Jana Šimanová
Technical University of Liberec, Faculty of Economics, Department of Economics
Studentská 1402/2, 461 17 Liberec 1, Czech Republic
jana.simanova@tul.cz

Aleš Kocourek
Technical University of Liberec, Faculty of Economics, Department of Economics
Studentská 1402/2, 461 17 Liberec 1, Czech Republic
ales.kocourek@tul.cz

Nominal vs. Real Regional Income Disparities in Selected Cities of the Czech Republic

Abstract
The paper brings first results of appliead research related to the measurement of the real regional disparities in the Czech Republic. The research hypothesis claims that the level of nominal income of regional inhabitants is compensated for by the level of costs of living. Therefore, it is highly inaccurate to consider socio-economic situation of the region's population by comparison of nominal income variables such as net disposable household income (NDHI) without taking the interregional price differences into account. The paper briefly outlines the methodology for the construction of spatial cost-of-living index (CoLI) based on the adjusted consumer basket for consumer price index. Authors then estimate the values of NDHI on the level of district cities (since the data is available on the level of NUTS3 only). These two indicators enable verification of research hypothesis. The results correspond to the fact that the disparities in real incomes are lower than those in the nominal incomes. Therefore, assesing the real regional social-economic disparities yields more accurate results about the social-economic position of regions which is a crucial finding especially for the process of creation and implementation of economic, social, and cohesion policies.

Key Words:
cost-of-living index, regional disparities, real disparities, nominal indicators, net disposable household income

JEL Classification: C21, R13, R31

Introduction

The paper is aimed at the issue of regional price disparities in the context of assessment of the standard of living in the selected cities of the Czech Republic, or more specifically on the identification of **possible trade-off between the levels of prices and of nominal incomes** across the Czech Republic. The main subject of the research lies in the construction of a Regional cost-of-living index (CoLI) based on the generally well-known and widely used consumer price index (CPI). This task is significantly preconditioned by the quality of periodical price investigation in the areas for which the index is to be constructed. Such investigations are carried out in 36 district cities of the Czech Republic and the results are published monthly on the aggregate level in the form of CPI. In the second step, the CoLI is applied as an instrument of rectification of nominal net disposable household income (NDHI).

The fundamental research hypothesis claims, the higher levels of income of households (measured by the nominal NDHI) generally tend to be compensated for by higher levels of consumer prices. Therefore, the comparison of nominal values of NDHI across

regions does not illustrate the real social-economic position of the region's inhabitants, although the nominal NDHI is generally used as the measure of social-economic ranking of regions in the Czech Republic and other European countries.

The quantification and evaluation of regional disparities remains one of the most up-to-date topics of regional politics. According to Czech as well as foreign authors, the role of the supply side is often overestimated in the regional policy at the expense of the demand side, or more specifically of the real income per capita. The effect of the level of real living costs is perceived by the current theories of regional development as an impact of localization of corporations. It is presumed (to a great extent controversially) that the consumer prices are lower and the real estate prices are higher as a result of economies of agglomeration [16]. According to Viturka [17], the price factors belong to the group of moderately important determinants of regional competitiveness. Kahoun [9] considers the fact that the regional differences in price levels remain neglected highly limiting for accountable regional comparison, especially because the difference in price levels between the Czech regions (cities) are significant.

In the German NUTS3 regions, the regional cost-of-living index (CoLI) was calculated in 1995 and 2004 on the basis of cost-of-goods index (CoGI) and housing rent index (HRI). [11][15] The spatial CoLI patterns were found relatively stable over time. The real regional disparities were proved to diminish at a higher pace than the nominal ones, especially across the East German regions. [14] In the United Kingdom, the issue of real regional disparities has been tackled by Overman and Gibbons [7], who focus solely on the prices of housing. During their research in 1998 – 2008, a significant trade-off between the level of wages and the costs of living was identified. Therefore, they recommend the economic policies should target the individual inhabitant and should attempt to improve his/her individual position, which will result in raising the situation of the whole region more efficiently than focusing on a geographically determined region. [7]. In the USA, the researchers from the Bureau of Economic Analysis are deeply engaged in the issue of metropolitan and nonmetropolitan price indices and also in the context of real income of population. They discovered a higher variability in real incomes in the nonmetropolitan areas than in the metropolitan ones. [1]

1. Methodology of Estimation of the Regional Cost-of-Living Index

For the construction of regional Cost-of-Living Indexes it is important to define the following:

1) Area for which it will be calculated.
2) Consumer basket.
3) The basic period and area to relate the value of CoLI to (Cost-of-Living Index formula).
4) Source of the data.

