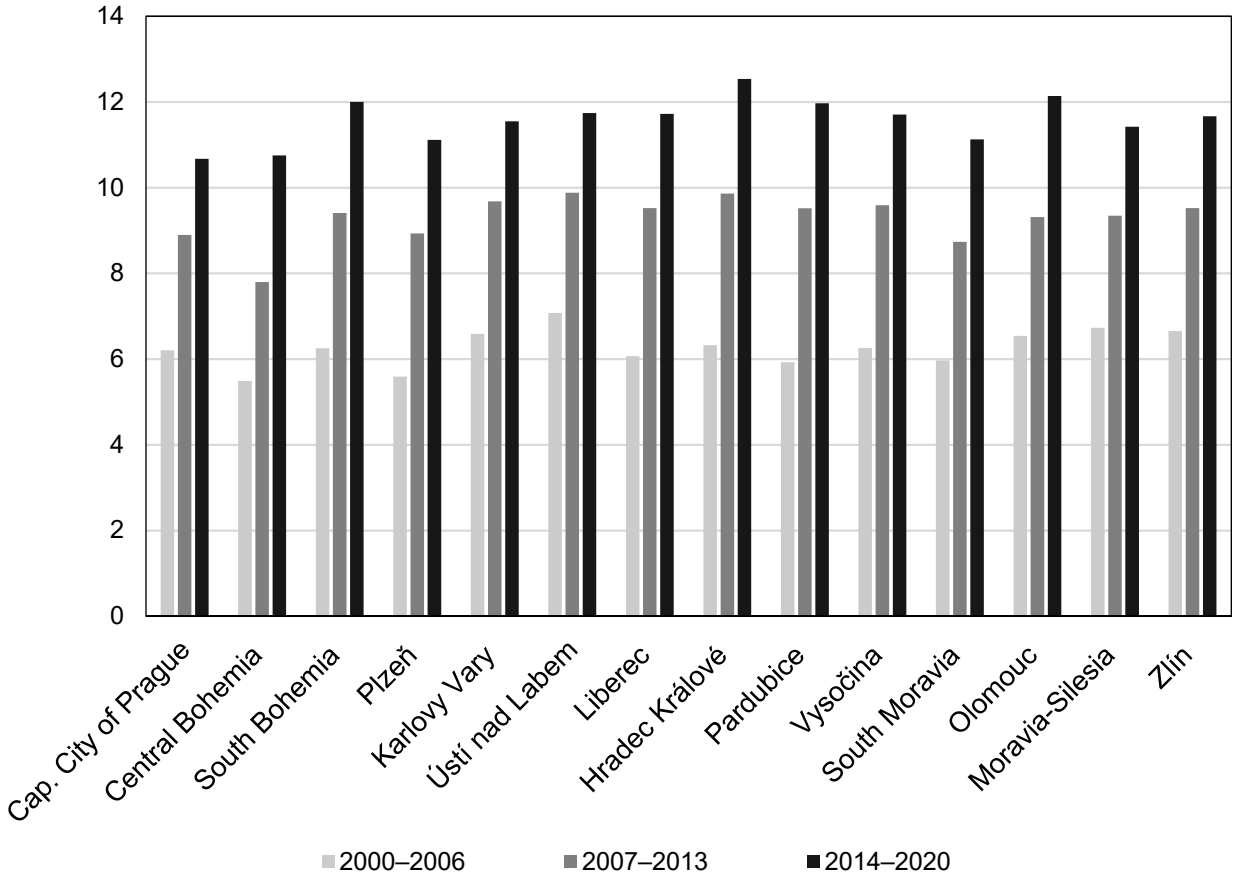
	2000–2006		2007–2013		2014–2020		2007–2013 / 2000–2006	2014–2020 / 2007–2013
Region	**Total amount**	**Annual average over the period**	**Total amount 2007–2013**	**Annual average over the period**	**Total amount 2014–2020**	**Annual average over the period**	**Percentage increase in annual average**	**Percentage increase in annual average**
	[CZK million]							
Capital City of Prague	36,862	7,372	77,425	11,061	99,008	14,144	50.03	27.88
Central Bohemia	32,257	6,451	71,094	10,156	104,482	14,926	57.43	46.96
South Bohemia	19,700	3,940	41,927	5,990	54,041	7,720	52.02	28.89
Plzeň	15,506	3,101	35,850	5,121	45,930	6,561	65.15	28.12
Karlovy Vary	*10,030*	*2,006*	*20,352*	*2,907*	*23,796*	*3,399*	*44.93*	*16.92*
Ústí nad Labem	*29,119*	*5,824*	*57,065*	*8,152*	*67,371*	*9,624*	*39.98*	*18.06*
Liberec	13,065	2,613	29,242	4,177	36,416	5,202	59.87	24.53
Hradec Králové	17,381	3,476	38,096	5,442	48,381	6,912	56.56	27.00
Pardubice	15,042	3,008	34,387	4,912	43,818	6,260	63.29	27.43
Vysočina	16,006	3,201	34,241	4,892	41,768	5,967	52.80	21.98
South Moravia	33,797	6,759	71,545	10,221	92,869	13,267	51.21	29.80
Olomouc	20,921	4,184	41,485	5,926	53,680	7,669	41.64	29.40
Moravia-Silesia	*42,027*	*8,406*	*79,910*	*11,416*	*95,825*	*13,689*	*35.81*	*19.92*
Zlín	19,627	3,925	39,074	5,582	47,513	6,788	42.20	21.60

Note: The structurally disadvantaged regions are shown in *italics*.

Source: Own calculations from IS ReD database (MFČR, 2022)

The course of the development of yearly subsidy flows in individual regions is quite similar. It differs in absolute volumes, which, however, reflect the population sizes of individual regions (see Figure 2).

Figure 2: Assistance to NUTS 3 regions per capita per year in programming periods [CZK thousand]



Source: Own calculations from IS ReD database (MFČR, 2022)

Figure 2 shows that the annual averages in subsidies per capita in the regions gradually increased in the individual programming periods. In an interregional comparison, the subsidies per capita in the regions do not differ significantly. The structurally disadvantaged regions are average in this respect.

The results of the statistical analysis of regional budgets does not prove a relationship between a region's position and the assistance. The spatial autocorrelation of the values from Figure 1 based on Moran's index is 0.081. As such, it represents a random pattern. The *z*-score of 0.934 suggests that the pattern does not appear to be significantly different from random. Finally, the *p*-value 0.350 indicates that the analysed distribution is the result of a random process.

Results indicating random patterns also show up when we try the individual planning periods as shown in Table 4.

Transport infrastructure

The three largest beneficiaries of this subsidy area are the Directorate of Roads and Motorways (Ředitelství silnic a dálnic, ŘSD), the Railway Administration (Správa železnic) and the State Fund for Transport Infrastructure (Státní fond dopravní infrastruktury, SFDI). In total, from 2000 to 2020 they obtained subsidies of almost CZK 966 billion, which accounts for about 17% of all the subsidies (see Table 5).

