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ESTIMATION OF THE REGIONAL PRICE LEVELS IN THE CZECH REPUBLIC

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ABSTRACT

The aim of this article is to suggest and apply a method for estimation of the regional price levels in selected Czech districts. Its purpose is to enable the comparison of spatial differences in the regional price levels and thereby to provide an instrument for more precise and more realistic comparison of standard of living of households across the regions of the Czech Republic. Authors use data from the extensive price surveys carried out by the Czech Statistical Office and regionalize them by an original approach derived from the Eurostat-OECD International Comparison Program. The results reflect regional differences in market prices of goods, services, as well as housing and rentals. The findings prove the need for a more precise specification of economic and social disparities on a regional level originating in the recent shifts of regional policies from localities-and-areas-centered to local-people-centered.

KEYWORDS

Price Level, Regionalization, Törnqvist Index, Household.

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INTRODUCTION

The regional policies of the European Union (EU) are targeted among others at sustainable development of regions and improving the citizen's quality of life. The regional convergence has been one of the major issues of economic analyses and almost a third of the EU budget is set aside for the cohesion policy (EC, 2015). The primary indicator for assessment of regional economic performance is the regional gross domestic product compared on the European level in so-called purchasing parity standard (PPS). The PPS is calculated by the Eurostat within the Eurostat-OECD International Comparison Program on the national level and as such it does not take into account the differences in price levels across the regions. (Čadil and Mazouch, 2011) Although the regional price levels may constitute an important factor when assessing the economic development of a region, this issue has until recently not received much attention either in the world, or in the EU, or the Czech Republic respectively (Čadil et al., 2014).

The first attempts to measure the regional price levels in the Czech Republic have been carried out by Musil et al. (2012) and Čadil et al. (2014). The aim of this paper is to update and rectify their results using slightly more advanced methods of calculation and data processing. The purpose of this paper is to introduce a transitive superlative indicator of regional price levels (Regional Price-level Index, *RPI*) as an instrument for estimating the real standard of living in the Czech regions. Čadil et al. (2014) discuss the possibility of using their regional price-level indicator to adjust the regional nominal gross domestic product, we however aim mainly at the regional households and their real social-economic position.

The paper is divided into three major parts: At first, we discuss several approaches to regional price-level estimates applied in the world, in the countries of the EU, and also in the Czech Republic. In the second part, we introduce our method of data processing and calculation derived from the Eurostat-OECD International Comparison Program. Then we comment our results and compare them to those published by Musil et al. (2012) and Čadil et al. (2014).

1 Importance and topicality

The need to measure regional price levels originated in the new concept of regional policies which should be generally directed more at the people living in the region than at the area of the region. (Gibbons et al., 2011) The problem is, the nominal income indicators provide distorted information about social and economic position of inhabitants of a region because they do not reflect the regional differences in the costs of living. After all, even Kahoun (2011) and Viturka (2007) admit the price levels can vary locally and regionally, especially due to different prices of services and real estate.

In the last ten years, the issue of regional price indexes has been addressed by several authors, whose works are often based on regionalization of national price indexes. In the European countries,

the attempts to regionalize the price indexes are usually limited by insufficient or random investigation of prices in the respective regions. At present, the regional price levels are systematically measured and published in the USA, in the UK, and in Australia.

- The Bureau of Labor Statistics in the United States is the most ambitious one in the area of regional price levels. They use the hedonic regression extensively to determine the regional consumer baskets under the condition of constant households' utility across the country. They also apply the methods of the rent equivalent to estimate the prices of services connected with housing. Their consumer basket includes 800 representatives, the results are published every two years. Regional price index is calculated for 366 metropolitan areas which are defined by an urban center of more than 50 thousand inhabitants. They also calculate the price levels for the whole individual states using proportional indicators. (Aten and d'Souza, 2008, Aten et al., 2013)
- In 2011, the Australian Bureau of Statistics extended the list of areas for price survey by 22 cities and they publish the regional price index for 30 city districts. The consumer basket contains 500 representatives divided into 8 headings. Results are published every second year. (RDL.WA, 2011, Waschka et al., 2003)
- The Office of National Statistics in the United Kingdom has been publishing the results of the spatial price comparison every two years since 2000. Their consumer basket consists of 380 representatives surveyed in 65 regions. The collection of data is carried out by a commercial marketing company Research International. (Fenwick and O'Donoghue, 2003, Ball and Fenwick, 2004)
- In Germany, the published estimates of regional price levels are based on price survey carried out in 50 German cities in 1994. The first German author who evaluated the price investigation from the viewpoint of regional price levels was Ströhl (1994). His followers, Schultze (2003), Kosfeld et al. (2008), Kosfeld and Eckey (2010), and Roos (2006a, 2006b) look for possible ways of price level estimation in the regions where they have explanatory data at their disposal. They frequently apply econometric modelling and complement the calculation of regional price levels with a real estate price index. (Roos, 2003, Kosfeld et al., 2008, Kosfeld and Eckey, 2010)
- In the Czech Republic, the only and one-off attempt to estimate the regional price levels was carried out by Musil et al. (2012) on a common consumer basket and by Čadil et al. (2014) on a set of regional consumer baskets. They applied the Eurostat-OECD International Comparison Program methods with a certain simplification. They used a national approach

