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REGIONAL CONSUMPTION EXPENDITURES: AN IMPORTANT STARTING POINT FOR REGIONAL INPUT-OUTPUT TABLES

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Abstract

Construction of regional input-output tables represents a difficult research task. It is much more complicated than creation of national input output tables, because it includes not only international relations, but also interregional relations and the necessity of detailed data is very high. One of the most important starting points is the matrix of regional consumption expenditures. These data are not officially published, but were estimated in the preceding research.

It is essential to estimate not only regional final consumption expenditures of households, but also of general government and non-profit institutions serving households (NPISHs). These data are estimated for 14 Czech NUTS 3 regions taking into account all possible data sources accessible. The results are computed for the year 2011 using the most up-to-date national accounts information available. Moreover, regional price levels are taken into consideration. Regional households' consumption expenditures are subsequently compared with net disposable income of households and selected social statistics indicators and a brief regional analysis of well-being of households is carried out.

Data on regional consumption expenditures need to be transformed to become suitable for regional input-output modeling. Therefore, commodity structure of consumption expenditures is estimated and all figures are transferred from purchasers' prices to basic prices. Further, the applicability of regional consumption expenditures for multi-regional input-output (MRIO) model is discussed in the paper.

Key words: regional input-output tables, regional consumption expenditures, expenditure approach to GDP estimate.

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1. Introduction

Construction of regional input-output tables (RIOTs) is a very complicated issue; however, it constantly attracts attention of researchers. Having RIOTs at a disposal means that you can easily analyze relations among different regions or estimate the response of one or more regions to e.g. price shocks or demand shocks in other regions. The aim of this paper is to present the procedure of construction of regional consumption expenditures matrix, which is a necessary input for the compilation of regional input-output model.

Construction of RIOTs is a long-term task including several phases. The first consists in preparation of input data matrices. One of the necessary input matrices is the matrix of regional consumption expenditures that comprise final household consumption expenditures (FHCE), final general government consumption expenditures (FGGCE) and final NPISHs consumption expenditures (FNPIHCE). These data are not published for NUTS 3 regions in the Czech Republic. Therefore, we had to regionalize data available for the national economy or NUTS 2 regions (see section 2). The data obtained are further analyzed and regional price levels are taken into consideration. Moreover, regional FHCE are compared with net disposable income of households and selected social statistics indicators and a brief regional analysis of well-being of households is carried out in sections 3 and 4. Section 5 presents the transformation of regional consumption expenditures data into commodity structure and subsequently from purchasers' prices to basic prices. In section 6 the applicability of regional consumption expenditures for multi-regional input-output (MRIO) model is discussed.

2. Regionalization of consumption expenditures

It was already stated, that consumption expenditures are published in national accounts for the whole Czech Republic only. For the case of FHCE it is also possible to take partly into account data from Household Budget Survey (HBS) which are available since 2011 for NUTS 2 regions as well. However, these data have some limitations. Firstly, they are focused just on monetary expenditures. It means, that some expenditures, e.g. imputed rentals for housing or FISIM, are not covered at all. Secondly, as surveyed data they are strongly influenced by the willingness of respondents to report all expenditures. This leads again to underestimation of some expenditures, mainly alcoholic beverages, tobacco products and narcotics.

For each of 48 CZ-COICOP categories the most appropriate regionalization key was found and top-down method was applied. If no suitable indicator was available, HBS data would be used for estimate. Such a regionalization was done in the previous research for the year 2009 (Kramulová & Musil, 2013, 818-822) and updated for the year 2011. The regionalization is now performed in a more precise way, as new data sources were applied. Table 1 summarizes the regionalization keys for CZ-COICOP categories. Using these keys weight schemes of FHCE were determined for each category. Sometimes, the weights had to be slightly adjusted, especially in the case of HBS data, because some regions were constantly overestimated (compared to other regional indicators such as net disposable income).

Concerning FGGCE and FNPIHCE the main data source applied were supply and use tables (SUT) in CZ-CPA classification. The whole non-market output (all categories) was regionalized by compensations of employees. In case of social benefits in kind different weights were applied for different CZ-CPA categories. Table 2 shows the regionalization keys for social benefits in kind for FGGCE. Since FNPIHCE are much smaller in value, just for

CZ-CPA 30 the regionalization key Medical technology was used, otherwise Mid-year population was employed.

Table 1. Summary of regionalization keys applied for different CZ-COICOP categories.