Table 5: Subsidies for transport agencies (2000–2020)

Name of agency	Total amount drawn (CZK million)
Directorate of Roads and Motorways of the Czech Republic (ŘSD)	496,039
Railway Administration (SŽDC)	384,223
State Fund for Transport Infrastructure (SFDI)	85,595

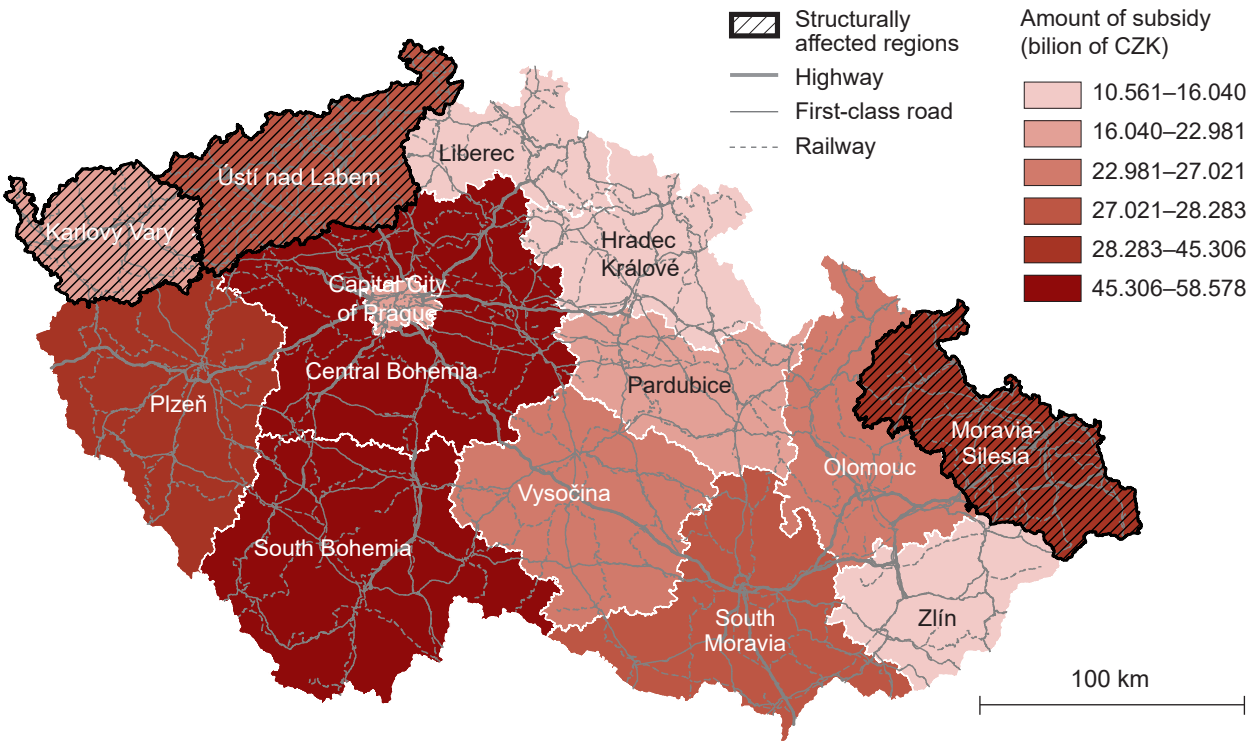
Source: Own calculations from IS ReD (MFČR, 2022) and Ministry of Regional Development database (MMR, 2022)

Subsidies with local impact on individual regions can be evaluated for the two planning periods 2007–2014 and 2014–2020 according to data of the Ministry of Regional Development.

As it is obvious from Figure 3, the subsidies to all modes of transport infrastructures concentrated mainly in the regions of Central Bohemia, South Bohemia, followed by Plzeň and the structurally disadvantaged region of Moravia-Silesia. The structurally disadvantaged regions are presented in the full scope of diversity: from heavily subsidized Moravia-Silesia to mildly subsidised Ústí nad Labem to weakly subsidised Karlovy Vary. The distribution of resources among regions was obviously influenced by major investments in new motorways and upgrading of main railway lines along TEN-T corridors. If the data on transport projects are converted to the area of regions (see Figure 4), the structurally affected regions come out better. This applies to all the three regions, but it is particularly evident in the Moravian-Silesian Region.

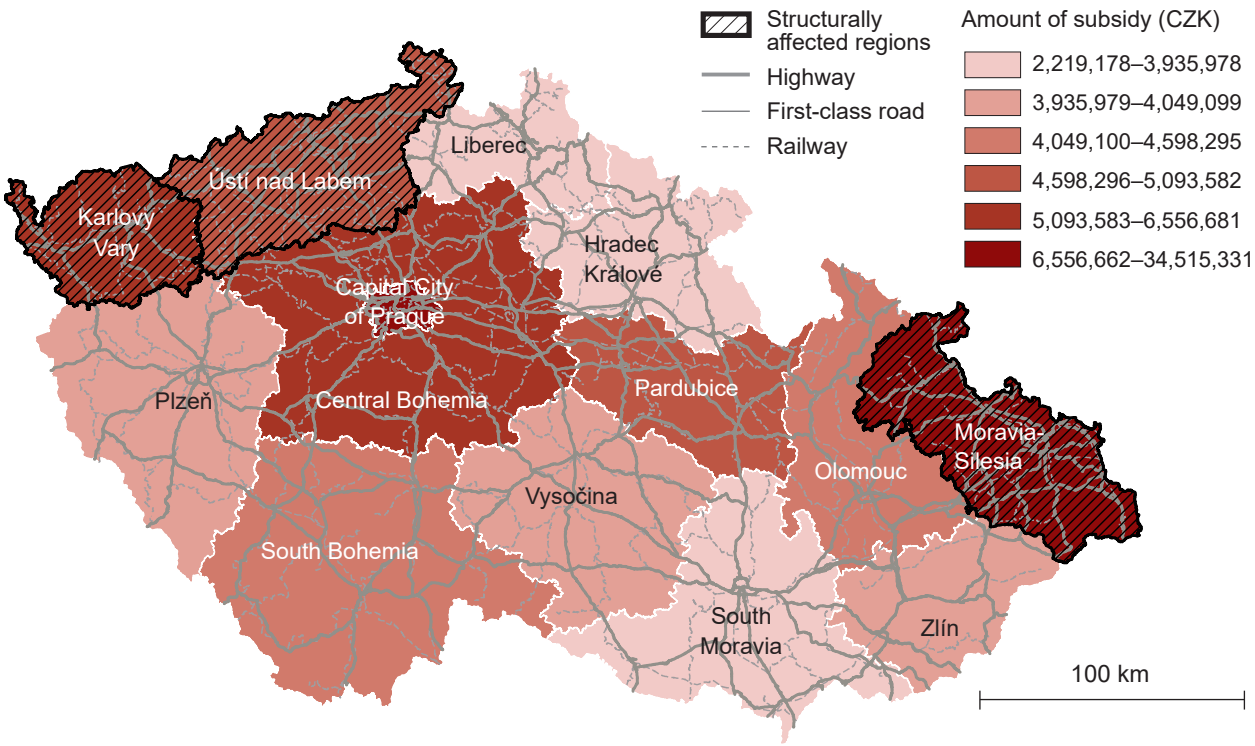
Also, in the case of transport infrastructure the results of statistical analysis of total assistance (Figure 3) do not prove a relationship between a region's position and the assistance. Moran's index value is 0.014, the *z*-score is 1.367 and the *p*-value is 0.172.

Figure 3: Total assistance to transport projects (2007–2020)



Source: Own calculations from IS ReD (MFČR, 2022) and Ministry of Regional Development database (MMR, 2022)