Ad 1) The fact that the price investigation carried out by the Czech Statistical Office is rather extensive and covers 36 districts (out of 76) of the Czech Republic represents an indisputable advantage. Prices of goods and services are usually collected in cities which are the centres of districts/counties (referred to as "district cities"). Therefore, the areas for which the index will be calculated correspond with catastral territories of the 36 district cities in the Czech Republic.

Ad 2) The consumer basket should be the same across the regions in order to ensure the condition of temporal and territorial comparison. The weights of the commodities in the consumer basket in the Czech Republic are revised according to the data from household panel survey. The consumer basket is identical in terms of structure in all the regions, it means that the price of all representatives has to be investigated or calculated for all the 36 cities. In the years 2011 - 13, this condition is met by 92.7 % of commodities of the consumer

basket for CPI. The representatices of the consumer basket can be clasified into the following groups from the CoLI point of view:

- **a)** representatives, which households can purchase only regionally (locally) and which can to a certain extent contribute to interregional differences in price levels. These representatives constitute 59 % of the consumer basket. They are imputed in the consumer basket in the prices investigated in the given territory.
- **b)** representatives where the purchase is usually performed transregionally, these representatives do not create regional differences (e.g. electricity, gas, coach transport, etc.). These representatives constitute 28 % of the consumer basket. They are imputed in the consumer basket in the average price for the whole Czech Republic.
- **c)** representatives where the prices are fixed across the regions (fee stamps, cigarettes, magazines…) These representatives constitute 5.7 % of the consumer basket. These are imputed into the consumer basket in the same price for which they are purchased.

Ad 3) In general, an actual or fictive area may be chosen as the base (reference) region. When only national consumption patterns are available, the use of national average prices would be in accordance with the pure Laspeyres approach. In the Czech Republic, we use the city average prices which represent the fictive "average territory". Thus, the Laspeyres modified CoLI used for the calculation could be written as:

$$CoLI_r = \frac{\sum_{i=1}^{N} p_{ir} q_i}{\sum_{i=1}^{N} p_{ia} q_i} = \sum_{i=1}^{N} \frac{p_{ir}}{p_{ia}} \frac{p_{ia} q_i}{\sum_{i=1}^{N} p_{ia} q_i} = \sum_{i=1}^{N} \frac{p_{ir}}{p_{ia}} w_i \,, \qquad (1)$$

where p_{ir} is the price and q_i is the quantity of goods or services i consumed in a region r, p_{ia} stands for the mean price, in this case the average price of the 36 cities in 2011. As can be seen, Laspeyres index is the sum of all relative prices between the region of interest and the regional average price (in this case the average price of the 36 district cities) in the base year 2011, weighted by the expenditure weight w_i of each individual representative in the regional consumer basket. [6][10][12]

Ad 4) The source of the data is the price survey of goods and services in the Czech cities which is carried out by the Czech Statistical Office twice a month on average. In the majority of cases, for each representative of the consumer basket three prices are collected. Another source of data for CoLI estimation in the cities is the data from survey of prices of real estate – housing rent index – which are published every year by the Czech Statistical Office on the basis of data supplied by the Ministry of Finance of the Czech Republic.

Results of CoLI in the 36 Czech district cities in 2011 – 2013 are shown in Fig. 1.