(rather than domestic) and calculated the regional price levels for the Czech regions (NUTS3) based on the historical data from 2007. (Musil et al., 2012, Čadil et al., 2014)

2 Methods and data sources

The process of *RPI* construction is based on the Eurostat-OECD International Comparison Program methods and its core is therefore similar to the approach applied by Musil et al. (2012) and Čadil et al. (2014). The major differences appear in the following five aspects:

2.1 Area Segmentation for Regional Price Level

Without any doubt, the segmentation into smaller representative units is always more appropriate. However, in the Czech Republic, reliable estimates are limited by the data available from price surveys (for the purpose of the construction of the national consumer price index) and from household expenditure surveys (Family Accounts Statistics).

- The Czech Statistical Office performs price surveys in 35 districts and in the Capital of Praha, i.e. on the level of selected LAU1 (formerly NUTS4). These data are the main source for the *RPI* calculation and therefore their localization will be respected. Raw monthly data from price surveys in 2011–2013 were used.
- Household expenditures in the classification of individual consumption by purpose (CZ-COICOP) are recorded only at the level of cohesion regions (NUTS2). Thus, the Family Accounts Statistics represent the only official data source on regional household expenditure structure.

The primary spatial level selected for our calculations are the former districts (LAU1). The expenditure weights for these lower territorial administrative units will be approximated using the method of Small Area Estimation (for details se e.g. Pfeffermann, 2002 or Rao and Molina, 2015).

2.2 Price Data Adjustment

The prices are investigated by the Czech Statistical Office in 35 districts (LAU1) and the Capital of Praha for approximately 700 price representatives. The main purpose of this price investigation is the construction of time indexes (national consumer price index). Thus, the diversity of varieties[2] investigated for each price representative is an advantage here, because it increases the robustness of the basic set for the calculation of the consumer price index.

We use the same price data, but for a totally new purpose – to calculate the regional price levels. Therefore, the spatial diversity of the investigated varieties of each price representative is undesirable and can significantly bias the results. In each region, identical or qualitatively very similar

[2] **Variety of a price representative** is a concrete and in the reporting unit permanently investigated product or service respecting specific conditions of the offer at the place of investigation which are not deviating from the characteristics (general description) of the price representative.

goods should be surveyed so that the spatial comparability is ensured. In this respect, the headings containing the price representatives of a wide range of qualitatively different varieties are the most questionable – typically these are clothing and footwear (Heading 03) and furnishing, household equipment, and routine maintenance of the house (Heading 05).

The procedure of raw data adjustment (from monthly surveys carried out in 2011–2013) was divided into three steps:

- Qualitative adjustment: All prices surveyed for each price representative were clustered into several varieties using a specialized text-mining software based on the principles of Levenshtein distance chain metric. This procedure analyzed the text information in "notes" attached to each of the 1,717,102 surveyed prices from years 2011–2013. Obtained varieties were then checked and rectified manually. The 560 price representatives[3] surveyed by the Czech Statistical Office regionally were split into 4,673 varieties.
- Quantitative adjustment: The three-sigma rule was applied repeatedly in each year and each region (LAU1) on each variety of a price representative to remove the outliers.
- Complementing the data matrix: For each price representative the spatially most usually surveyed variety was chosen as a characteristic variety across all the regions. In those regions, where the characteristic variety of a price representative was not surveyed, its price was estimated using the least square method according to the prices of non-characteristic varieties of the same price representative (similar to the method of bridging – see Eurostat, 2012), according to the price of characteristic and non-characteristic varieties in other regions (similar to Musil et al., 2012 approach) and/or according to the development of the price in time (methods of panel data analysis). If filling the gaps of the data matrix failed for a particular price representative in any region (LAU1), it was completely removed from further computation (which was the case for 68 price representatives).

