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**Cross Cutting Topics – Part 1
SPPIs by customer sector**

Hungary

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The views expressed in this paper are those of the author alone and do not necessarily represent the position of HCSO or any other organization with whom the author may be affiliated.

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1. INTRODUCTION

In the line with the draft Framework Regulation Integrating Business Statistics (FRIBS) within the European Statistical programme (ESP), the extension of coverage the actually produced Service Producer Price Indices (SPPIs) is necessary. Among others, SPPIs are expected to be used them as deflators for producing of volume indicators (real GDP and Index of Services Production, ISP).

Regarding the available resources as well as cost and burden on National Statistical Office and data suppliers –for some service area – it seems to be considerable using of already available data sources, primarily Consumer Price Indices (CPIs) as proxies for SPPIs.

At present, production of SPPIs in European Union is required by the European Council Regulation on short-term statistics (STS Regulation¹) for determined services activities. According to this regulation, SPPI express the average price development of services provided by the resident producers and sold to customers that are enterprises or persons representing enterprises (business to business, B2B). It is worth mention however, that SPPIs should reflect the structure of the total output to be deflated ensuring the necessary consistency. This goal can be achieved by producing a sub-index for all relevant submarket, especially for demand of businesses (B2B).

The overall objective of this paper is to give an overview on Hungarian experiences concerning SPPIs by customer sector.

2. SERVICES PRODUCER PRICE INDICES, SPPIs in Hungary

In European Union the SPPIs are classified as principal economic STS indicators (PEEI)² – concerning six sections in the FRIBS according to the NACE Rev. 2.

- H Transportation and storage;
- I Accommodation and food service activities;
- J Information and communication;
- L Real estate activities;
- M Professional, scientific and technical activities;
- N Administrative and support service activities.

¹ (EC) NO 1158/2005 of the European Parliament and of the Council of 6 July 2005 amending Council Regulation (EC) NO 1165/98 concerning short-term statistics.

² STS, Principal European Economic Indicators – PEEIs: industrial production index, industrial output price index for domestic market, industrial new orders index, industrial import price index, production in construction, turnover index for retail trade and retail, turnover index for other services, corporate output price index for services

Nevertheless, the above mentioned industries are not yet fully covered by SPPIs in most of countries.

In Hungary, all required SPPIs are available for the current STS-coverage and experimental SPPIs required by the FRIBS are under development. Indices are product-based.

Concerning the coverage by the type of customer, B2All, B2B, B2C, B2E SPPIs are calculated, (B2Other is included in B2B index).

In accordance with the FRIBS, to establish an internationally comparable indicator of services production (ISP) – B2All deflators are required, which reflect the average price development of the total output as follows:

- coverage of all destinations regarding the residency of client;
- coverage of all destinations regarding the type of customer (business, household, other).

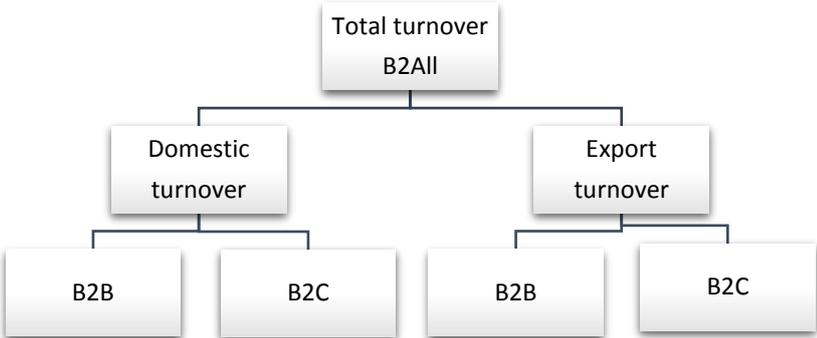
2.1. Coverage of destinations by the type of customer

SPPIs, when using them as deflators for the total industrial output, theoretically should cover all types of users (B2All):

- **businesses (B2B)** (currently the B2B index reflects the price development of sales for public organizations as well).
- **households (B2C)** – business to customers.