Data source for the key	CZ-COICOP category
HBS 2011	Other categories not mentioned below
Mid-year population 18+	Alcoholic beverages (02100)
Mid-year population	Tobacco (02200)
Drug users (Prague Hygiene Station Annual report 2011)	Narcotics (02300)
National accounts (CZSO)	Actual rentals for housing (04100), Imputed rentals for housing (04200)
Dwellings in regions	Maintenance and repair of the dwelling (04300), Water supply and miscellaneous services relating to the dwelling (04400)
Energy Regulatory Office Statistics	Electricity, gas and other fuels (04500)
Households in regions	Furnishings, household equipment and routine household maintenance (05000), Communication (08000), Insurance (12500)
Institute of Health Information and Statistics of the Czech Republic	Health (06000), Social protection (12400)
Car Importers Association	Purchase of vehicles (07100)
Ministry of Transport	Operation of personal transport equipment (07200)
Ministry of Education, Youth and Sports Statistics	Post-secondary non-tertiary education (10300), Tertiary education (10400), Education not definable by level (10500)
Rozkoš bez rizika Association	Prostitution (12200)
Ministry of Regional Development	FISIM (12610)

Source: Authors.

Table 2. Summary of regionalization keys applied for different CZ-CPA categories.

Data source for the key	CZ-CPA category
Mid-year population	Other categories not mentioned below
Medicine costs of hospitals	Basic pharmaceutical products and pharmaceutical preparations (21)
Medical technology	Computer, electronic and optical products (26), Other transport equipment (30), Other manufactured goods (32)
Revenues of hospitals from health insurance	Human health services (86)

Source: Authors.

3. Analysis of results

For more reliable results we also incorporated in the computations regional price levels whose estimation is another important issue being solved all around the world (e.g. Alberola & Marques, 2001, Hayes, 2005, Aten et al., 2012, Brandt & Holz, 2006, Blien et al., 2009 or Roos, 2006). Our approach is based on OECD and Eurostat methodology (European Commission, 2006) and is described in Musil et al. (2012). Regional price levels were estimated for the year 2007, because no newer data are available. However, it can be expected that changes in regional price levels are over a 7-year period insignificant, because they are caused mainly by different level of economic development, rate of unemployment etc. Therefore, application of 2007 regional price levels on 2011 FHCE will not cause a big distortion of results.

Table 3 shows estimated FHCE in regional breakdown. The highest expenditures per capita are observed in the capital city Praha (almost 30 % above average) followed by Středočeský kraj (surrounding region of the capital city). Expenditures per capita in all other regions are below the average of the whole Czech Republic. This comparison is influenced by different regional price levels; therefore FHCE are expressed in regional purchase power standard (RPPS) that enables to compare real values. Praha remains after this adjustment still the region with the highest level of well-being measured by amount of goods and services purchased by households, but the difference declined from almost 30 % to just 7 %.

Table 3. FHCE estimate, 2011

Region	FHCE per capita in CZK	FHCE per capita, % structure (CZ = 100)	RPPP	FHCE per capita in RPPS, % structure (CZ = 100)
Praha	235 081	129.4	120.8	107.0
Středočeský kraj	185 138	101.9	102.6	99.3
Jihočeský kraj	170 668	93.9	97.5	96.4
Plzeňský kraj	171 572	94.4	97.1	97.3
Karlovarský kraj	171 782	94.5	101.3	93.3
Ústecký kraj	170 765	94.0	94.1	99.8
Liberecký kraj	173 450	95.4	100.2	95.2
Královéhradecký kraj	171 481	94.4	96.2	98.1
Pardubický kraj	172 175	94.7	98.9	95.8
Kraj Vysočina	171 683	94.5	95.1	99.3
Jihomoravský kraj	181 345	99.8	104.6	95.4
Olomoucký kraj	169 759	93.4	96.6	96.7
Zlínský kraj	171 935	94.6	100.8	93.9
Moravskoslezský kraj	171 920	94.6	96.9	97.6
Czech Republic	181 739	100.0	100.0	100.0

Source: Czech Statistical Office, Authors.

Expenditures in other regions are below the national average, with the lowest value in Karlovarský kraj being the least developed region with relatively high price level caused by tourism and high proportion of foreigners living in Karlovy Vary (regional city).

Table 4 describes the estimate of “Use of disposable income” account of households in the year 2011. Net disposable income of households is published by the Czech Statistical Office, other items were estimated by the authors. Households in all regions are able to create savings, though savings in Karlovarský kraj are quite tight.

4. Regional analysis of well-being of households

It is useful to compare FHCE with net disposable income, because this indicator shows the volume of resources that household sector has at a disposal for final consumption expenditures and savings (Hronová et al., 2009, 155). Region with the lowest standard of living is Karlovarský kraj. Households in this region can buy the least amount of goods and services (- 6.7 % in comparison to national average); moreover, they spend almost the whole net disposable income on FHCE. On the contrary, at the top of the ranking is capital city Praha, where the households may purchase the highest amount of goods and services. Nevertheless, the at-risk-of-poverty rate¹ is the highest in Praha region, because of unequal distribution of income (Dvornáková, 2012).