2.3 Expenditure Weights

The selection of expenditure weights influences results, index interpretation and its application. If national weights are used, indexes have a form of comparison on the basis of fixed consumer basket and the index does not reflect individual consumer habits of regional households. The disadvantage of such a procedure is that if expenditure shares (or more generally weights) are related to another set of households, it is not possible to speak about an index on the basis of regional cost of living. The method of fixed basket decreases regional distinctiveness of the result.

[3] Out of the 700 price representatives included in the Czech consumer basket, some are investigated centrally (such as prices of electricity, gas etc.) and some record regionally constant price (such as cigarettes, post stamps, etc.).

The comparison on the basis of regional weights brings more illustrative results better reflecting the regional specifics in consumer behavior, but it requires transitivity of price indexes. The most widely used method of transitivity implementation is the EKS method (Eltetö a Köves, 1964; Szulc, 1964). The EKS method ensures transitivity by means of geometric averages of all direct and indirect price comparisons (for more information see Eurostat, 2012).

The only source of official information about regional household expenditures in relation to their income in the Czech Republic is the Family Accounts Statistics. The data are investigated on a set of 2,850 households selected by quota sampling. Regional results are published only on NUTS2 level (which in the case of Moravskoslezský region and the Capital of Praha corresponds with the regional level NUTS3).

Following the payment method suggested by Melser and Hill (2007), we decided to replace the imputed rent in the CZ-COICOP Heading 04 of the consumer basket with expenditures on households' own dwelling financed by mortgages. The intention is to incorporate into the index the real expenditures on the repayment of mortgages, which affect the purchasing power of Czech households with increasing significance. The mortgage repayments are characterized by higher regional variability as they are influenced by the price of real property including land (plots). In the years 2011–2013 approximately 115 billion CZK was paid annually for the repayment of mortgages according to authors' calculations. Data for these calculations were provided by the Czech National Bank, the Ministry of Regional Development, and the Ministry of Finance of the Czech Republic. The General Financial Directorate of the Ministry of Finance of the Czech Republic was the source of data about applied interests as a part of income tax return of physical persons which enabled detailed segmentation of the mortgage repayments on the regional level of LAU1.

2.4 Period and Frequency of Investigation

The current approaches to regional price level estimation and the results published e.g. by Slesnick (2002) or Tabuchi (2001) show, the regional differences in prices are rather stable over time. To ensure the consistency of the data in the Czech Republic (the rent deregulation started in 2011 and the data on household expenditures in CZ-COICOP classification are available for the NUTS2 since 2011), we suggest to compute the regional price levels for a period 2011–2013. Since the procedure of qualitative data adjustment is very time-consuming and capacity-demanding, we suggest to repeat the procedure in at least three-year long (but preferably longer) periods. The longer time span offers more data and increases robustness of the results.

2.5 Aggregation Method

The method of price aggregation of individual price representative into one overall number is generally a formula for the calculation of a price index. An index which is intended to be used as a spatial index should include information about weights from different areas, it means it should be superlative.

Generally, three superlative indexes are distinguished: Fisher, Törnqvist, and Walsh index. Fisher index is a geometric average of Laspeyres and Paasche indexes. Törnqvist index is a geometric average of geometric Laspeyres and geometric Paasche indexes. Walsh index compares expenditures

on the purchase of an average consumer basket which is a geometric average of consumer baskets of regions *A* and *B*. (Melser and Hill, 2007)

Unlike Fisher index, the Törnqvist index (and also geometric Laspeyres and Paasche index) is interesting because it can be decomposed so that the share of each price representative (or of any CZ-COICOP Heading) in the total price level can be easily determined. The use of EKS method when calculating unweighted price parities and the choice of Törnqvist index for aggregation enable better economic interpretation of results due to the relative representation of the expenditure function. The EKS method together with the application of a superlative index reflect the substitutional effect. A price index created in this way complies with the condition of transitivity and also satisfies the condition of characteristicity. (Eurostat, 2012)