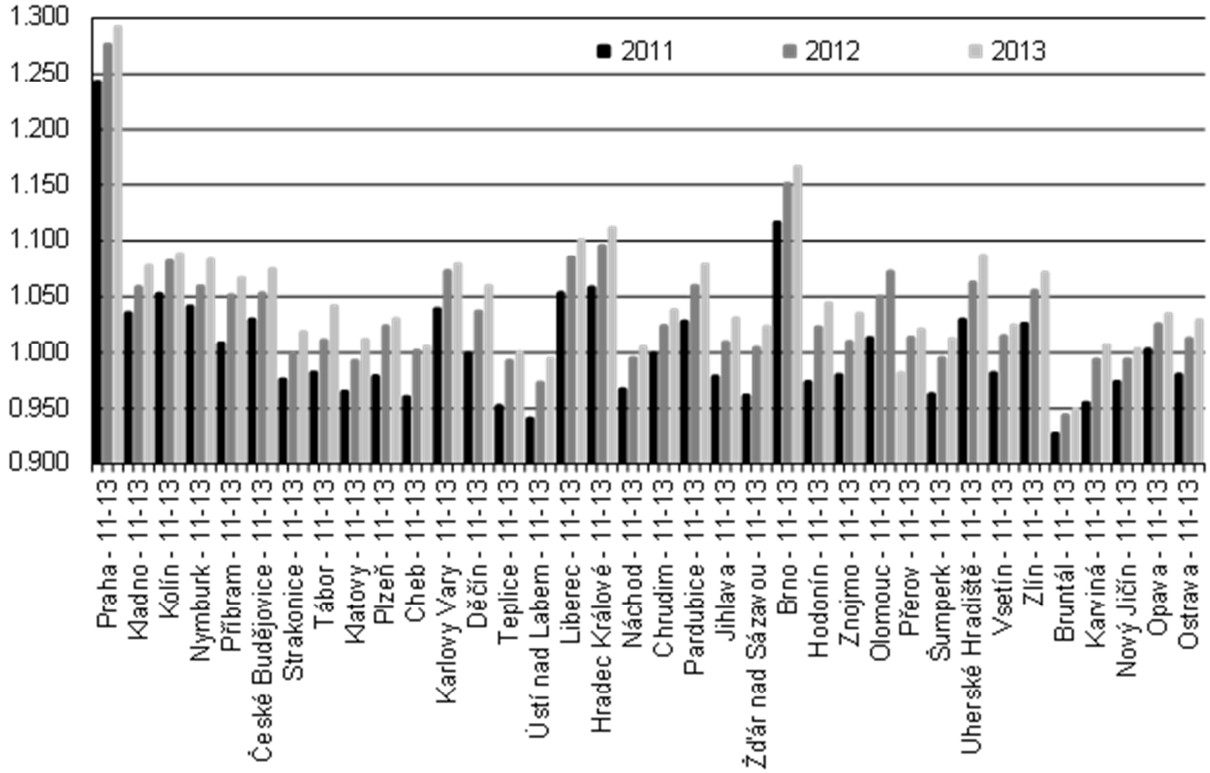

Figure 1: Regional CoLI in Selected District Cities of the Czech Republic in 2011 – 2013
Source: authors' own calculations, data from [5]

2. Methodology of Estimation of the Nominal Net Disposable Household Income on the Level of District Cities

The net disposable household income (NDHI) is the result of balance of revenues and expenditures recorded at the secondary distribution of income account. It shows how is the surplus/deficit of primary incomes redistributed through the taxes, social benefits and other transfer payments [13]. The NDHI as such represents a value of money the households are at their disposal for final consumption, savings, or assets accumulation. The indicator illustrates the material wealth of households with permanent residence in the particular region or locality. [6]

Since the value of NDHI is not published on disaggregated to the level of district cities in the Czech Republic, but only to the level of regions (NUTS3), it was necessary to select potential regressors on the regional (NUTS3) level available also for the district cities (NUTS5) to estimate the income indicator NDHI per capita in the requested territory and time. Among the potential regressors, the following were tested:

- PRIMEMP: Share of employees in the primary sector on the economically active population.
- SECEMP: Share of employees in the secondary sector on the economically active population.
- UNEMP: Share of unemployed on the economically active population.
- PRIMEDU: Share of population of 15 and older that has attained pre-primary or primary levels of education only.
- UNIEDU: Share of population of 15 and older that has attained tertiary level of education.
- REGION: The belonging of a district city to a certain region using a dummy variable.

