

16th Meeting of the Ottawa Group on Price Indices

**Hosted by the Getulio Vargas Foundation (FGV)
and the Brazilian Institute of Geography and
Statistics (IBGE), 08 – 10 May 2019**

Report from the meeting



<https://eventos.fgv.br/en/ottawa-group-meeting>

Introduction

The Getulio Vargas Foundation (FGV) and the Brazilian Institute of Geography and Statistics (IBGE) hosted the 16th Meeting of the Ottawa Group on Price Indices from 08 to 10 May 2019.

The 2019 meeting was the first to host by two statistical offices in Latin America. More than 85 participants from 20 statistical institutes and 20 international organizations attended it as well as leading scholars in the field of price statistics.

Further background on the sixteenth Ottawa Group Meeting can be found at:

<https://eventos.fgv.br/en/ottawa-group-meeting>

The sixteenth meeting: Summary

The papers submitted for discussion at the meeting were grouped into six topics and ten sessions. The sessions with your respective chairpersons are shown below.

- Session 1: New data sources to compile price indices (I)
Chairperson: Patrick Kelly
- Session 2: Pricing seasonal products
Chairperson: Roberto Olinto
- Session 3: New data sources to compile price indices (II)
Chairperson: Jens Mehrhoff
- Session 4: Other topics (I)
Chairperson: Jan de Haan
- Session 5: New data sources to compile price indices (III)
Chairperson: Jens Mehrhoff
- Session 6: Compiling housing price indices
Chairperson: David Fenwick
- Session 7: Index number formulae
Chairperson: Ludwig von Auer

- Session 8: Quality adjustment
Chairperson: Brian Graf
- Session 9: New data sources to compile price indices (IV)
Chairperson: Antonio Chessa
- Session 10: Other topics (II)
Chairperson: Paulo Picchetti

Twenty six papers were presented for discussion in the plenary sessions and 29 papers were presented in a dedicated poster session.

Papers were very well received by participants and useful discussions were held on various topics relating to the concepts, methods and compilation procedures for consumer price indices. The group debated many issues at the forefront of current thinking on the development and improvement of these indices. The key points emerging from each session are given in the Chairperson's summary notes in Annex A.

Evaluation forms indicated very positive feedback from participants on all aspects and some suggestions for further improvement have been made. The venue, particularly having all in one place at the Conference Centre, was praised. The participants also appreciated the offer of good hotels near the meeting. So were the organization in terms of timing and the meeting itself as regards content. The 16th meeting had two dedicated poster session including all papers not selected for the plenary sessions due to the time constraints given the very high number of excellent submissions. A summary of the participants' feedback is given in Annex B.

The success of the meetings reflected the following contributions:

- the Steering Committee members (OGSC) for their assistance in planning this meeting;
- the session chairs for leading the discussions and preparing summaries of each session;
- the authors for their contributions and the quality of the papers presented;
- all participants for the fruitful discussions and feedback; and
- the staff at the Getulio Vargas Foundation for their help in organizing the meeting and their support provided to participants.

The Annex C provides a list of suggestions for the next meetings made by Vagner Ardeo the member of the steering committee that was mainly responsible for the organization of the 16th meeting.

The next meeting

The next Ottawa Group meeting will be co-hosted by Istituto Nazionale di Statistica (Istat) and Bank of Italy, in the city of Rome, from 09 to 11 of June 2021.

Possible topics for discussion at the next meeting are:

- new data sources to compile price indices (scanner / web-scraped data; quality adjustment);
- compiling property price indices (residential and commercial);
- challenging areas of measurement (e.g. services);
- conceptual frameworks (index number formulae; multi-purpose price statistics); and
- treatment of special cases (strongly seasonal products; zero prices).

The final list of topics will be distributed with the invitation and call for papers.

Vagner Ardeo
Getulio Vargas Foundation
(on behalf of the OGSC)

Annex A: Chairperson's summary notes

Session 1: New data sources to compile price indices (I)

Chairperson: Patrick Kelly

- Jens Mehrhoff: Towards a new paradigm for scanner data price indices: applying big data techniques to big data
- *Jan de Haan, Jacco Daalman: Scanner Data in the CPI: The Imputation CCDI Index Revisited*
- *Anna Bobel, Jacek Białek: Comparison of Price Index Methods for CPI Measurement using Scanner Data*

Session summary:

Three papers exploring the use of new transactional data sources were presented in the first session. The availability transactions datasets from retailers has exploded the possibilities for calculating price indices. However, the most appropriate choice of formula is still under debate. Indexes calculated using transactional data tend to show drift, especially when new products are included, old ones discontinued, or barcodes recycled (relaunches). Each of the papers test different methods to assess their performance in calculating an index that minimizes bias.