The calculation of the Regional Price-level Index (*RPI*) starts by computing the unweighted price parities. We follow the EKS method simplified by the fact, our price matrix is complete and all price representatives are characteristic in all regions (although in some of the regions their prices had to be estimated). Thus, the unweighted price parity of a region *A* can be written as:

$$p_A = \prod_{k=1}^{36} \left(P_{A,k}\right)^{1/36}, \tag{1}$$

where $P_{A,k}$ is the ratio of the price of the representative (more precisely of a characteristic variety of the price representative) in the region *A* to the price of the same representative in the *k*-th region, where k = 1, 2, 3…36; p_A is the unweighted price parity of the region *A* on the level of a particular price representative (its characteristic variety).

In the next step, the geometric Laspeyres and Paasche price indexes are calculated. (Eurostat, 2012) The geometric Laspeyres index (2) is a weighted geometric mean of unweighted price parities of a region *A* using the weights of the region *A*. The Paasche geometric price index (3) is a weighted geometric mean of unweighted price parities of a region *A* using the weights of the benchmark region *B*.

$$P_A^{GL} = \prod_{n=1}^{N} \left(p_A\right)^{s_n^A}, \text{where} \sum_{n=1}^{N} s_n^A = 1, \tag{2}$$

$$P_A^{GP} = \prod_{n=1}^{N} \left(p_A\right)^{s_n^B}, \text{where} \sum_{n=1}^{N} s_n^B = 1, \tag{3}$$

where *A* is the particular region, *B* is the benchmark region (here characterized by an average regional expenditure structure), P^{GL} is geometric Laspeyres index and P^{GP} is geometric Paasche index, p_A is the unweighted price parity of the region *A* on the level of a particular price representative, s_n is the share of a particular price representative on the total household expenditures.

The regional price level is calculated into the shape of an index number using the Törnqvist price index:

$$RPI_A = P_A^T = \sqrt{P_A^{GL} P_A^{GP}}\ , \qquad (4)$$

where $RPI_A = P^T$ is Törnqvist regional price index for a region *A*.

The properties of the *RPI* make is possible to recalculated its values to the level of region NUTS3 and cohesion region NUTS2 as a geometric weighted average of district (LAU1) indexes, where the weight is the proportion of the particular LAU1 total household expenditures on the total household expenditures of the corresponding NUTS3 or NUTS2 region.

3 Results

The results of our calculations are summed up in the Table 1 bellow. It is apparent that the differences in regional price levels are to the highest extent influenced by the CZ-COICOP Heading 04 (Housing, Water, Gas, Electricity, and Other Fuels), Heading 10 (Education), and Heading 11 (Restaurants and Hotels) – i.e. immobile commodities.