For the estimation of model, the panel data analysis methods were applied using the software eViews 8.1. Since the aim of the estimation is to regionally disaggregate the data

(not to perform forecasting or extrapolation in time), we will consider our data geografically stationary [2] and cointegrated. Regarding the characteristics of the data, fixed effects were chosen for the period and ordinary least square (no effects) for the cross-section dimension. The results of the model are summed up in the equation (2) bellow and in the figure 2 showing the model performance on the real actual data on the regional (NUTS2) level.

$$NDHI = 220{,}721.532 - 2{,}708.365 * PRIMEDU + 1{,}268.094 * UNIEDU - \\ -1{,}955.267 * REGION \quad , \qquad (2)$$

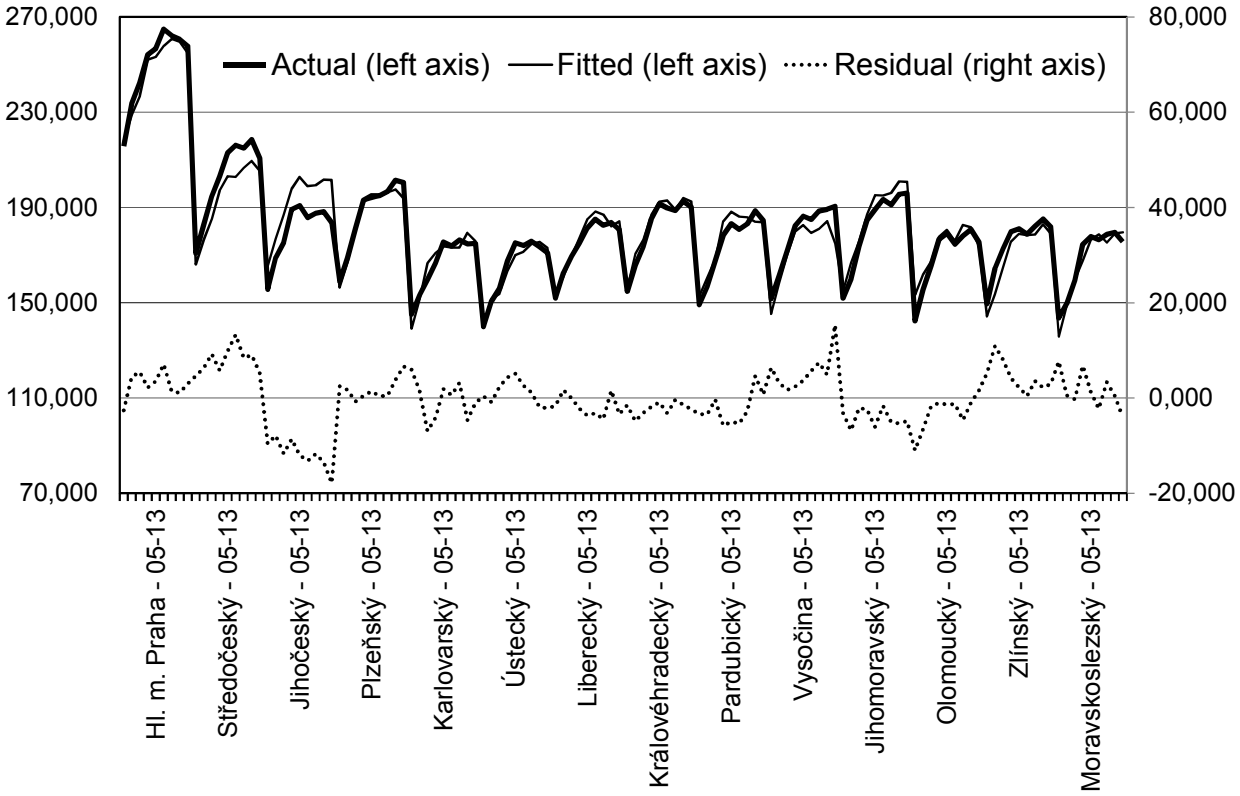

Figure 2: Fitted, Actual and Residual Values of the Regression Model of Regional Nominal NDHI in the Czech NUTS3 Regions in 2005 – 2013
Source: authors' own calculations in eViews 8.1