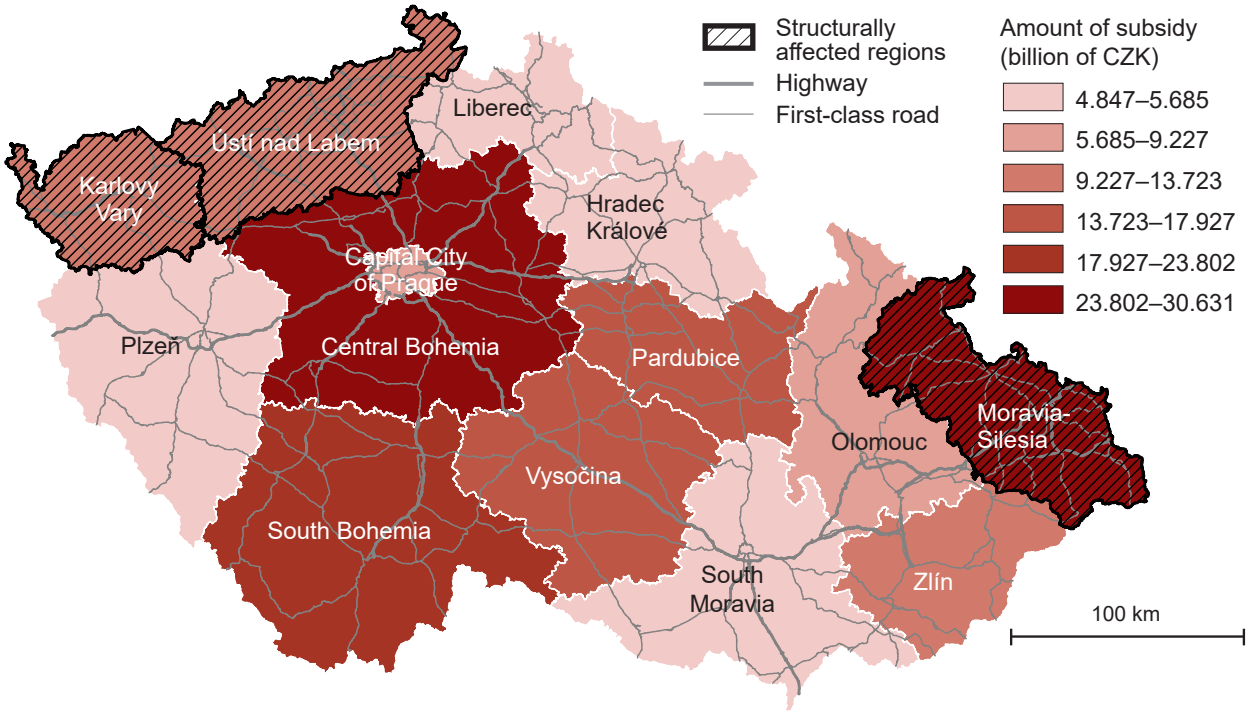
Figure 4: Total assistance to transport projects per km² of region area (2007–2020)



Source: Own calculations from IS ReD (MFČR, 2022) and Ministry of Regional Development database (MMR, 2022)

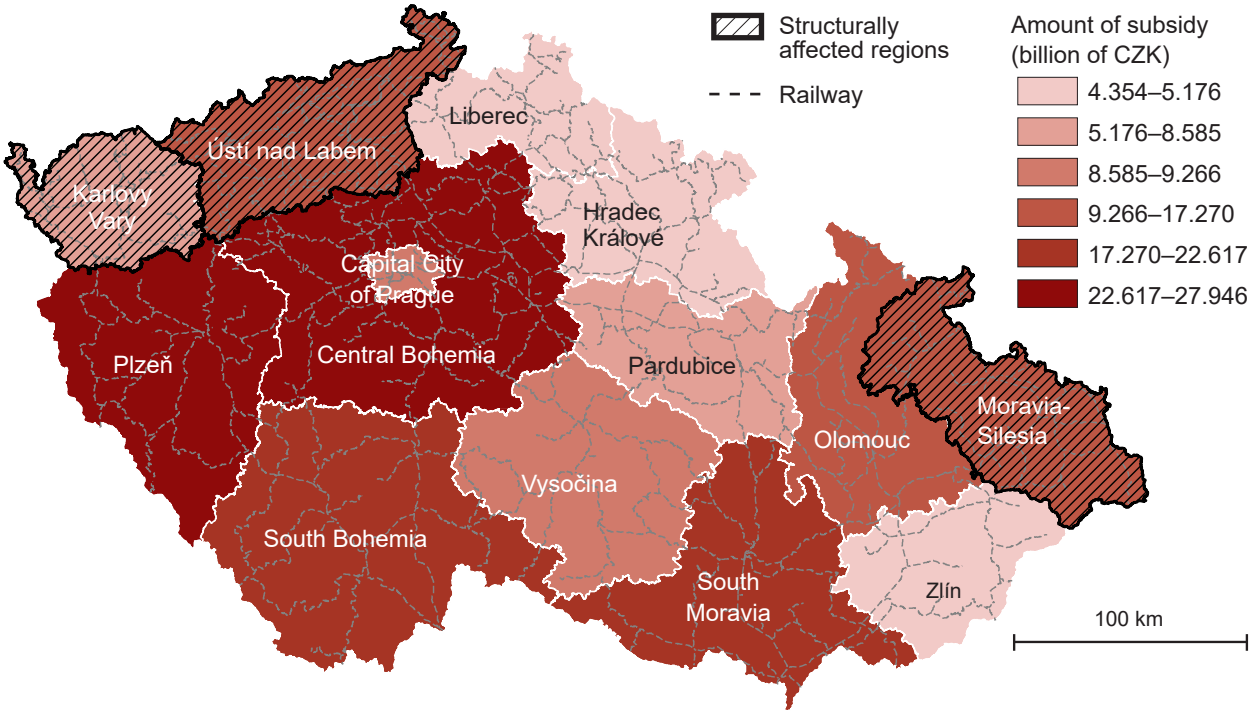
Random values between regions can also be observed for the split between road (ŘSD) and rail (SŽDC) transport.

Figure 5: Total assistance to road projects of ŘSD (2007–2020)



Source: Own calculations from IS ReD (MFČR, 2022) and Ministry of Regional Development database (MMR, 2022)

Figure 6: Total assistance to railway projects of SŽDC (2007–2020)



Source: Own calculations from IS ReD (MFČR, 2022) and Ministry of Regional Development database (MMR, 2022)

While the spatial distribution of investments in rail and road transport networks to regions is proportionally similar, the total volume of investments in road infrastructure slightly exceeds investments in railways (Figures 5 and 6).

Higher education and science

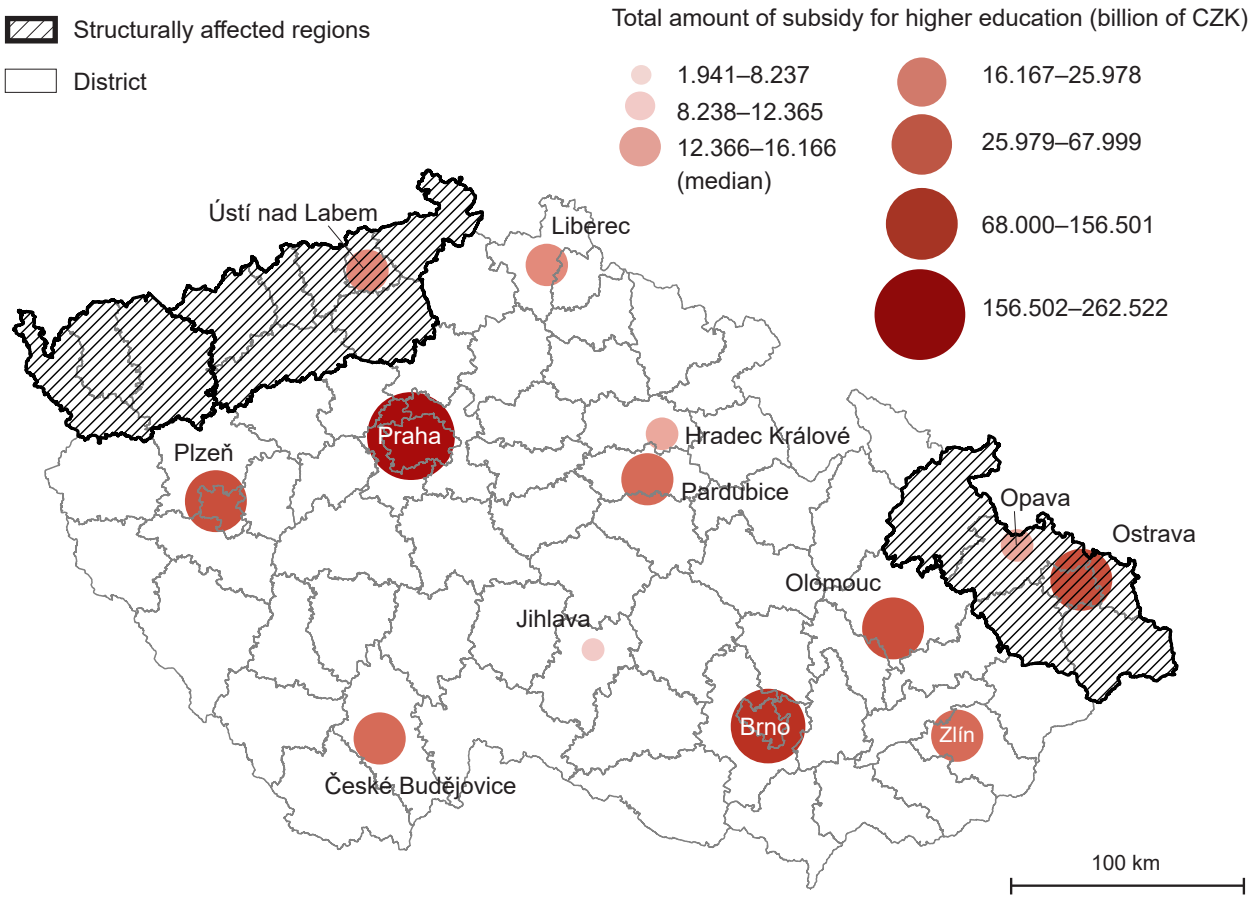
Table 6: Allocation of subsidies to higher education (2000–2020)