Table 1 Regional Price-Level Index (*RPI*) and Its Twelve CZ-COICOP Headings

District	LAU1	RPI	CZ-COICOP Heading											
			01	02	03	04	05	06	07	08	09	10	11	12
Praha	1100	**1.165**	1.012	1.006	1.057	1.481	1.009	1.042	1.152	1.006	1.101	1.459	1.104	1.120
Kladno	2103	**1.041**	1.004	0.993	0.982	1.099	0.990	1.049	1.028	0.983	1.006	1.164	1.031	1.072
Kolín	2104	**1.034**	1.037	1.018	1.063	1.063	0.979	1.025	1.004	1.002	1.062	1.082	1.008	1.030
Nymburk	2108	**1.017**	1.022	1.014	1.027	1.088	1.013	0.938	0.980	1.008	0.988	1.040	0.914	0.948
Příbram	2111	**1.023**	1.009	0.988	1.056	1.036	1.007	1.068	1.024	0.995	1.037	1.013	1.016	1.028
České Budějovice	3101	**1.022**	1.034	0.986	1.045	1.008	1.026	0.971	1.015	0.997	1.053	1.037	1.059	0.974
Strakonice	3106	**0.972**	1.033	0.978	0.937	0.959	1.024	0.966	0.913	1.008	0.985	0.886	0.971	0.967
Tábor	3107	**0.995**	1.002	0.993	1.070	0.988	0.992	0.971	0.997	0.991	0.988	0.933	1.064	1.016
Klatovy	3202	**0.954**	0.978	0.988	0.959	0.910	1.022	1.001	0.942	1.002	0.995	0.972	1.017	0.936
Plzeň	3203	**1.032**	1.012	1.004	0.992	1.021	0.987	0.968	1.033	0.998	0.995	1.345	1.060	1.059
Cheb	4101	**0.965**	0.999	1.012	0.925	0.943	0.990	0.977	0.992	1.003	1.020	0.954	1.009	0.988
Karlovy Vary	4102	**0.990**	0.993	1.012	1.136	0.901	1.044	0.959	1.044	0.999	1.017	1.110	0.909	1.006
Děčín	4201	**0.988**	1.007	0.962	0.988	0.946	1.031	1.011	1.040	1.012	1.010	0.903	1.005	1.091
Teplice	4206	**0.994**	1.010	0.999	0.967	1.012	0.977	1.012	1.064	0.997	0.986	0.928	1.000	1.015
Ústí nad Labem	4207	**0.967**	0.976	0.994	0.937	1.008	0.910	0.979	1.031	1.012	0.985	1.018	0.931	1.015
Liberec	5103	**1.038**	0.994	1.006	1.070	1.075	1.030	1.045	1.035	1.006	1.029	1.076	1.042	1.047
Hradec Králové	5201	**1.050**	1.016	1.021	1.001	1.085	0.982	1.049	1.035	1.024	0.988	1.019	1.050	0.967
Náchod	5203	**0.978**	1.001	1.004	0.988	0.978	0.975	1.060	0.973	0.991	0.981	0.934	0.941	0.932
Chrudim	5301	**0.972**	1.016	1.000	0.952	0.916	0.971	0.981	0.963	0.990	1.024	0.975	1.014	0.906
Pardubice	5302	**1.040**	1.016	1.025	1.071	0.977	1.013	1.041	1.044	1.004	1.041	1.138	1.084	1.051
Jihlava	6102	**0.981**	0.997	1.006	1.009	0.877	1.001	1.073	1.034	1.005	0.985	0.887	0.944	0.986
Žďár nad Sázavou	6105	**0.962**	1.000	0.990	0.998	0.898	0.995	0.932	0.964	0.990	0.977	0.964	0.891	0.950
Brno	6202	**1.085**	1.021	1.013	0.989	1.221	1.016	1.009	0.986	0.995	1.039	1.158	1.150	1.103
Hodonín	6205	**0.988**	1.001	1.003	0.984	0.965	1.023	0.986	0.967	0.996	0.983	0.943	0.986	0.996
Znojmo	6207	**0.976**	1.010	0.998	1.006	0.913	1.025	1.000	0.942	0.987	0.983	0.821	0.989	1.005
Olomouc	7102	**1.003**	0.986	0.992	1.003	0.961	1.002	0.952	1.037	0.996	0.999	0.946	1.070	0.983
Přerov	7104	**0.984**	0.992	1.011	0.970	0.994	0.995	0.969	0.955	1.000	0.959	0.975	1.048	0.973
Šumperk	7105	**0.965**	0.971	1.006	1.018	0.957	1.028	1.004	0.941	0.999	0.964	0.765	1.010	0.916
Uherské Hradiště	7202	**1.009**	1.002	1.015	0.969	1.003	1.016	1.005	0.975	0.974	1.012	0.902	1.008	1.035
Vsetín	7203	**0.996**	0.991	0.998	1.004	1.010	1.014	1.018	0.984	0.995	0.948	0.913	0.904	1.011
Zlín	7204	**1.032**	1.007	1.001	0.988	1.105	0.986	0.970	1.025	0.995	0.991	1.116	0.980	1.029
Bruntál	8101	**0.933**	0.940	0.990	0.986	0.912	0.992	0.984	0.910	1.011	0.942	0.848	0.939	0.941
Karviná	8103	**0.970**	0.990	0.993	1.011	0.972	0.991	1.025	0.958	0.998	0.945	0.906	0.943	0.983
Nový Jičín	8104	**0.974**	0.958	0.983	0.980	0.963	1.003	1.026	0.962	1.020	1.017	1.045	0.986	1.025
Opava	8105	**1.004**	0.985	1.002	0.904	1.043	0.971	0.924	1.039	0.998	0.966	0.945	1.041	0.974
Ostrava	8106	**1.001**	0.992	1.004	1.007	0.972	0.979	1.038	1.038	1.016	1.017	1.070	0.945	0.972

Source: authors' calculations, based on (CZSO, 2014)

The Table 2 indicates the regional price levels in 35 districts (LAU1) and the Capital of Praha as well as the price levels in higher territorial administrative units (region NUTS3 and cohesion region NUTS2). Obviously the price levels are higher in the districts with the most populated, economically strong centers, such as Praha, Brno, Hradec Králové, Pardubice or Liberec (Bednářová, 2015).