The statistically significant regressors of NDHI on the level of regions (NUTS3) included PRIMEDU and REGION with negative influence on the NDHI and UNIEDU with a positive influence on the NDHI. These three variables are capable of explaining 94,5 % of variability of the data, the robustness of the model was also verified using *F*-statistics and Jarque-Bera test for normality of residuals.

3. Results

The software eViews 8.1 was then employed to estimate the values of NDHI on the "lower" level of district cities. The results can be found in the figure 3, illustrated as the nominal NDHI values for the 36 district cities in the years 2011 – 2013 (only for these three years the regional CoLI values have been computed so far).

In the following step of the analysis, the results of regional CoLIs were confronted with the values of nominal NDHIs per capita and year in the 36 district cities. The real NDHIs per capital and year were calculated for the selected 36 district cities and for years 2011 -

2013. The results are shown in figure 3. As expected, the most pronounced differences are recorded for the largest cities of Prague and Brno. Figure 3 as well as desctiptive statistics shown in table 1 suggest, there might be some trade-off between the regional values of nominal NDHI per capita and the regional CoLI: the higher nominal NDHI per capita seems to be compensated for by the higher values of CoLI.

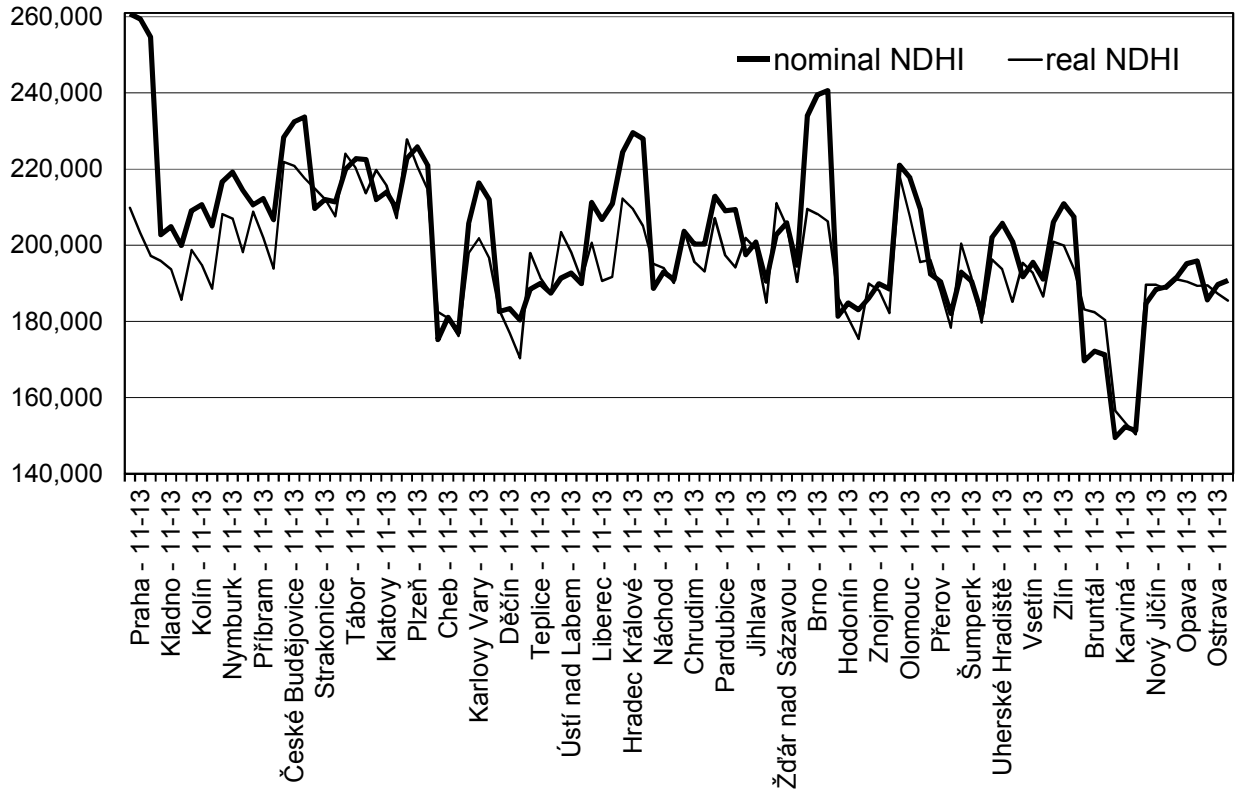

Figure 3: Nominal vs. Real Regional NDHI in Selected District Cities of the Czech Republic in 2011 – 2013
Source: authors' own calculations in eViews 8.1

Table 1: Basic statistic characteristics in the sample of nominal and real NDHI

Indicator	Standard deviation	Mean	Median
Nominal NDHI	20 125	202 266.34	202 427.73
Real NDHI	14 102	196 166.20	195 479.84

Source: authors' calculations in eViews 8.1

The main hypothesis of this article was focused on validation of the statistically significant influence of regional price levels on the extent of recorded interregional nominal social-economic disparities. We used five tests on homogeneity of variance (F-test, Siegel-Tukey test, Bartlett test, Leven test, and Brown-Forsythe test). The results of all these tests are summed up in the table 2. All of them give very similar results.

Since the *P*-value **exceeded** the 5% level, the null hypothesis of homogeneity of variances **is rejected** and we can conclude the regional CoLIs reassess the nominal regional disparities significantly. The interregional differences measured by nominal NDHI per capita are significantly wider than the real disparities.