Figure 1

The Turnover share on type of consumer of the services



In most of cases the output of services production is predominantly accounted from sales for the business partners, therefore B2B indices are adequate estimations for the B2All SPPIs. At the same time – in some cases – the demand of households is also significant,

so B2B indices should be supplemented by other deflators, first off all by properly adjusted consumer prices (Harmonized Indices of Consumer Prices at Constant Tax, HICP-CT). For this reason the development of B2All indices beside B2B indicators seems to be necessary.

2.2. Use of CPI/HICP data as proxies for SPPIs

By Eurostat's proposals use of additional data like CPI (Consumer price index) or HICP (Harmonized Index of Consumer Prices) to estimate B2C indices could be an appropriate solution to calculate a B2All index at required level.

By the revised SPPI methodological guide³ using CPIs as proxies can be considered as special case of the pricing method – „direct use of prices of repeated services”. However it is important to adjust CPIs valuated at purchasers prices, to basic prices (i.e. effects of taxes and subsidies on prices have to be removed) before their use as deflators of services turnover. On the other hand, when applying CPI's, it is assumed that prices for businesses and households move in a similar trend with a similar composition of consumption.

Three possible approaches could be taken into account: a) using B2B SPPIs regardless of the mismatch, b) develop B2All SPPIs, c) use a mixed approach which combines SPPI and other deflator data, primarily CPIs/HICPs.

2.3. Possible areas of using CPI/HICP in SPPI context

In Hungary, from the 1st quarter of 2013, beside the B2B SPPIs required by the current STS-regulation, B2All SPPIs for air passenger transport, post and telecommunication services are also produced and for two latter disclosed.

B2All SPPIs are computed as weighted average of B2B SPPIs and HICP-CT.

According to our experiences, the possible areas could be completed by consumer price indices are presented in the Table 1 as well as weights for calculation of B2All SPPIs using adequate sub-indices for B2B and B2C submarkets.

³ OECD – EUROSTAT, Methodological guide for developing producer price indices for services (draft version)

Table 1.

The estimated Turnover share for B2B and B2C in Hungary, Total Turnover=100%

CPA'2015	Name	Estimated Turnover share (%)	
		SPPI	HICP-CT
49	Land transport services and transport services via pipelines	80	20
51	Passenger air transport	20	80
55	Accommodation services	30	70
53	Postal activities	80	20
61	Telecommunication	45	55
68	Real estate activities	55	45
74	Other professional, scientific and technical services	95	5
77	Rental and leasing services	95	5
79	Travel agency, tour operator and other reservation services and related services	30	70

Weighting together B2B SPPIs and HICP-CT - a simplified (fictive) example

NACE (Rev. 2)/ CPA 2015	Division/Class	B2All %	B2B %	B2C %
61	Telecommunication activities	100.0	49.5	50.5
61.10	Wired telecommunication activities	30.0	40.0	60.0
61.20	Wireless telecommunication activities	55.0	50.0	50.0
61.30	Satellite telecommunication activities	5.0	0.0	100.0
6190	Other telecommunication activities	10.0	100.0	0.0