Jens Mehrhoff: Towards a new paradigm for scanner data price indices: applying big data techniques to big data

In this first presentation of the meeting, Jens Mehrhoff of Eurostat argues that dynamic factor models are superior to popular multilateral index formula for dealing with large data sets sourced from web scraping or scanner transactions. This modelling approach yields less noise and more signal than multilateral approaches. Using a readily available data set, weighted and unweighted time dummy regressions are used to calculate an index, and these are compared to a traditional CPI index. The dynamic factor models use structural time series modelling. Estimates are improved using a Kalman smoother. The results show a signal to noise ration of three times and unweighted time dummy method.

Jan de Haan, Jacco Daalmans: Scanner Data in the CPI: The Imputation CCDI Index Revisited

The Geks-Tournquist (CCDI) multilateral index is used by certain statistics offices for computation of price indices for scanner data. However, the method can suffer from bias because it does not explicitly account for quality change of new and disappearing items or relaunches (use of same barcode for different items). An imputation CCDI, which includes a hedonic regression, is tested as an alternative to deal with this problem. They use a 17 month price data set for televisions from which six indexes are calculated to test the approach. The prices are represented as unit values. The imputed versions of the CDDI show lower level of deflation than the standard matched-model GEKS approach which has significant downward drift. They justify the varied behavior of the different index methods in terms of the composition of the index and the retailer's pricing strategy.

Anna Bobel, Jacek Białek: Comparison of Price Index Methods for CPI Measurement using Scanner Data

This paper from Poland starts its search for optimum index formula for incorporation of scanner data into the CPI by reviewing the progress of European stats agencies over the past 17 years. A wide range of index formula are reviewed which are grouped into the following categories: bilateral methods both unweighted (Jevons, Carli) and superlative (Tornquist, Fischer, Walsh); Multilateral (GEKS, CCDI, QU). They verify the impact of window updating methods and also different weighting schemes in quantity weights on the price index using the QU-TS and QU-EW methods. Two simulations are conducted using artificial data sets and also transaction data from a Polish online e-commerce platform are used. They find that changes in quantities have the biggest impact on differences between selected indexes. They also conclude that using the movement splice method provides the best way to reduce chain drift. Price dynamics observed using transactions data source are significantly different to those observed using traditional price collection methods.

Session 2: Pricing seasonal products **Chairperson: Roberto Olinto**

- Patrick Kelly, Matlhatsi Ratswana: Missing in action: testing alternative methods for imputations and seasonal items
- Corinne Becker Vermeulen: Pricing seasonal products: the imputation techniques
- Kristiina Nieminen, Yrjö Vartia, AnttiSuoperä, Satu Montonen: Chain Error as a Function of Seasonal Variation

Session Summary

The session 2 of the conference focus in experiences considering the imputation of prices considering the seasonal influence in the collection. The main issue is how to develop methods introducing this variability.

Missing in action: testing alternative imputation methods in price statistics

Imputations are a critical component of any statistical computation and bear special importance for the operational aspects of price statistics. Missing prices for seasonal items are a particular challenge. The literature elaborating imputations for price statistics is repetitive on the basics, but light on technical and analytical detail. Focusing on temporarily missing prices, this paper reviews the advice provided to compilers. The performance of different imputation methods for seasonal and non-seasonal products is assessed through the use of a multi-year synthetic dataset. Tests are conducted on the most appropriate level of imputation and the robustness of the standard options presented in the manuals. Time product dummy regression is tested as an additional imputation technique.

Pricing seasonal products: imputation techniques

Imputation techniques are very widespread for dealing with the problem of seasonal products. However, they also have significant effects on the results, depending on the assumptions made, the level of imputation and the structure of the basket of goods and services. Moreover, when seasonality is combined with a frequent change of assortment and very volatile prices, as in clothing and footwear, the situation becomes even more complicated. Through concrete simulations and a practical example with footwear, this document discusses imputation techniques, which are not as simple to apply as they might seem, and which could hide undesirable effects.

Chain Error as a Function of Seasonal Variation

Statistical institutions utilize more and more big data (a.k.a scanner-data, transaction data) in their CPI production because it provides enough information of the products. Now, one question arises; is it still necessary to treat seasonal products differently to ordinary products? Seasonal products are not available in the market every month (strongly seasonal) or have seasonal fluctuation in quantities (weakly seasonal). The paper show us that this no longer needed.