Table 2: Results of the Tests on Homoscedasticity

Method	Degrees of Freedom	Value	P-value
F-test	(107, 107)	2.0365	0.0003
Siegel-Tukey		2.8752	0.0040
Bartlett	1	13.1943	0.0003
Levene	(1, 214)	10.7091	0.0012
Brown-Forsythe	(1, 214)	10.7781	0.0012

Source: authors' calculations in eViews 8.1

Conclusion

First, the regression analysis on panel data showed that NDHI is mainly influenced by the rate of unemployment and the rate of inhabitants with basic education – both regressors lower the NDHI value.

Second, the results of analysis across all examined district cities of the Czech Republic verified the statistically significant trade-off between the CoLIs and NDHIs, when higher NDHIs imply higher CoLIs. This finding is, however, fundamentally biased by the cities of Prague and Brno. The analysis of the variability of the statistical set of regional nominal NDHIs per capita was tested against the variability of the regional real NDHIs per capita. The significant impact of application of CoLI was verified at the 5% level of significance. The nominal indicator of social-economic position of an average individual in the selected district cities of the Czech Republic recorded significantly higher variability than the real indicator. Thus, the differences in prices across regions decrease the interregional disparities and to some extent improving the social-economic situation of inhabitants of problematic regions of the Czech Republic.

Although differences in the quality of services such as education or health care which were examined by Horváthová and Abrhám [8] are not included into the comparison, spatial assessment of the relative regional price differences has the potential of improving the understanding of some of the market problems and represents an important mean of more precisely targeted interventions of economic policy. The regional price levels play a crucial role in consumers' decision making, in localization of economic subjects, and as such can influence the extent of regional disparities.[2]

More precise definition of localities as well as methods of assessing the real economic and social disparities (using the regional Cost-of-Living Index) is desirable for increasing the efficiency of applied instruments of regional policies.[3] It seems useful to focus the policies of regional development on the real social-economic situation of the individuals and implicitly on the position of geographically determined region.

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