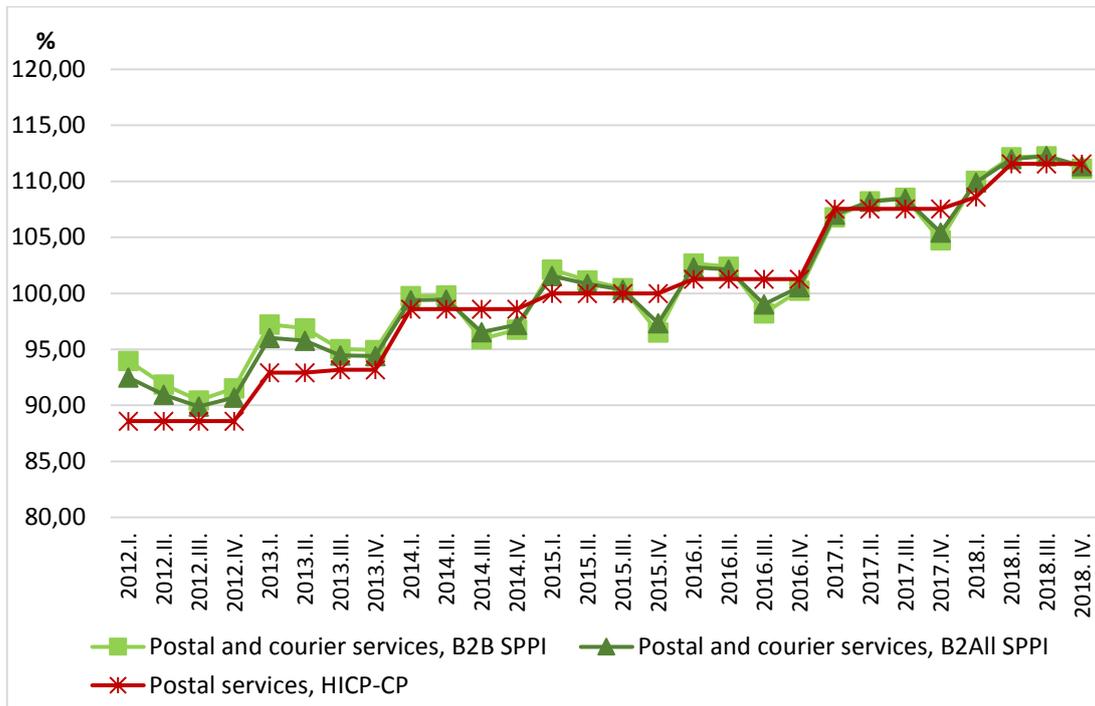
Calculation/estimation of the B2B:

A split of the industry into 49.5% B2B transactions and 50.5% B2C transactions results: B2B = $0,3 * 40 + 0,55 * 50 + 0,05 * 0 + 0,1 * 100$

Concerning the frequency, In Hungary quarterly and monthly SPPIs are also calculated.

Figure 2

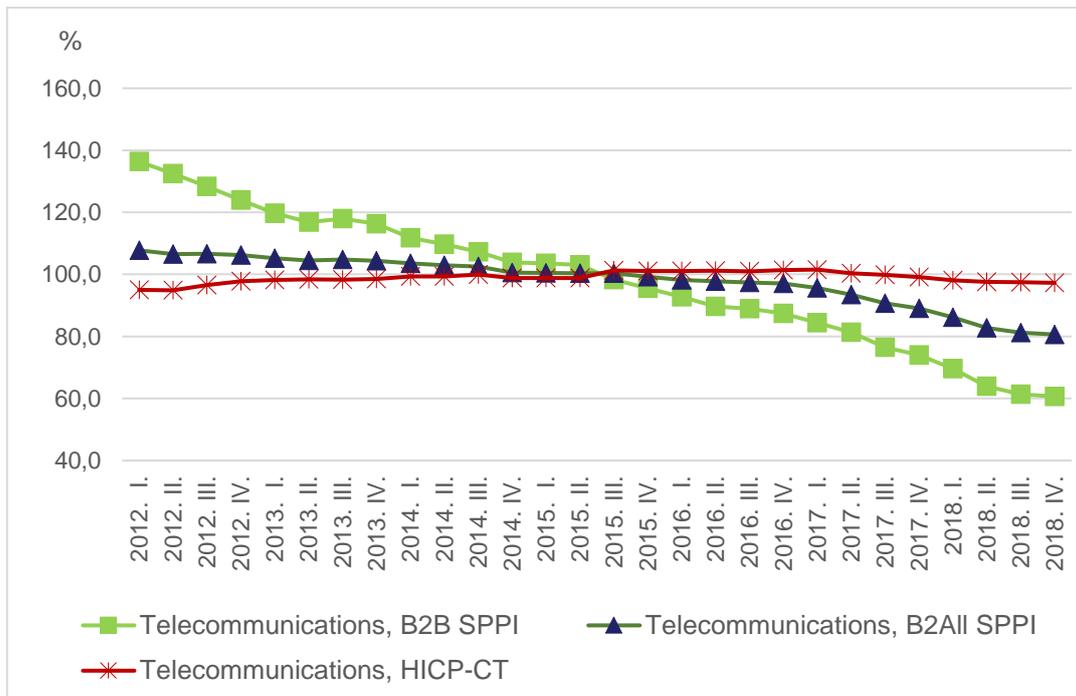
Quarterly price indices for Postal activities (H53) in Hungary (2015=100)
B-All = BB+ HICP-CT