City	Name of university	Total amount drawn (CZK million)
Prague	Charles University (UK)	123,234
	Czech Technical University in Prague (ČVUT)	63,517
	Czech University of Life Sciences (ČZU)	25,848
	University of Chemistry and Technology in Prague (VŠCHT)	18,977
	University of Economics and Business (VŠE)	18,735
	Academy of Performing Arts in Prague (AMU)	7,281
	Academy of Arts, Architecture & Design in Prague (UMPRUM)	2,722
	Academy of Fine Arts in Prague (AVU)	2,209
	Prague universities total	*262,522*
Brno	Masaryk University (MU)	72,323
	Brno University of Technology (VUT)	50,020
	Mendel University in Brno (MENDELU)	20,400
	University of Veterinary and Pharmaceutical Sciences Brno (VFU)	9,448
	Janáček Academy of Music and Performing Arts Brno (JAMU)	4,309
	Brno universities total	*156,501*
Ostrava + Opava	Technical University of Ostrava (VŠB-TUO)	34,855
	University of Ostrava (OU)	12,974
	Silesian University in Opava (SU)	8,238
	Ostrava + Opava total	*56,068*
Other centres	Palacký University Olomouc (UP)	44,274
	University of South Bohemia (JU)	20,170
	University of West Bohemia (ZČU)	25,979
	University of Pardubice (UPa)	16,393
	Tomáš Baťa University in Zlín (UTB)	16,167
	Technical University of Liberec (TUL)	14,628
	Jan Evangelista Purkyně University in Ústí nad Labem (UJEP)	12,366
	University of Hradec Králové (UHK)	9,511
	College of Polytechnics Jihlava (VŠPJ)	1,941
	Institute of Technology and Business in České Budějovice (VŠTE)	1,817
	Other centres total	*163,246*
All higher education facilities total		638,337

Source: Own calculations from IS ReD (MFČR, 2022)

Science and research are mainly pursued by universities, which are located in metropolises and regional centres. Between 2000 and 2020, public universities received total subsidies worth CZK 638 billion.

Figure 7: Total amount of assistance to higher education (2000–2020)



Source: Own calculations from IS ReD (MFČR, 2022)

From Figure 8, it is evident that the subsidies go to the regions where there are large universities or colleges and concentrations of students, scientific and research activities. These are mainly Prague, followed by the regions of South Moravia (Brno), Olomouc, and Moravia-Silesia (Ostrava and Opava). The weakest regions include the Vysočina Region and the Karlovy Vary Region.

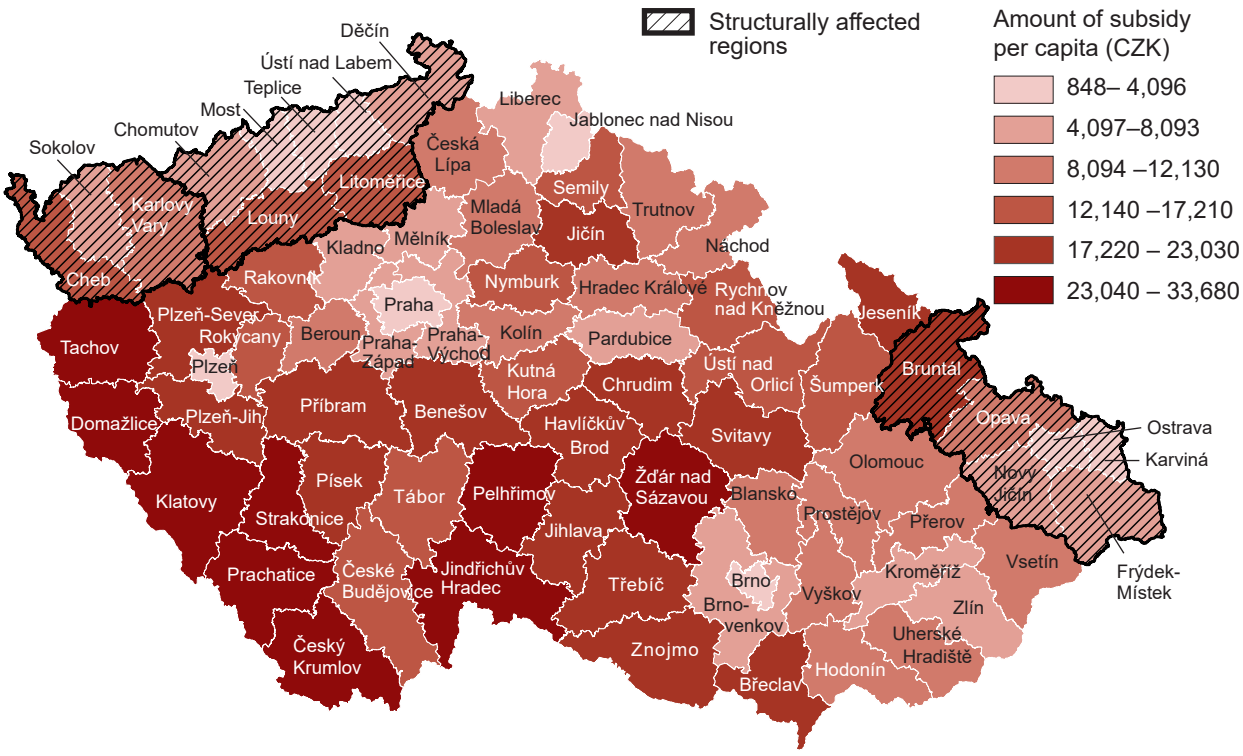
The higher education facilities especially in the major educational centres serve areas larger than their respective regions. Therefore, there is no sense in analysis of spatial correlation with respect to the regions.

Agriculture

Subsidies provided by the SZIF are designated to maintain the production potential of agriculture and its contribution to the development of rural areas. The total amount drawn for the years 2000–2020 was CZK 272,217 million, *i.e.,* CZK 13.6 billion annually on average.

At the level of districts (NUTS 4), data for territorial projection from the State Agricultural Intervention Fund database were available only for the years 2017–2019. This provides a more detailed picture and makes it possible to distinguish among different natural conditions for agriculture. In those years, subsidies to agriculture accounted for CZK 35.3 billion (SZIF, 2017), CZK 36.6 billion (SZIF, 2018) and CZK 39.7 billion (SZIF, 2019) respectively, which is considerably more that the average for the years 2000–2020 shown above. The spatial autocorrelation based on the Moran's index is 0.527, which represents a strong clustered pattern. From the z-score of 7.416 and the p-value <0.001, we can conclude that there is a less than 1% likelihood that this clustered pattern could be the result of random chance. The implementation of the local Moran's index using the cluster and outlier analysis method shows that the rate of subsidies per capita was highest in rural districts of the South Bohemian Region, the Plzeň Region and in the Vysočina Region.