The paper-analyzed use of scanner data that contains complete information on sold products; unit prices, quantities and sales value aggregated on week level. It was possible to show that seasonal products may be take into account easily in the CPI-index series calculations.

It was utilized properly defined bilateral price-links for normal and seasonal products simultaneously. Seasonal products are share by their availability to two groups: weakly and strongly seasonal products. It was used the base strategy and define the base period to be the normalized average month of previous year. This method produced prices and quantities for all commodities sold during the base period. It was used a comprehensive set of basic and index number formulas in this strategy and present numerical results.

The expectations was realized; with this method, It was captured usual seasonal fluctuation to the price series. There is only one qualification in the method: just use any superlative index number formula such as Törnqvist for all complete datasets.

Session 3: New data sources to compile price indices (II)

Chairperson: Jens Mehrhoff

- Rafael Posse, Jorge Alberto Moreno: Use of Big Data in modern markets coexisting with traditional markets data
- Andrew Tomadini, Michael Holt: Experimental clothing indexes using Australian web scraped data

Session Summary

This session on new data sources to compile price indices consisted of two presentations. The first one by Rafael Posse and Jorge A. Reyes from INEGI in Mexico on the use of big data in modern markets co-existing with traditional markets data, and the second one by Andrew Tomadini and Michael Holt from the Australian Bureau of Statistics on experimental clothing indexes using web-scraped data.

Use of Big Data in modern markets coexisting with traditional markets data

Rafael introduced the conceptual framework of incorporating the three data sources direct visit (field collection), web scraping and scanner data, taking advantage of the potential of each of the sources. He further discussed the differences between traditional markets and modern markets, in particular that prices may be more volatile in modern markets due to marketing strategies. Next, Rafael explained where INEGI stands in Mexico in terms of their experience with web scraping and scanner data. In a case study for gasoline, he compared the prices collected by fieldwork staff with those collected via web scraping – for the same sample of gas stations that are represented in the sample and for all gas stations in the country. The conclusion is that using web-scraped (and scanner) data, the precision of the indexes increases.

In the questions and answers it was discussed how these different sources should be used and how they should be combined. In addition, it was asked whether market weights could be derived from the household expenditure survey.

Experimental clothing indexes using Australian web scraped data

Andrew presented the ABS's approach to utilising big data for economic statistics, i.e. scanner data and multilateral methods. The current talk was focussed around the expanding use of web-scraped data for clothing and footwear and the challenges associated with this. While broader product definitions improve product matching over time, they also increase the risk of bias. Hence, three alternative product definitions were considered: i. item name; ii. brand and product type; and iii. brand, product type and product characteristics. To this end, keywords were extracted from item names. Since quantities cannot be obtained from web-scraped data, two unweighted index methods were considered: GEKS-Jevons and time-dummy hedonics. Fixed-base and multilateral indexes with broader product definitions proved to be more reliable than chain-linked indexes, which exhibit downward drift.

The discussion touched upon issues such as whether or not prices should be an input into the grouping, biases due to differences in online and offline prices, and what should be collected when store brands are present.

Session 4: Other topics (I)

Chairperson: Jan de Haan

- Ludwig von Auer: The Nature of Chain Drift: Implications for Scanner Data Price Indices
- Tsutomu Watanabe, Kozo Ueda, Kota Watanabe: Storable Goods, Chain Drifts, and the Cost of Living Index: New Methodology and Application to Japanese Data
- Antonio G. Chessa: A comparison of index extension methods for multilateral methods

The central theme in Session 4 on Other Topics (I) was drift in price indexes estimated from scanner data, in particular using multilateral index number methods. Multilateral methods for calculating price indexes across time have been increasingly studied over the last decade, and a few statistical agencies have already implemented these methods into their CPI. Drift in price indexes is a specific form of persistent bias, which should obviously be avoided as much as possible. A well-known phenomenon is chain drift (in multilateral or other types of weighted price indexes) due to promotional sales. Another form of chain drift, or more precisely: splicing drift, can occur if multilateral price index series are extended, when new data becomes available, and the most recently estimated index numbers are spliced onto the existing time series.

The Nature of Chain Drift: Implications for Scanner Data Price Indices

The session consisted of three presentations; unfortunately, a full paper for the second presentation was not available. Ludwig von Auer from Universität Trier presented his paper entitled “The Nature of Chain Drift”. He argued that the chain drift problem is broader than drift due to sales in connection with inventory behaviour of consumers. A second form of chain drift may arise from delayed changes in purchasing habits due to search or adjustment costs. “Sticky quantities” will typically lead to upward rather than downward chain drift. Von Auer proposed a novel stress test, based on quantities generated by utility maximizing consumers, to examine the resilience of price indexes with respect to both types of chain drift. He then showed that Rolling Window GEKS indexes indeed effectively reduce chain drift and that a “mean movement splice” (which is computationally simpler than the “mean splice”) works quite well.