Table 2 Regional Price-Level Index (*RPI*) on Three Levels of Spatial Segmentation

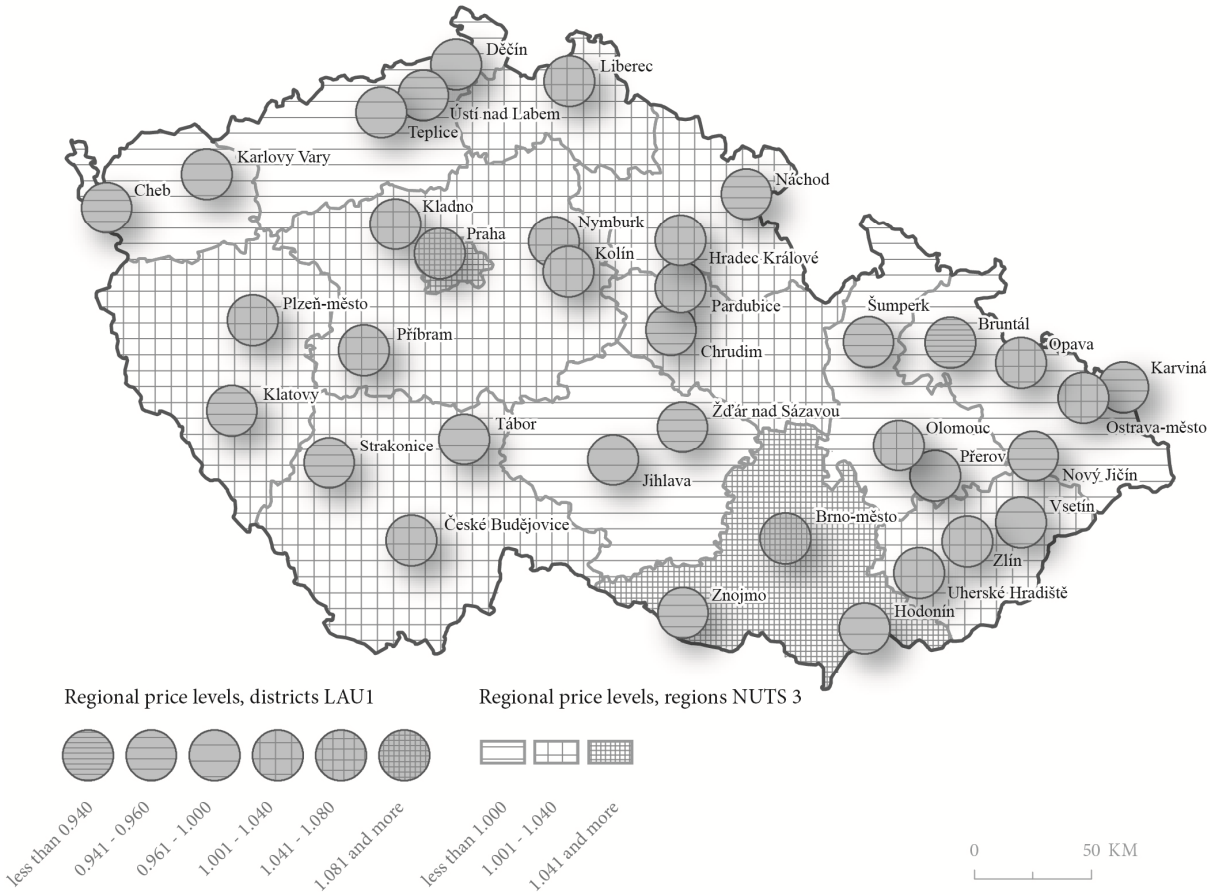
District	LAU1	RPI	Region	NUTS3	RPI	Cohesion Region	NUTS2	RPI
Praha	1100	1.165	Hlavní město Praha	CZ010	1.165	Praha	CZ01	1.165
Kladno	2103	1.041	Středočeský kraj	CZ020	1.030	Střední Čechy	CZ02	1.030
Kolín	2104	1.034						
Nymburk	2108	1.017						
Příbram	2111	1.023						
České Budějovice	3101	1.022	Jihočeský kraj	CZ031	1.005	Jihozápad	CZ03	1.006
Strakonice	3106	0.972						
Tábor	3107	0.995						
Klatovy	3202	0.954	Plzeňský kraj	CZ032	1.008			
Plzeň	3203	1.032						
Cheb	4101	0.965	Karlovarský kraj	CZ041	0.979	Severozápad	CZ04	0.982
Karlovy Vary	4102	0.990						
Děčín	4201	0.988	Ústecký kraj	CZ042	0.983			
Teplice	4206	0.994						
Ústí nad Labem	4207	0.967						
Liberec	5103	1.038	Liberecký kraj	CZ051	1.038	Severovýchod	CZ05	1.022
Hradec Králové	5201	1.050	Královéhradecký kraj	CZ052	1.021			
Náchod	5203	0.978						
Chrudim	5301	0.972	Pardubický kraj	CZ053	1.014			
Pardubice	5302	1.040						
Jihlava	6102	0.981	Kraj Vysočina	CZ063	0.971	Jihovýchod	CZ06	1.023
Žďár nad Sázavou	6105	0.962						
Brno	6202	1.085	Jihomoravský kraj	CZ064	1.043			
Hodonín	6205	0.988						
Znojmo	6207	0.976						
Olomouc	7102	1.003	Olomoucký kraj	CZ071	0.988	Střední Morava	CZ07	1.001
Přerov	7104	0.984						
Šumperk	7105	0.965						
Uherské Hradiště	7202	1.009	Zlínský kraj	CZ072	1.014			
Vsetín	7203	0.996						
Zlín	7204	1.032						
Bruntál	8101	0.933	Moravskoslezský kraj	CZ080	0.983	Moravskoslezsko	CZ08	0.983
Karviná	8103	0.970						
Nový Jičín	8104	0.974						
Opava	8105	1.004						
Ostrava	8106	1.001						