Figure 8: Amount of assistance to agriculture distributed by State Agricultural Intervention Fund (2017–2019)



Source: State Agricultural Intervention Fund (SZIF, 2022)

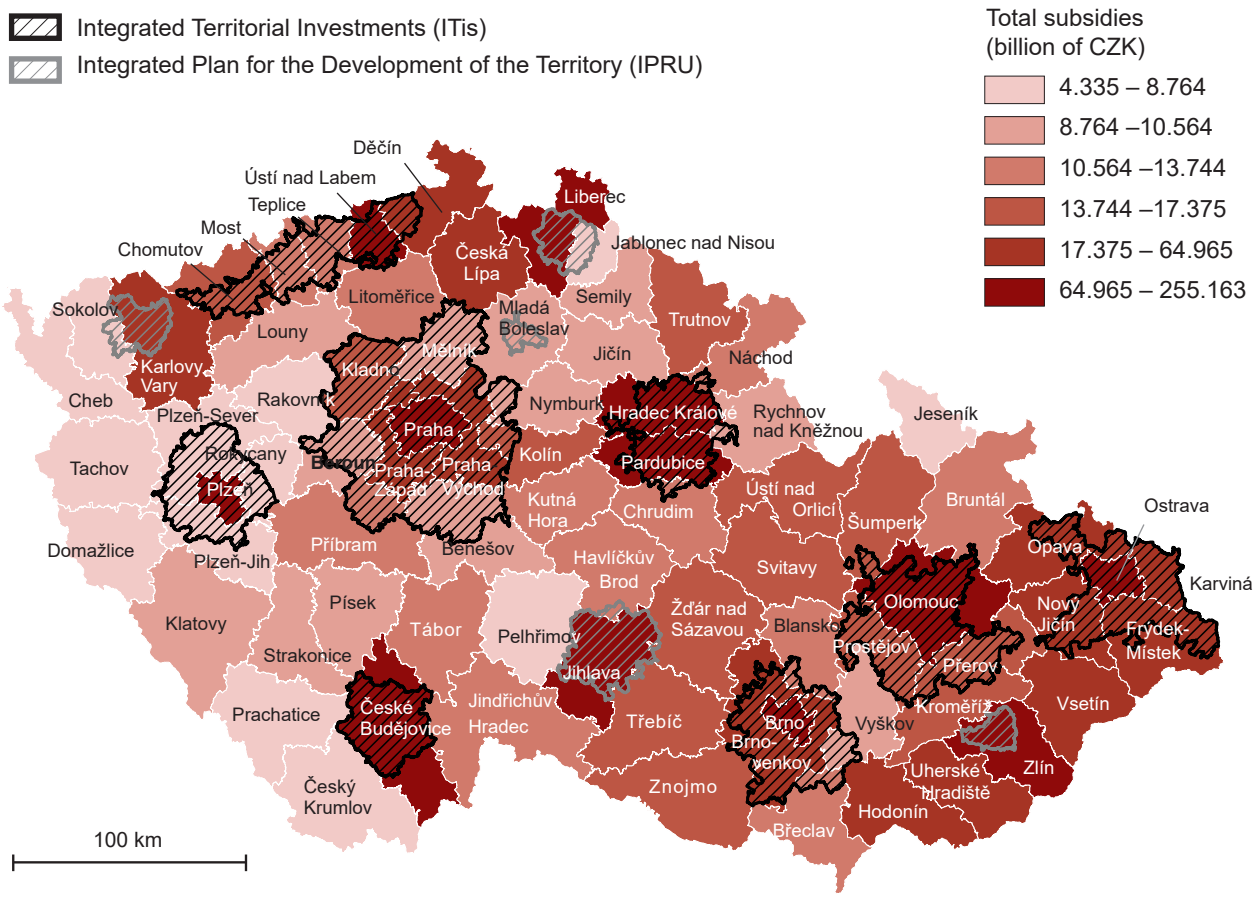
The structurally disadvantaged regions of Karlovy Vary and Ústí nad Labem were supported too but mostly only in rural districts with agricultural use. Surprisingly, the support was rather low in agriculturally favourable districts of central and southern Moravia as well as the Elbe lowland northeast of Prague.

4.2 Territorial distribution of subsidies to small beneficiaries by district

The more detailed analysis of territorial allocation of assistance in districts is available from the Ministry of Regional Development database for the whole period 2000–2020. The data distinguish the legal status of beneficiaries but not the field of use of the funding.

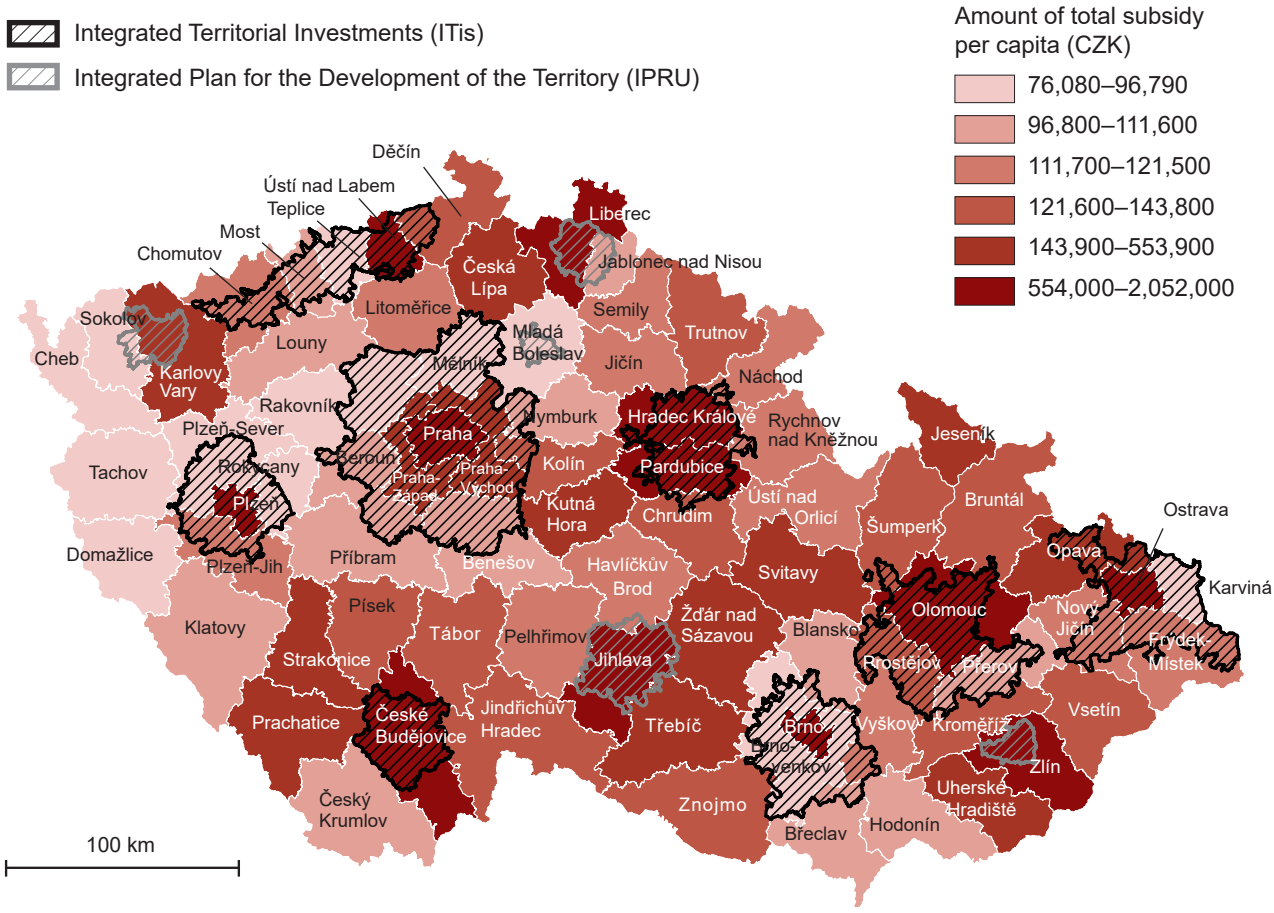
Figures 9a and 9b show the fund distribution displayed by the beneficiaries' address districts and the amounts that were sent to these districts as subsidies. Additionally, the areas of ITIs and IPRÚ are depicted, as defined by the Ministry of Regional Development.