One of the most interesting results is perhaps that, in his scanner data data set at least, chain drift caused by sticky quantities seems to be more persistent than chain drift due to stockpiling behaviour when sales occur. Sticky quantities could be found for other types of goods and services as well. An example might be the introduction of Uber in the market for taxi services where consumers may not be able to immediately change over from existing taxi services to Uber due to search and adjustment costs or to supply restrictions.

Storable Goods, Chain Drifts, and the Cost of Living Index: New Methodology and Application to Japanese Data

Kota Watanabe from CIGS and University of Tokyo presented work, jointly with Kozo Ueda from Waseda University and Tsutomu Watanabe from University of Tokyo, on “Storable Goods, Chain Drifts, and the Cost of Living Index: New Methodology and Application to Japanese Data”. Their focus is on the problem of chain drift due sales of storable goods and consumers’ stockpiling behaviour (hence, not on sticky quantities). In order to understand the mechanism behind this type of chain drift, they set up a quasi-dynamic model where goods are storable; firms have an incentive to conduct temporary price reductions, and consumers stockpile. Based on this model, they discussed how to construct a drift-free cost of living index, referred to as a “consumption-based” price index. Two variants of such an index were discussed: the consumption-based Törnqvist price index and the consumption-based Quadratic Mean of Order R price index. Using a Japanese scanner data set, Watanabe et al. once again illustrated the problem of chain drift and showed that while their approach mitigated chain drift, it did not completely remove it.

The results presented at the meeting were preliminary, and Watanabe suggested several topics for further work before finalising their paper: a careful analysis of whether the implications of their economic model are consistent with the actual data; a comparison of the consumption-based price index with alternative approaches, in particular the use of multilateral price indexes like GEKS; and improved treatment of quality changes and imputation of temporarily “missing prices”. These points are obviously important for a statistical agency that would like to implement their method.

A comparison of index extension methods for multilateral methods

The presentation by Antonio Chessa from Statistics Netherlands was on “A Comparison of Index Extension Methods for Multilateral Methods”. Multilateral price indexes have a revisions problem: when time passes and new data are added to the sample, previously estimated price indexes will change. A number of different methods to extend the time series have been proposed in the literature and countries which use a multilateral index method for the treatment of scanner data in the CPI have indeed implemented different extension approaches. Chessa presented the results of an extensive comparative study on Dutch scanner data for different types of goods. One of his main findings was that the use of rolling-window splicing methods, in particular a movement splice and a window splice, can lead to significant drift (for matched-model multilateral indexes) as the index will no longer be transitive.

A very interesting suggestion was to link rolling-window indexes to the published price indexes rather than the recalculated price indexes. The latter method has been proposed in the literature (and is actually used by at least two statistical agencies), but the former method has so far been overlooked. Chessa’s results seem to indicate that his alternative method does not suffer from “splicing drift”. It would be worthwhile if other statistical agencies tried this new method on their scanner data to examine whether similar results are found. Another finding was that, among the various rolling-window approaches, the half splice emerged as perhaps most promising.

Session 5: New data sources to compile price indices (III)

Chairperson: Jens Mehrhoff

- Edward Rowland: Machine learning for classification with big data in price statistics production pipelines
- Olivia Ståhl, Peter Nilsson: Towards a roadmap for Efficient use of Electronic Transaction Data in the Swedish CPI
- Manuel I. Bertolotto: Online Price Index with Product Replacement: The Closest Match Approach

Session Summary

Three papers were presented in this session on new data sources to compile price indices. First, Edward Rowland and Hazel Martindale from the ONS in the UK introduced machine learning for classification with big data in price statistics production pipeline, next Olivia Ståhl and Peter Nilsson from Statistics Sweden continued towards a roadmap for efficient use of electronic transaction data in the CPI, followed by Manuel I. Bertolotto from PriceStats and Universidad de San Andrés with an online price index with product replacement.

Machine learning for classification with big data in price statistics production pipelines

Edward's task was to use machine learning in the classification of web-scraped data to COICOP. The first problem he dealt with was making sense of text data. He employed natural language processing, including count vectorisation, term frequency / inverse document frequency and neural networks. The next problem – supervised classification requires labelled training data – was solved through fuzzy matching first and then label propagation, i.e. by means of unsupervised or semi-supervised techniques. The thus generated training data was then used in the classification using non-linear support vector machines, decision trees and random forests; precision, recall and F1-score were reported. Though the performance is not uniform, it looks extremely promising for clothing. More data should also help to make the classifier better.