Table 4. Households: Use of disposable income account, 2011

Region	Net disposable income of households	Adjustment for the change in net equity of households in pension funds reserves	FHCE	Net savings
Praha	309 636	2 143	291 017	20 762
Středočeský kraj	263 109	1 823	235 698	29 234
Jihočeský kraj	115 236	968	108 529	7 675
Plzeňský kraj	107 398	887	98 053	10 232
Karlovarský kraj	52 140	469	52 139	470
Ústecký kraj	141 628	1 263	141 495	1 396
Liberecký kraj	78 316	660	75 994	2 982
Královéhradecký kraj	99 571	841	95 009	5 403
Pardubický kraj	91 411	759	88 887	3 283
Kraj Vysočina	92 207	746	87 897	5 056
Jihomoravský kraj	215 251	1 706	211 200	5 757
Olomoucký kraj	110 147	942	108 450	2 639
Zlínský kraj	105 290	856	101 372	4 774
Moravskoslezský kraj	217 109	1 881	211 913	7 077
Czech Republic	1 998 449	15 944	1 907 653	106 740

Source: Czech Statistical Office, Authors.

¹ Dvornáková (2012) presents the calculation at the regional level. Eurostat publishes regional indicators that are based on national threshold. According to Eurostat data Praha is the region with the lowest at-risk-of-poverty rate, but the results are affected by regionally different price levels and distribution of income (that are not taken into account).

5. Data transformation

All calculations related to FHCE were done in “purpose classification” CZ-COICOP that is the most important one for such an analysis and at the same time the most widespread in the data sources. However, the data have to be transformed to “product classification” CZ-CPA as input-output tables are compiled in this classification. National transformation key was used for the transformation and 14 matrices (CZ-CPA x CZ-COICOP) of FHCE were computed. Non-market output is generally recorded in classification CZ-NACE and according to ESA 1995 standard matrix of non-market output is always diagonal, i.e. NACE = CPA. Vector of social benefits in kind is recorded again in product classification.

The basis for estimate of regional symmetric input-output tables forms the use table at basic prices. The difference between purchasers’ prices and basic prices consists in so-called valuation sets: value added tax (VAT), transport margins, trade margins, taxes on products without VAT and subsidies on products. All valuation sets data are available as the Czech Statistical office compiles SUT for each version of annual national accounts (preliminary, semi-definitive and definitive) data at the national level. This practice is not obvious in all EU countries, as some states provide these data very late or do not provide them at all. All valuation sets were allocated to regions proportionally to FHCE at purchasers’ prices for each product. This assumption is suitable for taxes and subsidies because no special regional taxes are applied in the Czech Republic and the rate of taxation for a product is the same in all regions. The question is, whether the rate of margins differs from region to region. We are convinced that this assumption is acceptable because regional markets in the Czech Republic are very similar. No valuation sets are applied on part of FGGCE and FNPISHCE that have its origin in non-market output.

6. Applicability of regional consumption expenditures for multi-regional input-output (MRIO) model

We have emphasized in the introduction that the construction of RIOTs is a very complicated task. One of the main obstacles is the non-availability of the data, as the lower the regional level is, the more complicated data availability occurs. Previous sections showed that even estimating regional expenditures is a long-term research question. Another reason is a very problematic measuring of foreign trade at the regional level (see e.g. Bracalente & Perugini, 2010, Matlovič et al., 2008 or Harris & Liu, 1998). The theory distinguishes two basic input-output models – inter-regional (IRIO) and multi-regional (MRIO). The latter requires significantly less data; therefore, the aim of further research is to build a MRIO model for Czech economy (14 NUTS 3 regions). For deeper theory on regional input-output models see e.g. Miller & Blair (2009). The main difference among inter-regional and multi-regional models lies in the computation of technical coefficients matrix \mathbf{A} (in case of RIOTs defined as \mathbf{A}^r or \mathbf{A}^{rr}). Whereas in case of the IRIO model, we take into account the region of origin as well as region of destination, in case of the MRIO model the region of origin is neglected.

The starting point of our model is the matrix of regional consumption expenditures presented in this paper. The next sequential step will be the estimation of inter- and intra-regional foreign trade, in a commodity breakdown as well and find a balance for each product in each region. And last but not least the matrices of output and intermediate consumption are necessary to be computed for the model to be complete.

7. Conclusion

This paper presented the procedure of construction of regional consumption expenditure matrix useful for further application in regional input-output model. The first step was to regionalize national values of FHCE, FGGCE and FNPISHCE. The most suitable regionalization keys were found and using top-down method, weights schemes were produced. The results were analyzed and compared with net disposable income as an indicator of well-being of households. The highest level of standard of living is observed in Praha. On the bottom of ranking list is Karlovarský kraj where well-being of households is influenced by a relatively high price level and a low level of economic performance. Further, the matrix was transformed firstly to CZ-CPA classification and after that from purchasers' prices to basic prices. In this form it can already be applied in regional input-output models. Building of MRIO model is the final aim of our research. This paper is the first step in our research.

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