Source: authors' calculations, based on (CZSO, 2014)

The regional price-level results also reflect themselves well in the structurally affected and economically weak regions (lower price levels in Teplice, Karviná, Nový Jičín, and in Hodonín, Znojmo, Přerov, Šumperk, Bruntál). Ostrava and Opava remain very close to the mean value.

The best graphic representation proved to be a cartogram in Figure 1 showing the regional price levels for NUTS3 and their sources in the selected districts of the Czech Republic.

Figure 1 Regional Price Levels in the Czech Republic in 2011–2013 (Comparison of Districts LAU1 and Regions NUTS3)



Source: authors' own calculations and processing based on (ARCDATA, 2014, CZSO 2014)

The *RPI* seems to have a shortcoming, that makes its immediate interpretation more difficult, especially when we want to compare it with results published by Musil et al. (2012) and Čadil et al. (2014). The geometric mean of our results is showing a slight overestimation by 1.6 percent (see Table 3). This is certainly caused by the different weights applied in geometric Laspeyres (2) and geometric Paashe (3) index. Therefore, the values of *RPI* for NUTS3 were “normalized” to ensure an easier comparison.

Table 3 Comparison of Normalized Regional Price Levels ($RPI_{norm.}$)[1], Regional Purchasing Power Parity with Common Consumer Basket ($RPPP_{com.}$)[2] and with Regional Consumer Basket ($RPPP_{reg.}$)[3].