During the discussion it was debated whether the classification should be run regularly or less frequent, e.g. at fixed intervals. Another issue that was raised was whether or not regional comparisons would be possible with this kind of data.

Towards a roadmap for efficient use of Electronic Transaction Data in the Swedish CPI

Olivia presented how processes to retrieve data can be standardised in the framework of a re-organisation within Statistics Sweden, how new demands on IT systems can be met that so far are embedded in the existing structures, and how new methods can be systematically evaluated given some degree of divergence. In the current situation the questions have moved towards what type of multilateral methods should be used and how to create homogenous products. The roadmap she presented has a more standardised treatment as goal. This roadmap encompasses five topics: i. a communication strategy in contact with potential providers; ii. a checklist for experimental data; iii. flexible systems to deal with incoming data; iv. methodological issues such as classification, stratification, data processing; and v. an increase in quality.

The questions and comments included where the priorities should be set with regard to the topics of the roadmap, if scanner data are used for retail sales too, whether such a framework exists for web-scraped data as well, and that data cleansing is very important and so is the classification strategy.

Online Price Index with Product Replacement: The Closest Match Approach

Manuel gave evidence that the current methodologies using large datasets show an abnormal downward trend. He traced this well-known phenomenon back to three causes: i. more than 90 % of products are replaced every year; ii. around 75 % of price changes are negative; and iii. products are introduced at a high price and discontinued at a low price. While this is taken into consideration in traditional CPIs, online methods cannot identify qualitatively similar goods. Identifying equal-quality products and restricting the implicit quality adjustment factor in a time-product dummy model, on the other hand, is a possible solution. The identification of the closest match proceeds in two stages: first filtering towards the previous seasons, and then scoring (similar) descriptions and characteristics. This approach is scalable without manual intervention.

Subsequent to the talk, it was debated which class of commodities was analysed, to which extent this method is a black box, whether a new product is linked one-to-one to an old one, if this approach smoothes the results, and why the proposed method is better than stratification.

Session 6: Compiling housing price indices

Chairperson: David Fenwick

- Rósmundur Guðnason: Owner occupied housing in the Icelandic CPI, a survey of simple user cost for a quarter of a century
- Paulo Picchetti: Residential Price Indexes using different sources of information
- Kate Burnett-Isaacs, Erwin Diewert, Ning Huang: Developing Land and Structure Price Indexes for Ottawa Condominium Apartment

Owner occupied housing in the Icelandic CPI, a survey of simple user cost for a quarter of a century

Rósmundur Guðnason's paper, entitled Owner occupied housing in the Icelandic CPI, a survey of simple user cost for a quarter of a century, surveyed the methods used the calculation of owner-occupier housing costs in the Iceland CPI. It presented a comparison between the simple user cost method used in Iceland and the user cost methods used by Sweden and Canada and included a simulation of the Swedish method using Iceland data. The methods differ. The Icelandic user cost measures the flow of services method targeting rental equivalence as defined in the national accounts. All prices are current prices. The Swedish and Canadian user cost methods reflect the fact that the main use of the CPI is for compensation. The prices used are from various time points, which are 12-15 years on average in the past. Iceland applies a real interest rate whilst Sweden and Canada use nominal rates.

Residential Price Indexes using different sources of information

Paulo Picchetti's paper, entitled Residential Price Indexes using different sources of information, focused on the availability of different sources of data on individual dwellings and their characteristics in the context of the data requirements for the estimation of the hedonic price model. It presented a methodology for combining appraisals data with data on advertised price, the two most reliable and timely data sets available in Brazil, to improve the precision of the hedonic model. The paper used data for Rio de Janeiro to illustrate the benefits.

Developing Land and Structure Price Indexes for Ottawa Condominium Apartment

Kate Burnett-Isaacs presented the paper entitled Developing Land and Structure Price Indexes for Ottawa Condominium Apartments. The paper gave special attention to the roles of communal land and structure space on the sale prices of condominium apartments, building on and taking forward previous extensive work relating to the demarcation between land and structure. A method for creating land price indexes for condominium apartments was demonstrated, subject to data availability, although no direct comparison could be made with other data sources, as no such sources exist.

