Measuring Regional Price Levels in the Czech Republic

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Abstract

Regional price level comparison in the Czech Republic was a topic not touched until recently. Then a team of researchers from the University of Economics in Prague pioneered the way for NUTS 3 regions for the year 2007 and repeatedly in 2012. Another step to establish more reliable results came together with a research team of the Technical University in Liberec, which brought qualitatively new and well advanced approaches. This article aims to discuss some aspects of the two attempts to establish regional price level compariso in the Czech Republic.[2]

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Purchasing power parity, regional price level	*E31*

INTRODUCTION

A price level is a relative quantity existing only in relation to another price level. In economic statistics it is usually the aggregate of a set of prices across a specific spectrum of goods and services produced or consumed, which is compared to an analogous aggregate of prices. A time comparison within the same space results in a price index like inflation, while the comparison over space at the same time gives Price Level Index (PLI). The mathematical essence of the two is the same, yet the practical issues differ.

Inflation is one of the most watched economic indicators in the world. So the corresponding resources for data compilation and processing are superior to those for measuring PLI. The latter is mostly used in the international Purchasing Power Parities (PPP) project. The object of the programme is to compare the price and volume levels of GDP and its component expenditures across participating countries. Before such comparisons can be made, it is necessary to express the volumes, which are in national currencies and valued at national price levels, in a common currency and at a uniform price level. Purchasing power parity (PPP) is used as a conversion bridge here; then the ratio of PPP to exchange rates gives PLI.

PLI is mostly connected with international comparisons, but the concept can also be applied for interregional comparisons within one country. Although Regional Price Level Index (RPLI) provides very valuable and interesting information, it is not yet part of any official statistical output of the Czech Statistical Office or Eurostat. But it is worth mentioning that the international PPP project requires the participating country to provide so called spatial coefficients in order to adjust the average prices obtained in the location of the price survey (usually the capital of the country) to the national average prices.

The spatial coefficients are nothing else than a special case of RPLI for the capital. To fulfil requirements of the PPP project the Czech Statistical Office uses rough estimations of the spatial coefficients. They are derived from Consumer Price Index (CPI) collected dataset at the specific detailed level set by the project.

Recently two interesting studies focused on the Czech RPLI emerged. The first one comes from a team working at the Czech Statistical Office and the University of Economics in Prague (UEP), see Kramulová, Musil, Zeman, Michlová (2016). The second one was prepared by a research team of the Technical University in Liberec (TUL), see Kocourek, Šimanová, Šmída (2016). The main source of the price information used in both of the studies came from the CPI database of the Czech Statistical Office.

Next chapter provides some basic evaluation of the two mentioned studies and some difficulties encountered when attempting to measure RPLI. RPLI in this article is a vector of relative price levels for considered regions, where the relative price level for the Czech Republic equals 100%. Only RPLI for the total household final consumption expenditures is considered, breakdowns for detailed COICOP categories are not dealt with.

COMPARISON OF THE TWO PROJECTS

UEP provides comparison of price levels in 2012, an update of similar results from 2007. The regional prices were obtained as averages over NUTS 3 of CPI basket representative items. The study mentions items with centrally collected prices, like energy, transport and internet prices, and their increased share in the basket. These centrally collected data may cause some difficulty or ambiguity to derive RPLI. UEP mentions imputation of some missing prices by an average of the other regions. It should be noted that this method is suitable only for regions where such a procedure can be expected to provide plausible outcomes. Especially for services, highly influenced by the local average wages, a more specific approach is often desirable. Yet, UEP presents a very efficient attempt to establish pilot RPLI in the Czech Republic.

To stay a little bit longer at the theme of the centrally collected prices, we can distinguish several cases. Some prices, like petrol, are strongly regional, but available data sources covering the whole country cannot be regionalized. On the other hand, internet prices are the same for the whole country and do not pose any problem for RPLI calculation. Railway transport is more difficult. It may be considered to have a single country price level, unless we want to raise the local differences in the quality of the service (accessibility, frequency, quality and efficiency of railway connections relevant to a given place or region).

There are difficult cases like an entry ticket to a local football match or a hotel accommodation. The latter is a complex case, as it is usually not only the quality-of-the-shelter component, but also the location, which plays an important role in the price determination. Here a question arises, how to establish a quality factor related to the location and how to abstract from this specific quality in order to obtain pure price level. Moreover, the hotel price is faced mostly by out-of-region customers, which brings about new issues with solutions depending on the intended use of the final RPLI results.

The second study (TUL) provides more advanced methodology, presenting real academic research of the topic, but at the same time also considerably more laborious. The ultimate difference between the two approaches consists in treatment of the quality differences for the compared items. The TUL approach thoroughly differentiates individual narrowly defined varieties within broader CPI representative item description. For some items this may play substantial role.

To explain the issue closer, let us have a simple example of a representative CPI item – white yoghurt, low fat content, standardized weight 150 g. Prices in this example range approximately from 4 CZK to 11 CZK over the Czech Republic (March 2017). In the next step, a further breakdown into individual varieties with different qualities as perceived by consumers is needed, distinguishing producer and mark, like "Olma Klasik, 2.7% fat". It is exactly this level where PPP methodology compares "like with like". Then, we come to the conclusion that the total price variation within representative item is mostly due to

the variation between these individual varieties. The average prices of varieties range approximately from 5 CZK to 10 CZK and the dispersion of prices within the specified varieties themselves is quite small and often due only to random discounts.