Region	NUTS3	*RPI*	$RPI_{norm.}$	$RPPP_{com.}$	$RPPP_{reg.}$
Hlavní město Praha	CZ010	1.165	1.147	1.197	1.208
Středočeský kraj	CZ020	1.030	1.013	1.019	1.026
Jihočeský kraj	CZ031	1.005	0.988	0.979	0.975
Plzeňský kraj	CZ032	1.008	0.992	0.971	0.971
Karlovarský kraj	CZ041	0.979	0.963	1.014	1.013
Ústecký kraj	CZ042	0.983	0.968	0.949	0.941
Liberecký kraj	CZ051	1.038	1.021	1.014	1.002
Královéhradecký kraj	CZ052	1.021	1.005	0.964	0.962
Pardubický kraj	CZ053	1.014	0.998	0.982	0.989
Kraj Vysočina	CZ063	0.971	0.955	0.956	0.951
Jihomoravský kraj	CZ064	1.043	1.026	1.034	1.046
Olomoucký kraj	CZ071	0.988	0.973	0.969	0.966
Zlínský kraj	CZ072	1.014	0.998	1.008	1.008
Moravskoslezský kraj	CZ080	0.983	0.967	0.967	0.969
Czech Republic Geometric Mean		**1.016**	**1.000**	**1.000**	**1.000**

Source: [1]authors' calculations, based on (CZSO, 2014), [2](Musil et al., 2012), [3](Čadil et al., 2014)

Obviously, our results indicate smaller regional difference in price levels than those published by Musil et al. (2012) and Čadil et al. (2014). The standard deviation of our regional price levels is 0.0457, while $RPPP_{com.}$ recorded 0.0599 (Musil et al., 2012) and $RPPP_{reg.}$ even 0.0640 (Čadil et al., 2014). Among the reasons, the following are worth mentioning:

1. We performed careful qualitative adjustment of the raw data, which ensures the goods and services are comparable across the regions or districts of the Czech Republic. Different quality of goods and services surveyed in different localities does not affect our results and this fact certainly reduces the differences in regional price levels.
2. Musil et al. (2012) is using a common consumer basket, therefore the results show smaller standard deviation than when regional consumer baskets are employed as in Čadil et al. (2014). Nevertheless, even Čadil et al. (2014) argues, that particular system of regional weights does not affect the results much.
3. The more significant differences between our results and those published earlier (Musil et al., 2012, Čadil et al., 2014) have been recorded in Capital of Praha, Karlovarský kraj, and Královéhradecký kraj. The less significant differences appeared in Plzeňský kraj and Ústecký kraj. They are probably caused by a different approach applied to CZ-COICOP Heading 04, esp. to imputed rent and also by the rent deregulation triggered in 2011.
4. Some minor changes may be attributed to the year of origin of the data sources too.

CONCLUSION

The purpose of Regional Price-level Index is to enable the comparison of spatial differences in the costs of living of an average household in a particular area. In terms of spatial comparison, the index needs to include all relevant expenditures which can indicate interregional differences and are purchased by households. These are mainly goods and services which cannot be provided supra-regionally (common food, local services) and market prices of rentals and real estate. The immobile commodities (housing, education, accommodation, catering) represent the main source of regional price-level differences.

The purpose of the *RPI*, however, is also a source of its shortcoming. It should be used and applied carefully, because it is clear, the average household is not a household of unemployed, or of pensioners. The social status is usually connected with a consumer behavior, differing significantly from the consumer behavior of an average household. Therefore, it should be strictly used together with or applied to average income indicators (average wage in a certain region, average net disposable household income, etc.)

Regional price level can represent valuable information when making decisions on the level of regional economic and social policy. Its ambition is a more precise definition of economic and social disparities in spatial comparison. The issue of low validity of interregional comparison by means of nominal income indicators, which do not include costs of living in the regions, was pointed out e.g. by Kahoun (2011), Gibbons et al. (2010), Viturka (2007) and others. In the strategy of the regional development of the Czech Republic, however, the nominal net disposable income is one of the crucial indicators determining the social position of inhabitants of a region.

The real income indicator would make the state and development of social and economic disparities on the regional and subregional levels more precise. (Viturka, 2007, Kahoun, 2011, Martinčík, 2008). According to the preliminary results of Šimanová and Kocourek (2014) and Kocourek et al. (2014), the real regional disparities in the income of households in the Czech Republic are smaller than so far published nominal ones, which is consistent with findings of Čahoun et al. (2014).

Therefore, it seems very useful (if not necessary) to measure or at least estimate the price levels on the most detailed scale available. Significant differences in cost of living can be identified even within the former districts in the Czech Republic (LAU1), a price level homogeneity on the level of NUTS3 or NUTS2 is therefore another very strong and hardly justifiable precondition.

Although on the lower levels of territorial division (LAU1 and smaller) the income indicators are also very difficult to measure or reliably estimate, even the regional price-level index alone seems to provide a very valuable information.

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