Figure 9a: Total assistance based on beneficiaries' registration sites summarized by districts (2000–2020)



Source: Own calculations from IS ReD (MFČR, 2022)

Figure 9b: Total assistance per capita based on beneficiaries' registration sites summarized by districts (2000–2020)



Source: Own calculations from IS ReD (MFČR, 2022)

The spatial autocorrelation based on Moran's index is −0.111, which represents a random pattern. According to the *z*-score of −1.426, the pattern does not appear to be significantly different from random, while the *p*-value is 0.154.

Obviously, the funding has concentrated in the populous core areas of ITIs. Interestingly, the districts adjacent to the core areas that are still parts of the development areas of Brno, Plzeň, Liberec, Ústí and Labem and, to a certain extent, also Ostrava and Prague received relatively less assistance. This may suggest that the existing gaps between the core and hinterlands within development areas will be petrified, while the increase of residential population is highest in these hinterlands due to suburbanisation.

Sparsely populated rural and peripheral districts, especially of western and southern Bohemia, received less funding. The assistance was generally higher for the eastern districts of Moravia than for the districts in Bohemia, especially its western districts.

Territorially identifiable subsidies by beneficiary legal form

Among the groups of legal forms of beneficiaries, only part of the supported projects can be clearly identified as for their immediate territorial destination on district level, which is more detailed than the regional distribution above. In terms of investment volumes, this part makes up about 25% of the whole amount of subsidies. Of all the legal forms of beneficiaries with a higher share of subsidies, these groups are: municipalities, municipal organizations and associations of municipalities (11.2% of total support) and educational legal entities (10.7% of total support). The selected forms also include the category of individual persons or entrepreneurs, which has a share in the total support of only 1.2%, but its territorial spread is nationwide with an impact at the lowest territorial level.

The following cartograms depict amounts of funding assistance per capita (per district resident).

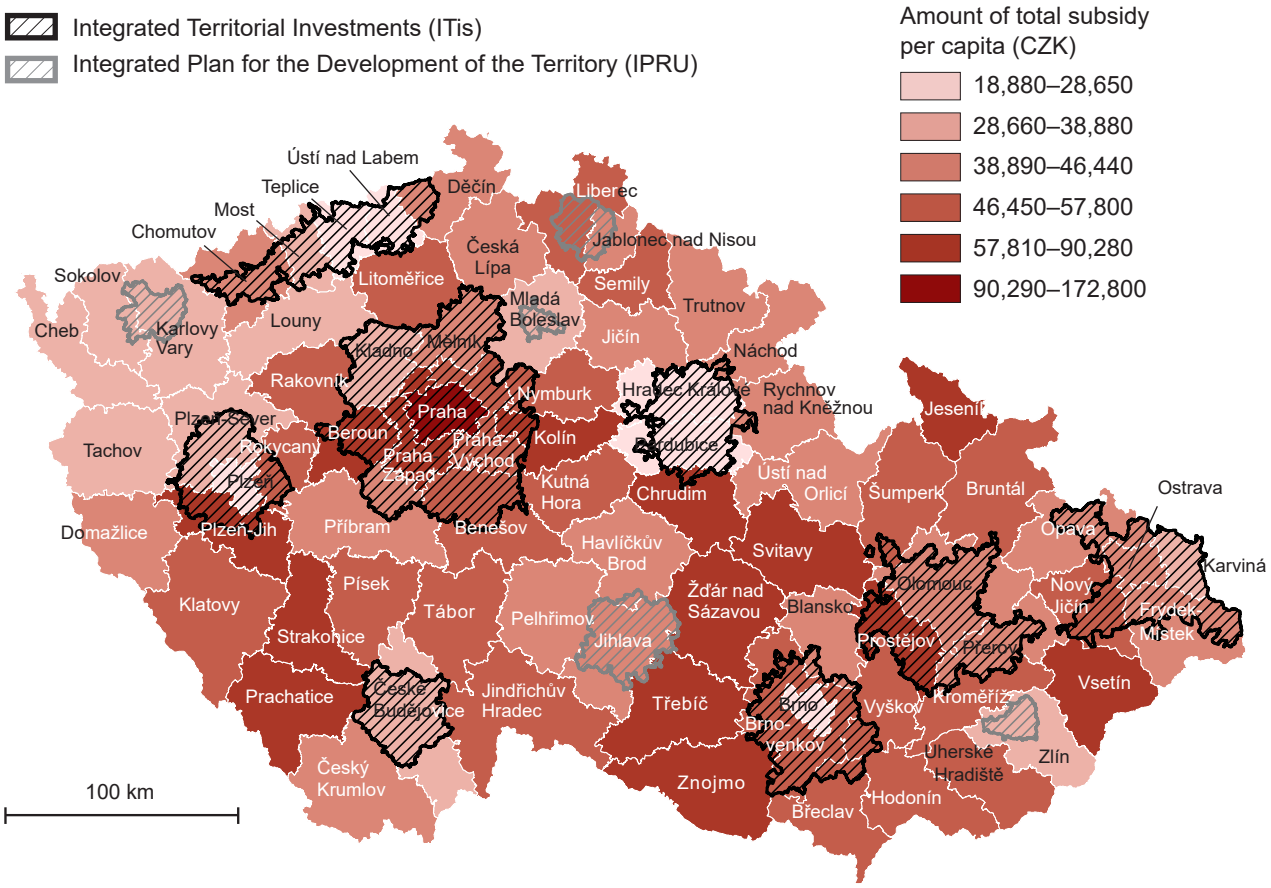
Municipalities, municipal organizations and associations of municipalities

Subsidies to municipalities, municipal organizations and associations of municipalities show a disparate amount of assistance per capita between the cores and their hinterlands. Subsidies of this type tend to be channelled preferably to municipalities in rural areas, except in the structurally affected regions, which obviously received funding from other sources.

The spatial autocorrelation based on Moran's index is 0.100, which represents a clustered pattern. From the *z*-score of 1.834 and the *p*-value 0.067, we can conclude that there is a less than 10% likelihood that this clustered pattern could be the result of random chance. The implementation of the local Moran's index using the cluster and outlier analysis method shows clustering with similar values in the Prague Metropolitan Region.

In a comparison between NUTS 3 regions, Karlovy Vary and Hradec Králové regions are less subsidised; the structurally disadvantaged regions of Ústí nad Labem and Moravia-Silesia show roughly average values. This shows how simplified is the image of NUTS 3 or even NUTS 2 if we look at the "detail" of the district level (NUTS 4).