Source: Database of the HCSO

Figure 3

Quarterly price indices for Telecommunication (J61) in Hungary (2015=100)
B-All = BB+ HICP-CT



Source: Database of the HCSO

The main differences between SPPI and HICP could be summarised as follows:

- ✓ *Frequency (quarterly, monthly);*
- ✓ *Overall methodology used;*
- ✓ *Classification (NACE / COICOP);*
- ✓ *Prices observed (output (basic) prices / consumer prices);*
- ✓ *Questions on domestic/non-domestic (export) share of the markets;*
- ✓ *Questions on approaches to be followed:*
 - *combination of B2B with B2C or*
 - *observation directly B2All transactions?*

The main challenges for statisticians concerning the SPPIs by customer sector are as follows:

- ✓ Using of an appropriate HICP-CT as proxy for SPPI's (for which areas, questions on coverage);
- ✓ In case of conjointly using of HICP-CT with SPPIs, the following issues are needed to consider:
 - How to produce B2All SPPIs?
 - How to identify B2B and C2C markets?
 - What is the turnover share between the business and household's consumption?
 - How to estimate export?
 - How to produce monthly SPPIs?

3. TEMPORAL DISAGGREGATION

3.1. The methodological description of calculation the monthly SPPIs⁴

According to the proposals of the ISP guide (Eurostat, 2014), the monthly SPPIs as deflators have been calculated on the basis of the quarterly SPPIs by using of sector-specific temporal disaggregation methods.

We have tested methods – simple mathematical interpolation to sophisticated model-based techniques – to convert time series with a low (LF) frequency into higher frequency (HF) series. Basically we have used methods that disaggregate temporal data only on the basis of mathematical-statistical models and in some cases methods that input additional statistical data which could be correlated with the estimated data (use of HICPs).

⁴ Krisztina Dékány was involved in the methodological description, and making the illustrations for temporal disaggregation of quarterly SPPIs to the monthly SPPIs.

Regarding the observed areas, we have analysed the quarterly time series of both B2B and B2All aggregates as well as quarterly and monthly series of existing HICPs. As a result of above analysis of time series, we have estimated consistent monthly SPPIs as deflators for monthly turnover data.

The production of monthly ISPs means another challenge in terms of deadlines, which in case of the ISP is $t+60$. The delays for the availability of turnover data and SPPI data in the current STS regulation and in the future FRIBS will remain unchanged (i.e. 60 days for turnover data and 90 days for SPPIs). However, the turnover index will have a monthly periodicity while the periodicity of the SPPIs will remain quarterly.

To solve this contradiction, the forecasting of SPPIs will be also needed. The estimation could be done by using e.g. an ARIMA model. We have also tested forecasting of quarterly SPPIs followed by subsequent temporal disaggregation to calculate monthly deflators.

3.2. Temporal disaggregation of quarterly SPPIs – Theoretical basis of the process

The first reference period is the first quarter of 2015 (2015Q1) with the base year of 2015.

In order to get the monthly indices, we had to set up the models for the time series following the instruction and help from our colleagues from the Methodology Department. This task was completed with JDEMETRA+ seasonal adjustment ARIMA method. The output of this process has been used, mostly the trend (t) series to reach our goal.

The next step was to select the type of the temporal disaggregation. The Chow-Lin method was chosen due to the test we performed (to minimize the residuals' errors), on the other hand this is the simplest model to describe certain time-varying processes and specifies that the output variable depends linearly on its own previous values and on a stochastic term. This method is based on the assumption that the original indices can be represented by a linear regression model with first order autoregressive errors.