Discussion was wide ranging and covered issues relating to concepts, the availability and reliability of data sets and the limitations of existing applications of hedonic models. The availability of timely, accurate and relevant data remained a challenge, but the session concluded that the methodology deployed in Picchetti's paper for combining different data sets looked promising and that the paper by Burnett-Isaacs, Diewert and Huang presented a possible solution to what had been a difficult problem. Guðnason's paper generated a discussion on conceptual issues and how the different approaches to measuring owner occupier housing costs in a CPI can lead to significantly different results arising from the rates of change in house prices and the use of nominal or real interest rates. Index volatility varies according to the approach deployed and differences in the economic circumstances.

Session 7: Index number

formulae Chairperson: Ludwig
von Auer

- Ragnhild Nygaard, Li-Chun Zhang, Ingvild Johansen: Evaluating unit-value price indices in a dynamic item universe
- Claude Lamboray: Elementary aggregation: A not so elementary story!

Summary

This session on Index number theory and its application examined a range of topics relevant to both National Statistical Office practitioners as well as important theoretical questions. It addresses research undertaken at Statistics Norway and at Eurostat. Both studies are concerned with finding the most reliable procedure for processing scanner data in a CPI.

Evaluating unit-value price indices in a dynamic item universe

The first paper by Nygaard, Zhang, and Johansen presented their studies on "Evaluating unit-value price indices in a dynamic item universe". The paper explains the efforts by Statistics Norway to implement a generic scanner data methodology that works well across different commodity groups including those with high product churns. It proposes a two parts approach that consists of a Total Effect Framework (TEF) and a set of generic diagnostics.

The TEF attempts to establish a systematic catalogue of decisions that have to be made when choosing an index formula for scanner data. Under the TEF, the different alternatives of a choice can be studied analytically wherever possible. Yet the complexity involved is often such that clear-cut conclusions cannot be reached a priori independent of the actual data. The paper therefore reviews, synthesizes and develops a set of

generic diagnostics. They are illustrated using scanner datasets mainly from the markets of sport equipment which have high product churns.

Elementary aggregation: A not so elementary story!

The paper's starting point is the observation that the compilation of a CPI is often presented in two stages. First, prices are aggregated without weights at the elementary level. These elementary price indices are then aggregated to the higher levels using expenditure weights. Nowadays, a CPI may be compiled in more than two stages and weights may be available even within the elementary aggregates. In order to clarify the concepts and methods underlying elementary aggregation, the paper first presents a generic framework that can be applied and understood independently of the data source at hand.

With scanner data, the index compiler must make two main structural decisions which can have a significant impact on inflation measurement. First, the product which is being aggregated must be defined. Second, the level must be fixed up to which these products are first aggregated. In order to formalize this second issue, the study distinguishes two strategies for a product category that can be divided into sub-categories. Either the products are directly aggregated to the category level, using for instance a multilateral method. Alternatively, the multilateral method aggregates only up to the sub-category level, and these intermediate sub-category level indices are then aggregated to the category level using for instance a Laspeyres-type index formula. The paper examines the impact of introducing this additional level of fixity in the CPI structure. The resulting price indices are compared to those obtained from a more traditional setup where prices of the most sold products are simply aggregated with an unweighted index formula. The indices are compiled with transaction data taken from the publicly available Dominick's data set.

Session 8: Quality adjustment

Chairperson: Brian Graf

- Jean-Denis Zafar, Mathilde Poulhes: Webscraping prices to estimate hedonic models and extensions to other predictive methods
- Elisabeth Wieland: Measuring price dynamics of package holidays with transaction data

Web scraping prices to estimate hedonic models and extensions to other predictive methods

The presentation focused on the use of web scraping to collect the prices and characteristics of laptops to develop more robust and reliable hedonic regressions for estimating the value of quality changes when items are replaced. Web scraping addresses the issue of small sample sizes that can affect the reliability of hedonic

regression models. Machine learning algorithms can be applied not only to select the most relevant and necessary variables, but also for predicting prices. The current work is ongoing and future developments include: testing of models over longer time period; using predictive methods to adjust for quality; testing generalized additive models; improving treatment of missing values; detecting outliers; and extending the use of web scraping and predictive models to include other electronic goods.

Measuring Price Dynamics of Package Holidays with Transaction Data

A joint project of the Federal Statistical Office of Germany and Deutsche Bundesbank analyzed the use of transaction data provided by Amadeus to improve the measurement of price change for package holidays. A number of challenges were identified with the data, such as grouping unstructured text into meaningful categories, treatment of missing prices, and identifying outliers. In addition to the use of transaction data, the project evaluated different index aggregation methods including hedonic regression, stratification, and a multilateral method. Six major holiday destinations for German travelers were selected. Each of the aggregation methods produced similar results in terms of price change; however, additional research is needed to determine whether transaction-based methods perform well in terms of a changing sample and quality adjustment.