Figure 10: Amount of assistance per capita to municipalities, municipal organizations and associations of municipalities visualized by districts (2000–2020)



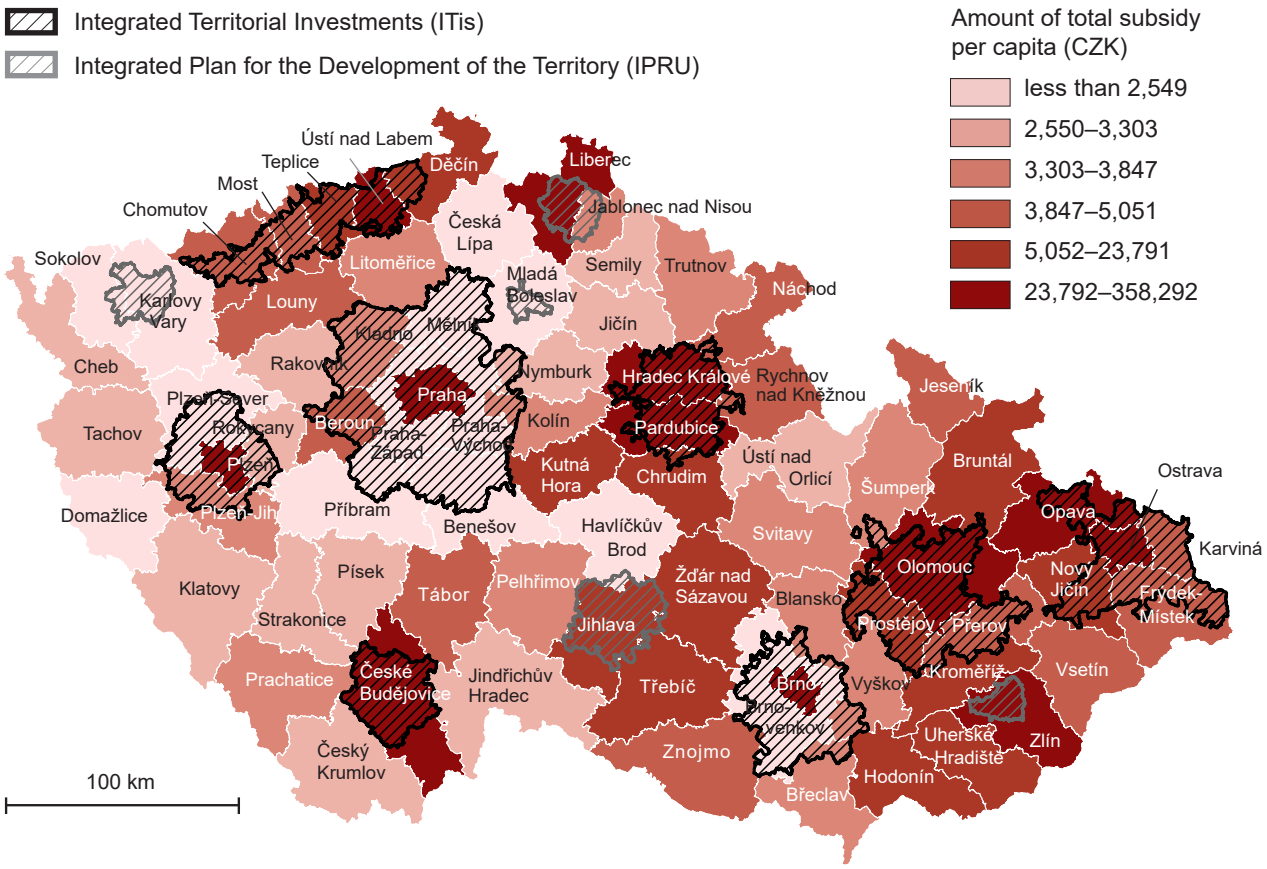
Source: Own calculations from IS ReD (MFČR, 2022)

Educational legal entities

For the educational legal entities, the results of our statistical analysis do not prove any clustering of districts. The Moran's index value is −0.070, the *z*-score is −0.905 and the *p*-value is 0.366.

Subsidies to basic and secondary educational legal entities are directed mainly to the cores of ITIs. This can be explained by a higher concentration of secondary schools in major centres, but the territorial allocation of subsidies to primary and possibly secondary education would deserve special research. In Bohemia, almost all regions except the Capital City of Prague and the regions of Hradec Králové and Ústí nad Labem are below the subsidy median. On the other hand, there is an evident growth in development in Moravia, where almost all districts and cores of super-local development areas show values above the median. The exception is the hinterland of Brno, similar to the case of Prague, where considerable disparate development is evident.

Figure 11: Amount of assistance per capita to primary and secondary tiers of educational legal entities by districts (2000–2020)



Source: Own calculations from IS ReD (MFČR, 2022)

Individual persons and entrepreneurs

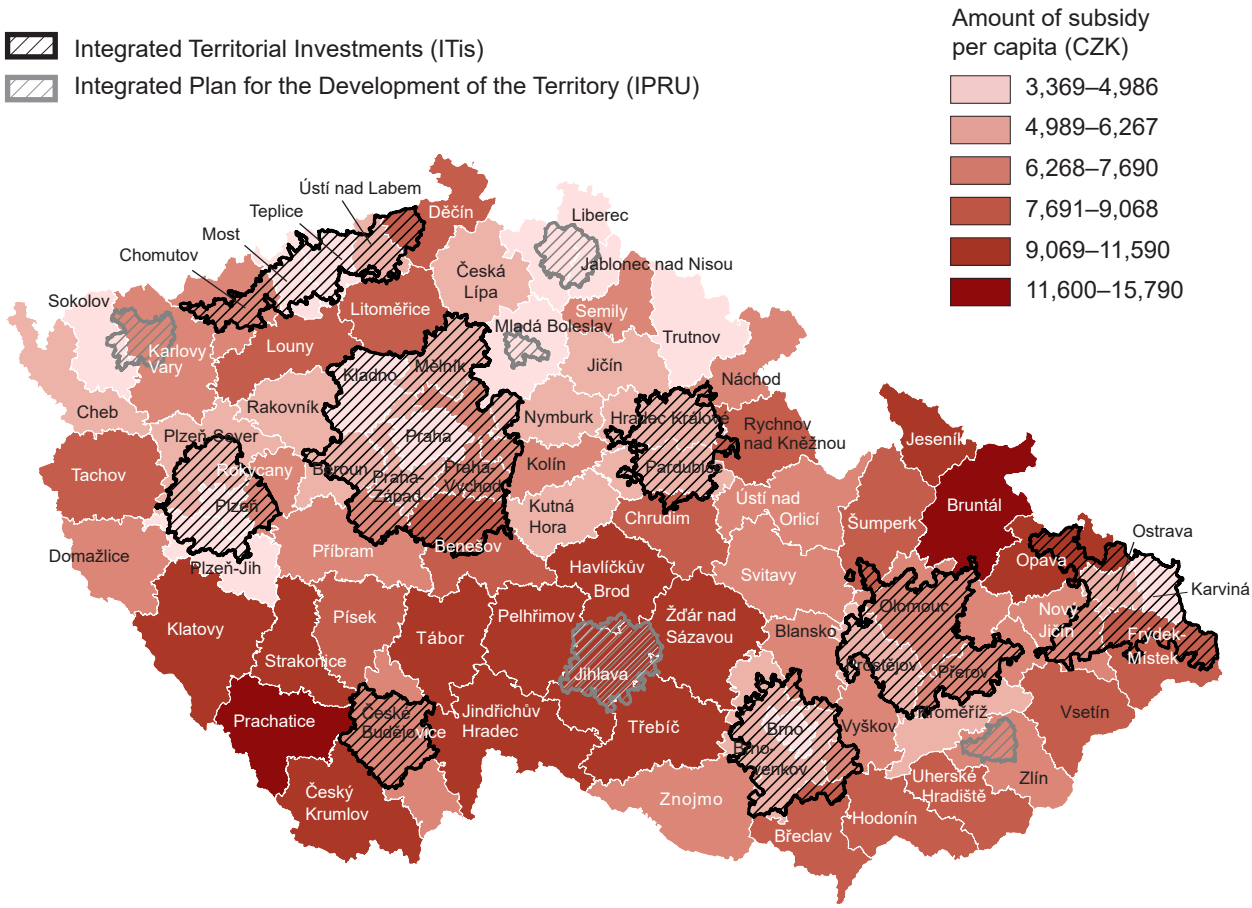
Rural parts of Vysočina, South Bohemia and Moravia-Silesia belong to the most successful regions in receiving subsidies to individual entrepreneurs; however, the share of individuals in the total subsidies is small.

The spatial autocorrelation based on the Moran's index is 0.378, which represents a clustered pattern. The *z*-score of 5.450 and *p*-value < 0.001 mean a less than 1% likelihood that this clustered pattern could be the result of random chance and it is almost certain that the districts form spatial clusters.