We had only one preliminary requirement for the monthly indices: their arithmetic average should correspond to the original quarterly index. We assume that in the case of temporal disaggregation, the model uses the trend values of the original time series well and sets monthly indices as such. Based on all these consideration and settings, the next 3 figures present the results for B-B indices for postal and telecommunication activities (H53 and J61) and for B2All indices for H53.

The figures show the details in the enlarged parts which present that the estimates are good enough – monthly indices clearly follow the original timeline, which seems to be acceptable – of course at this test level.

3.3. The calculation of SPPIs for services provided for all customers (B2All)

To produce the monthly B2All indices we have analysed two possibilities:

- To calculate and publish quarterly B2All indices on these fields, and their temporal disaggregation can be made as described above.
- To use monthly Harmonized Indices of Consumer Prices at Constant Tax (HICT-CT) for combining them with the B2B ones in order to get the relevant monthly figures, applying the appropriate weights.

According to our tests the second choice is probably better, because we exactly know the HICT-CT indices and in this case we only estimate once (the B-B part). Furthermore in this way the average of the monthly indices are closer to the quarterly indices.

Figure 4.

Quarterly and monthly price indices for Postal activities (J61) B2B Hungary, 2012-2017 (2015=100)

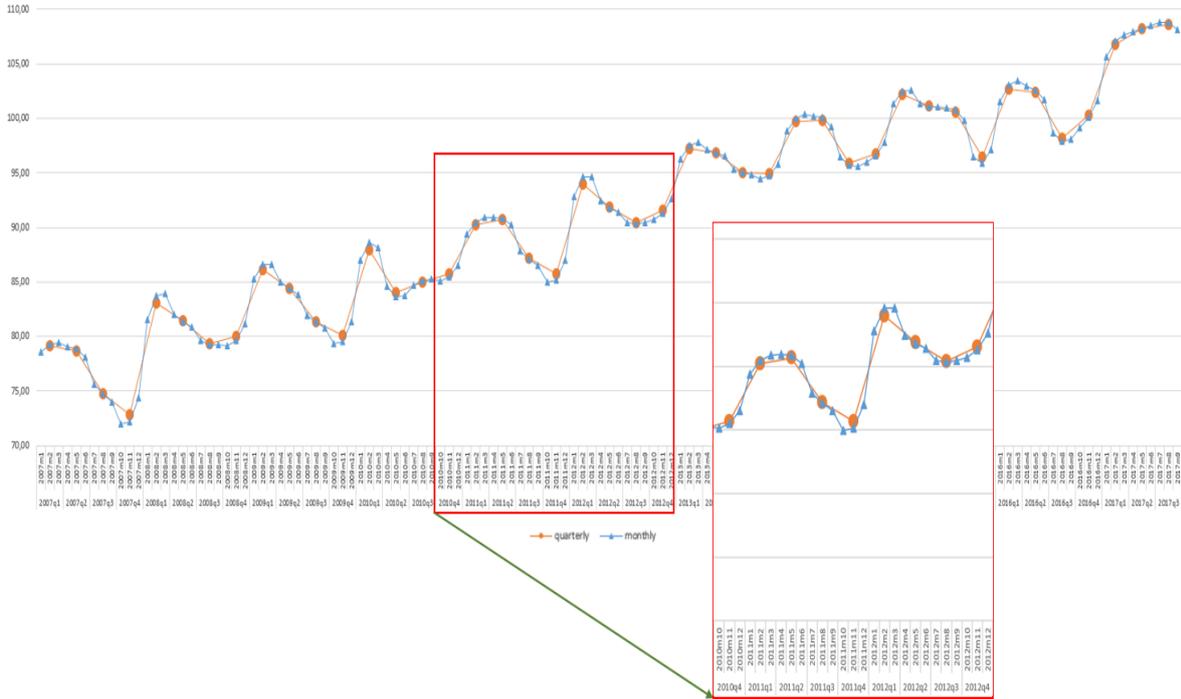


Figure 5.