CPI perception is similar to that of PPP. For CPI monthly change of the white yoghurt price index, it is necessary to keep the same composition of the varieties used for the calculation of the average price in numerator and denominator. This is achieved by a selection of suitable subsets of actually collected data.

The utilization of this detailed information and the price comparison at the level of variety in TUL project is its most valuable aspect. It presents very significant exploitation of the information contained in the CPI collected database. It is no surprise that related TUL data processing was perhaps the most challenging part of the whole project. The Czech Statistical Office also came to the conclusion to use the detailed TUL results as the best estimates for PPP space coefficients in future.

Another ambition of TUL was an attempt to capture price differences between individual districts (former NUTS 4) in spite of the data collection being limited only to 35 of them, presenting barely half of their total number. While estimated RPLI for the districts without original price data may not be always reliable, the aggregated RPLI for the hierarchically higher NUTS 3 is likely to be more accurate than those from the UEP calculation.

Next table shows comparison of the results of RPLI for NUTS 3. Usual alphabetical ordering makes statistics less illustrative than sorting by some important indicator. It suggests itself to use TUL RPLI results as preferred ones, but even they do not seem fully plausible (e.g. high RPLI in Zlínský kraj). Natural expectation says that RPLI should partly depend on an average consumer's income. Therefore the ordering of the Table 1 was determined by an artificial RPLI obtained as a result of the weighted geometric mean of RPLI from TUL with weight of 0.5, RPLI of UEP with weight of 0.25 and the average wage relative level in the respective NUTS 3 in 2012 (source: Czech Statistical Office) with weight of 0.25.

Table 1 RPLI according to UEP and TUL – comparison of results

Region	RPLI % 2012 UEP	RPLI % 2011–13 TUL	Difference p.p.	Average wages % 2012
Hlavní město Praha	122.3	117.1	5.2	135.8
Středočeský kraj	106.3	104.8	1.5	99.6
Jihomoravský kraj	100.6	103.0	−2.4	96.6
Liberecký kraj	100.5	101.4	−0.9	91.6
Plzeňský kraj	100.0	100.1	−0.1	93.3
Královéhradecký kraj	96.7	101.2	−4.5	89.8
Moravskoslezský kraj	97.2	98.9	−1.7	93.5
Zlínský kraj	97.5	101.5	−4.0	86.5
Jihočeský kraj	99.0	99.7	−0.7	87.9
Pardubický kraj	96.2	100.1	−3.9	88.7
Olomoucký kraj	96.9	99.2	−2.3	87.4
Ústecký kraj	96.7	97.4	−0.7	90.7
Kraj Vysočina	93.1	97.7	−4.6	89.4
Karlovarský kraj	99.9	97.7	2.2	83.2
Czech Republic	**100.0**	**100.0**		**100.0**

Source: UEP, TUL, Czech Statistical Office, own calculations

UEP RPLI shows a standard deviation (over individual NUTS 3) of 3.0%, TUL only 2.1%, while for wages it achieves 4.2% (outlying Prague is always excluded). All the three statistics are quite well correlated, as expected. Some part of the variance of RPLI over NUTS 3 in both UEP and TUL can be explained by the fact that the source database for calculation was not primarily designed for the space comparisons and is neither suitably balanced nor sufficiently large for that purpose.

UEP has evidently larger variance. The most likely cause is that in regions with higher wages and consequently higher purchasing power one can expect a composition of varieties within the given representative item shifted towards relatively higher quality products. It suggests that UEP results are therefore overvalued in higher tail and symmetrically undervalued in the lower tail.

Differences between results of UEP and TUL for some NUTS 3 are quite high (see Table 1), which suggest low accuracy of results generally. Obviously, the information beyond decimal point has no meaning.

CONCLUSION

Whatever estimations of RPLI in the Czech Republic are highly appreciated, as official price statistics is concentrated on inflation measurement and resources to price comparison in space dimension are relatively poor. Comparison of price levels over space also reveals many practical problems, hardly perceptible in the domain of the time comparison (price indices). One of them, not mentioned here, is a big sensitivity to the estimations of the relative weights used for the comparisons.

Typically, the quality of achieved outcome is a reward for the corresponding effort. In that sense TUL results are superior. We can take them as a good reference point, perhaps with an exception of Zlínský kraj, where it is more plausible simply to impute relative price level of 100%.

Based on TUL results, it is now interesting to make own, a very rough estimate of RPLI just by assuming the price level being equal to 100% for all the goods in the consumer market for all NUTS 3 (with an assigned relative weight of the goods on total of 60%), and the price level of all the services being equal to the average wage relative level in the respective NUTS 3 (with a relative weight of the services on total of 40%). Then, surprisingly, this somewhat unsophisticated estimate of RPLI would be closer to our reference (TUL) than UEP, where the distance of the RPLI vectors is measured by the sum of the absolute differences of their elements.

What does this finding mean? Simply, the Czech Republic is a small country in terms of economic geography. The price level of consumer goods is rather homogeneous and the variations of RPLI are explicable by the conditions on the local labour market.

Finally, it remains to answer the question whether it makes sense to combine the results of UEP and TUL together. Some kind of such a construction has been proposed in this article to arrange the regions according to their supposed price levels within the Table 1 (statistics not explicitly shown). But, as both TUL and UEP suffer from real data insufficiency and, at the same time, TUL presents better usage of the available data, it is more appropriate to combine only TUL results with the average wage levels. The reason for this approach is that the wage statistics cover the whole region considered and to some extent complement the deficiencies in the full coverage by the price quotations used in both the studies.

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