The implementation of the local Moran's index using the cluster and outlier analysis method shows clustering with similar values in the Vysočina and South Bohemia Regions. As was the case with subsidies to municipalities, municipal organisations and associations of municipalities, subsidies to individuals and entrepreneurs were directed largely to rural

districts, with the exception of the Karlovy Vary Region. In the comparison of individual programming periods, a relative increase in the subsidy rate was recorded in the cases of the Vysočina Region, as well as other Czech regions, especially South Bohemia and partly Central Bohemia and Ústí nad Labem. The Moravian-Silesian Region shows a stable good position in drawing subsidies. The Liberec, Pardubice Region, Hradec Králové and Plzeň Regions show lower drawing rates.

Figure 12: Amount of assistance per capita to individual persons/entrepreneurs by districts (2000–2020)



Source: Own calculations from IS ReD (MFČR, 2022)

The subsidy distribution stated above covers the whole territory of the country, but accounts for a relatively small share of total subsidies, about 25%. The specific and precise utilization of subsidies is closely monitored at the regional level for projects that can be divided into groups important for land-use development and for which local implementation linked to the beneficiary's Company ID (IČO) is indicated. These account for approximately 60% of the subsidies that have the highest social effect, since they affect the main subsidy areas: transport, agriculture, higher education and subsidies to administrative units,

specifically to regions. Regions are among the 20 largest beneficiaries of subsidies, headed by the Moravian-Silesian Region and the Capital City of Prague. The Vysočina Region and the Liberec Region utilized the lowest amount. The Karlovy Vary Region is the only region in the Czech Republic that is not among the 20 largest beneficiaries of subsidies. The Karlovy Vary Region received subsidies totalling CZK 54,178 million.

If we look at the distribution by areas of use, these mainly include transport infrastructure (ŘSD, SŽDC and SFDI), agriculture (SZIF), technical infrastructure (OTE, a.s.) and higher education and science (Charles University and Masaryk University).

The total amount that went to these 20 largest beneficiaries is CZK 3,377,752 million and it accounts for about 60% of all the subsidies since 1998. The results of the comparison show that the highest share of subsidies goes to road and rail transport infrastructure, which affects wider territory. The rest of the beneficiaries received subsidies totalling CZK 2,352,398 million.

5. Discussion

National subsidies and European Union funds represent important instruments for the implementation of priorities of spatial planning as well as regional policy and the EU Cohesion Policy. The share of contribution from the EU funds is very high in the Czech Republic and it has been increasing since the 2004 accession to EU.

The information on subsidies in the Czech Republic can be drawn from three relevant sources, which are very different in many aspects. As such, it is difficult to connect it together.

- The most comprehensive source of datasets on subsidies is the information system of the Central Register of Subsidies (IS ReD) managed by the Ministry of Finance, which contains datasets with long-term stored records in a unified data model. Its main disadvantage is the absence of information on territorial direction of projects in many records. The register does not distinguish the source of the subsidies, which prevents identifying ESIF funding.
- The dataset run and updated under the Ministry of Regional Development is another important source that enables monitoring of territorial implementations. The dataset consists of one table for each programming period with a clear structure, but the structuring of the table is different for individual programming periods, which makes it difficult to compare funding beyond programming periods. The unit of monitoring of territorial implementation is the region. According to certain studies, more detailed administrative units, such as districts or municipalities with extended powers, would be more suitable for the sake of monitoring (Hájek *et al*., 2016).

- The dataset on subsidies from the State Agricultural Intervention Fund (SZIF) is the third data source with open data on subsidies that meets the condition of information about territorial implementation of projects at the level of districts. Unfortunately, the list of subsidy recipients, which is necessary for territorial identification, is currently available only for the last three fiscal years.

The main prerequisites for the correct interpretation of data on subsidies are content and attribute knowledge, which brings an understanding of the territorial implementation of subsidies. Thus, it is not just about technical processing of datasets (Kokeš, 2020). The article, however limited by the disintegrated monitoring of data on subsidies with the above-mentioned incompatibilities, which makes it difficult to develop a more precise monitoring image of territorial destination of the support, strives for a framework assessment of the territorial and thematic allocation of structural funds. It shows basic tendencies and proportions in the direction of support, which the authors consider essential.

While data on the provision of development support are publicly available as required by the rules, their structure does not allow an objective ex-post assessment of the effectiveness of the Structural Funds for individual territorial units and types of territories. It would be advisable for the future to reframe the databases so that the territorial dimension and the source of assistance could be easily identifiable but, at the same time, to maintain comparability of the data from particular programming periods.

6. Conclusion

The results of the comparison show that the total amount of assistance was steadily increasing during the period under review. The increase was very high between the programming periods 2000–2006 and 2007–2013, obviously due to lesser support in the pre-accession period before 2004. The funding per capita was not significantly different among regions and there was no significant difference between assistance to the structurally disadvantaged regions.

As for providing subsidies to the structurally disadvantaged regions, there is an evident effort to support all the three structurally disadvantaged regions relatively evenly, even though this support has not been growing significantly over time. The highest increase was evident in the programming periods until 2014. In the programming period 2014–2020, the funding dynamic was relatively lower there than in other regions, where the increase made on average 10% more than in the disadvantaged regions.

The Karlovy Vary Region appears to be weakest among the structurally disadvantaged regions in receiving support from EU structural funds. The explanation may be that there was no big transport investment, the conditions for agriculture are not particularly favourable and the region also lacks a strong university centre. Obviously, the territorial absorption capacity played its role as mentioned by Hájek *et al*. (2014), particularly in large infrastructural investments.

As for the use of the funds, the most significant share of support (except agriculture, which lacks specified data for most of the period under review) went to transport: road and rail infrastructure, with road and motorway investments prevailing over railways. The data on regional distribution of transport investments should be interpreted with caution, given the linear nature of these investments across regional borders and their impact on wider territory. Science and research were another large beneficiary. Here, the big university centres of Prague followed by Brno were dominant beneficiaries, which also reflects the number of their students. The data on support to agriculture are difficult to compare with other supported activities due to the limited temporal availability. The majority of support in the period for which data are available went to rural districts with less favourable conditions for agriculture.

The data on support related to the population of the districts show a greater success of municipalities and small businesses in rural districts in southern Bohemia and Moravia in obtaining support. In contrast, schools and educational facilities have been successful especially in districts with large cities.

The spatial statistics at the NUTS 3 level (regions) clearly indicate a random distribution. This does not statistically support the hypothesis that subsidies are targeted at certain regions, such as the structurally affected regions of Karlovy Vary, Ústí nad Labem od Moravia-Silesia.

In the spatial statistics at the NUTS 4 level (districts), three indicators manifest themselves in spatial clusters. These are subsidies to agriculture, municipalities, and individuals and entrepreneurs. In contrast, subsidies to educational legal entities appear to be spatially random. These are mostly concentrated in the populous core areas of ITIs.

The Central Register of Subsidies together with the records of the Ministry for Regional Development, which manages the portal of the European Structural and Investment Funds in the Czech Republic, are the most valuable sources of public administration. In the form of open data, they describe a large amount of financial data with territorial records on project implementation. For a working evaluation, it is desirable to monitor in the long term a unified data model, which should not be fundamentally changed between individual planning periods. It is also necessary to follow information about territorial implementations of projects at the level of districts or municipalities with extended powers.

With a view to assessing the differential effectiveness of support for the development of transport infrastructure, agriculture and education and research (Rodríguez-Pose and Fratesi, 2004, see above), the volumes of support to these areas – within the limits of the available data – were compared. Using Table 2, which includes the most important beneficiaries of subsidies, it can be deduced that the large beneficiaries of subsidies in transport infrastructure accounted for 26%, universities and research institutions for 17% and agriculture for 7% of the total volume of support (significantly increasing in recent years up to 15%); territorial public administration received the remaining 50% of the subsidies. This would suggest that the bulk

of support was directed to economic "hardware", while the socio-economic "software" with the highest level of efficiency, represented by higher education and research, accounted for just over a sixth of the subsidy support.

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