Quarterly and monthly price indices for Telecommunication (J61), B2B Hungary, 2012-2017 (2015=100)

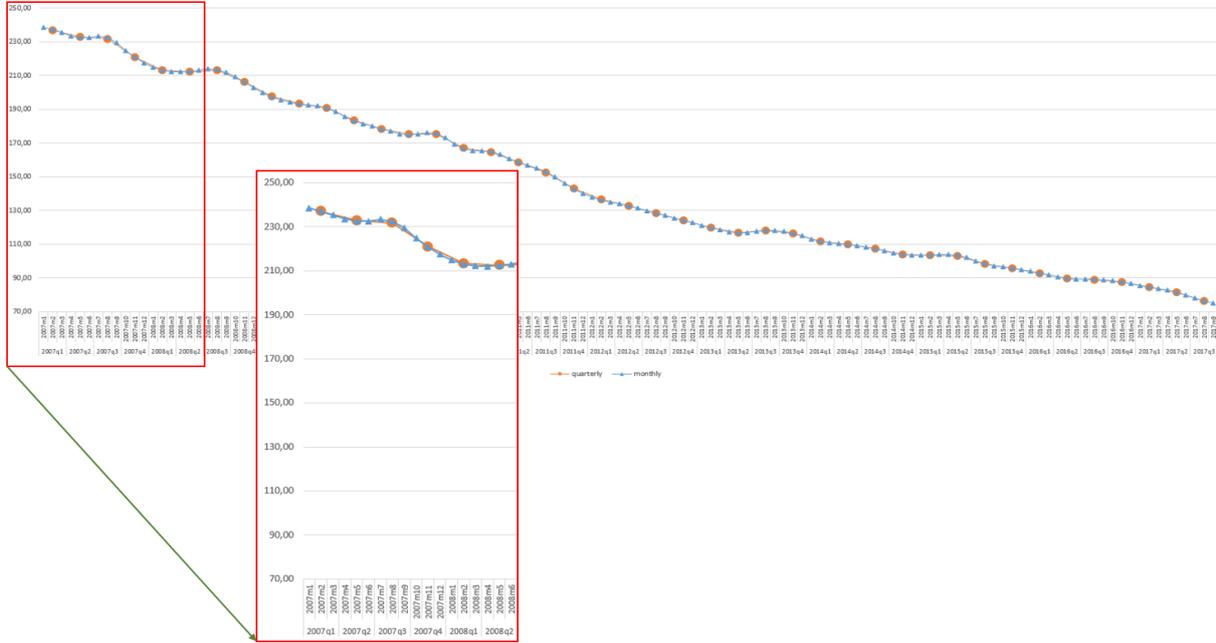
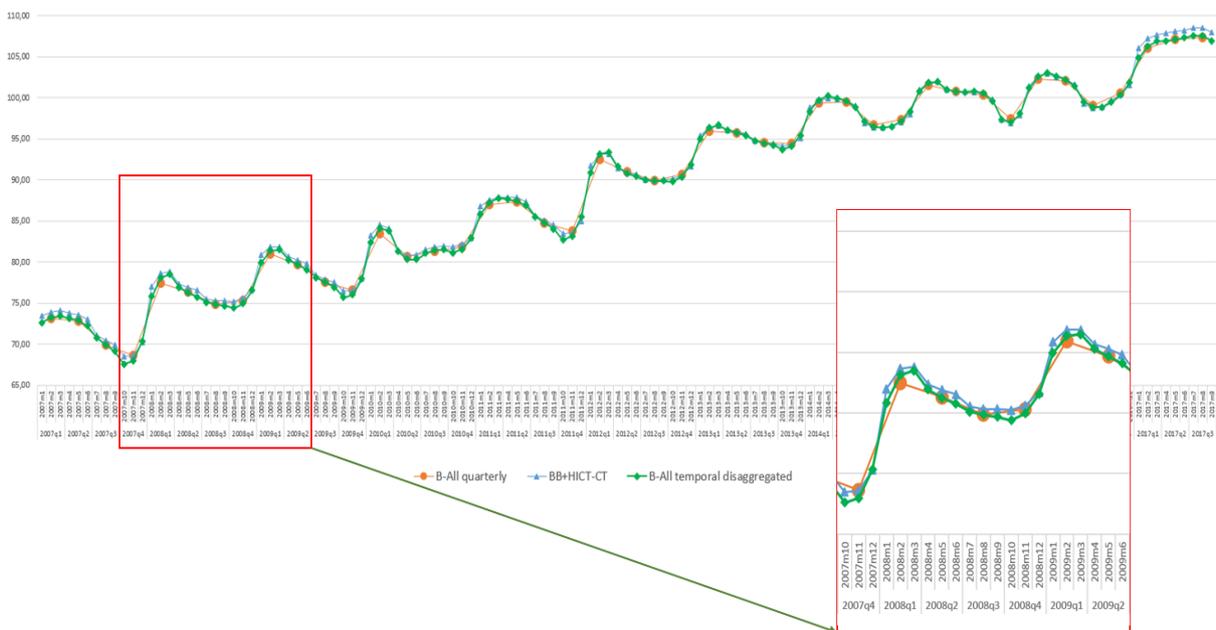