Session 9: New data sources to compile price indices (IV)

Chairperson: Antonio Chessa

- Tanya Flower: *Using alternative data sources in consumer prices, UK*
- Lincoln Teixeira da Silva, Ingrid Luquett de Oliveira, Vladimir G. Miranda, Tiago Dantas: *Studies of new data sources and techniques to improve CPI compilation in Brazil*
- Can Tongur: *Challenging the CES assumption with scanner data – pitfalls of the fixed basket*

Summary

In recent years, National Statistical Institutes have made big steps towards exploring the potential of so-called “alternative data sources” like transaction (scanner) data and web scraped data. The number of NSIs that are using such data in CPI production and for research purposes has grown considerably in a few years’ time. The first research stages conducted by NSIs typically focus on analyzing new data sources and also new index methods that exploit the potential of such rich and vast data sources better than traditional methods. Transaction and web scraped data can be compared to traditionally collected data. Such data sets also allow detailed statistical and economic-theoretical analyses. While NSIs make progress in this respect, the range of topics that are influenced by innovation initiatives concerning the CPI is gradually expanded. For

example, NSIs are also thinking about how to design a harmonized IT system that is capable of integrating and processing different data sources. This session offered contributions on the different topics mentioned above.

Using alternative data sources in consumer prices, UK

The Office for National Statistics of the UK is making big efforts to acquire transaction data and web scraped data. The collection of online prices and metadata was already started in 2014. Different methods are being explored for calculating price indices for such data. Meanwhile, the ONS has been working on a design for an IT system that integrates the three main data sources (prices collected in traditional surveys, web scraped data and transaction data), with the aim of taking this system into live production by January 2023.

The paper gives an overview of the different stages (“pipelines”) covered by the IT system, from receiving and validating data to index calculation, analysis of results and publication. (Also other NSIs, like Statistics Netherlands, are working on a harmonized system.) In particular, the paper offers a detailed description of the “main pipeline” and its modules, which cover tasks from pre-processing and classification to index calculation and aggregation. Example indices are given, which illustrate the impact of different choices or settings within modules. The paper concludes with an overview of future research activities, which include classification (see presentation by Edward Rowland in Session 5) and proxies for expenditure based product weights for web scraped data (see poster by Sara Heledd Thomas in Poster session II).

One of the questions from the audience addressed the implications of the shift towards electronic data collection for staff capacity at data collection departments of NSIs.

Studies of new data sources and techniques to improve CPI compilation in Brazil

The study presented by Lincoln da Silva explores the possibilities of using web scraped data of airfares and household appliances in the Brazilian CPI. An in-house web scraper was developed for airfares (coded in R). The automated and manually collected data were compared on numbers of observations (price quotes), ticket prices and indices. The price differences between the two collection modes were rather small, with a high frequency (> 90%) concentrated in an interval between -100 and 100 Brazilian Reais (appr. within -25 and 25 US\$). As a consequence, the differences between the two indices are quite small as well, apart from several isolated periods.

The second part of the study deals with the use of web scraping techniques to implement hedonic models for quality adjustment in the CPI, in this case concerning household appliances (e.g. TVs and refrigerators). The study addresses the question whether parameter estimates based on web scraped prices can be used for quality adjustment, since online and offline prices may differ. The authors did not find strong

evidence for interaction between shop type and other price determining product characteristics, so that the previously posed question found an affirmative answer in this study.

From the audience the question was raised whether the study controlled for geographic distribution for such a big country like Brazil (not controlled for) and which prices to use for airfares, as ticket prices may show considerable variation for the same destination, some of which may not be sold. The chairperson added that the CPI unit of Statistics Netherlands is currently doing a project, in which transaction data of airfares is one of the data sets that will be analyzed. The project may shed more light on the airfares to select from web scraped data.

Challenging the CES assumption with scanner data – pitfalls of the fixed basket

The Jevons index is used by many NSIs in their CPI to compute price indices for elementary aggregates. Although the attention is shifting towards multilateral methods, the Jevons index is still used by NSIs for transaction data.

Can Tongur presents an applied economic-theoretic study, in which the elasticity of substitution assumptions underlying the Jevons index formula are investigated by making use of transaction data. More precisely, the Jevons index reflects the special case of Cobb-Douglas preferences, since the CES cost function tends towards a Cobb-Douglas function when the elasticity parameter in the CES function goes to unity (see p. 5 in Tongur's paper). This study shows that mean and median estimates of the elasticity parameter clearly exceed unity for each of the four product categories considered. Although a limited set of products was considered in this study, the presenter concludes that there seems to be little support for insisting on the Jevons index in a time where more detailed data are becoming available, containing also expenditure data. Especially the restriction to a fixed basket is found to be a big concern with regard to representativeness.