Figure 6.

Quarterly and monthly SPPIs or Postal activities (H53), B2All, Hungary, 2012-2017 (2015=100)



4. B2E (Export) trade

Definition of the export service:

The *destination* is determined by the *residency* of the third party that has ordered or purchased the product.

- ✓ *Non-domestic market* (Export): products or services sold to the non-resident customers,
- ✓ *Domestic market*: products or services sold to the resident customers.

Remark: Export data are influenced by the exchange rate of the foreign currency. In Hungary price data received at foreign currency are converted to the HUF by the quarterly exchange rate of the Hungarian National Bank.

Main challenges that statisticians face

- ✓ Availability of consistent data sources;
- ✓ Globalization in general;
- ✓ Establishing of affiliated companies/subsidiaries abroad;
- ✓ To distinguish between the international services and service exports - different interpretation by the Statistical Office, Tax Office, data suppliers; (e.g. concerning *transport, postal and telecommunication services*).

In Hungary B2E SPPIs are obtained as a result of the compulsory quarterly SPPI survey. Within the frame of the SBS and STS statistics, export data are aggregated using data of companies performing dual accounting (the coverage and quality of these statistics is limited).

According to the Hungarian experiences, some **special cases for export services** could be mentioned:

- ✓ Concerning the freight transport by road activities, export is the total sum paid by a non-resident company regardless of national borders;
- ✓ For postal activities the export is dominated by delivery of letters (parcels) coming from abroad for an sum agreed between the national post offices concerned.
- ✓ In the case of telecommunication, mobile network operators must establish Roaming Agreements to govern the exchange of customer billing data for their customers who “roam” on the visited network. Export is highly covered by inboard (foreign visitor’s) roaming rates. Roamers are not billed directly by the visited operator. They will be billed at home on the regular monthly bill.
- ✓ As regard the accommodation, export / inbound tourism means accommodation for foreign tourists in Hungary.

5. SUMMARY

In Hungary within the frame of the SPPI observation system, actually the services areas required by the current European STS-regulation are covered by producer price indices. Primarily the quarterly product-based B2B SPPIs are calculated, however, B2All indices are also produced as weighted average of B2B and B2C indices. B2C is estimated by HICP-CT (Harmonized Index of Consumer Prices at Constant Tax) in several areas, from which the B2All SPPIs for postal and telecommunication activities (H53 and J61) are disclosed.

In 2013 Hungary – following the step by step approach – started to develop a methodological basis for new SPPIs and deflators for value data as required by FRIBS. For these services industries also the B2All SPPIs are expected to be produced.

Applying the temporal disaggregation method, monthly B2B and B2All SPPIs are also calculated.

Monthly B2B are estimated by temporal disaggregation of quarterly B2B SPPI, and monthly B2All are calculated as a weighted average of monthly B2B SPPI and monthly B2C (HICP-CT).