The discussion after the presentation addressed the use of the CES. One of the questions was whether the CES function would be restrictive. Another question that could be interesting to consider in a follow-up study is what other insights and messages can be obtained from this study, for instance, with regard to index method.

Session 10: Other topics (II)

Chairperson: Paulo Picchetti

- Doron Sayag, Danny Pfeffermann, Dan Benhur: Reducing Revisions in House Price Index with Nowcasting Model
- Brian Graf, Margarida Martins: Update of the CPI Manual

Reducing Revisions in Israel's House Price Index with Nowcasting Models

Doron Sayag presented the paper, co-authored by Dano Ben-Hur and Danny Pfeffermann. Their important contribution is a statistical methodology for dealing with the undesired effects of revisions in published house price index caused by late arrival of data. This methodology is rooted in a class of models that have been consistently used in the macroeconomics literature for producing timely measurements of economic activity, commonly known as “nowcasting”. Basically, these models employ out-of-sample prediction techniques for estimating current values of not yet available statistics, exploring their relationships with other variables whose values are already known at a given point in time. Using the same basic idea for estimating current values of variables employed in hedonic house price estimates, the authors provide evidence that their technique successfully reduces revisions in house price indices in the Israeli experience.

Update of the CPI Manual

Brian Graf presented the progress in the update of the 2004 CPI Manual, initiated in the 2014 UNECE-ILO CPI Group of Experts Meeting. The final draft of what will turn out to be two publications:

- Consumer Price Index Manual: Concepts and Practices (Manual)
- Consumer Price Index: Theory

Is expected to be available by October 2019. After formal editing by the IMF (expected to be completed by February 2020), a white cover version is to be submitted to UNSC in the same month, to receive formal endorsement by March 2020 (only in the case of the Consumer Price Index Manual, as UNSC does not endorse theoretical aspects, only concepts and practices). In both publications, changes and updates to the 2004 edition will reflect several important developments of recent years, including the issues involved in the use of scanner data, missing prices, quality adjustment, and web-scraping, among others. In the end, both publications will provide valuable guidelines for all practitioners involved in the production and analysis of Consumer Price Indices across countries.

Annex B: Summary of the participants' feedback

Annex B summarizes the evaluations reported by 47 of the 80 participants of the 16th Ottawa Group Meeting.

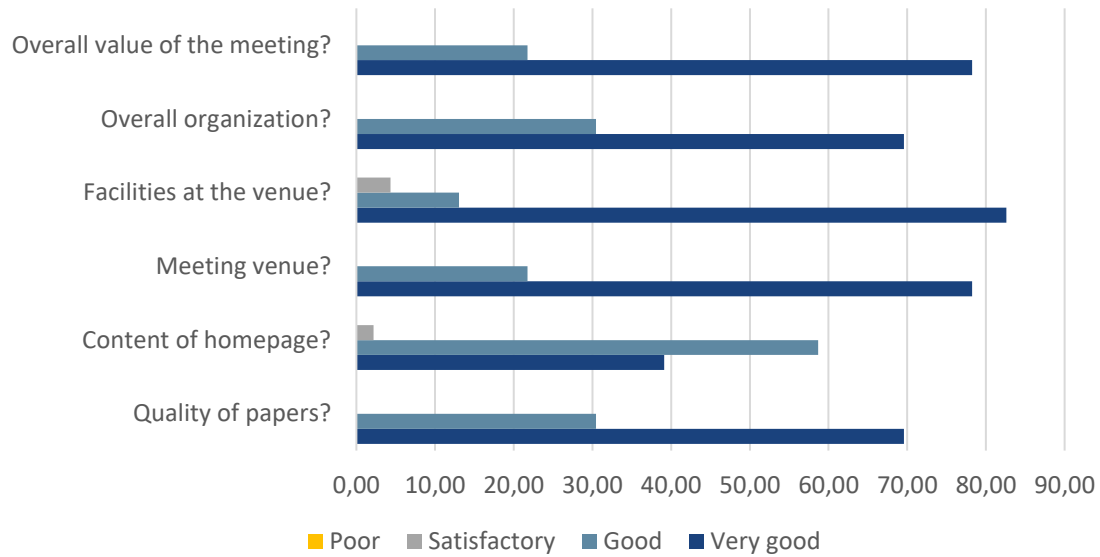
The points that received the best evaluations were facilities at the venue, meeting venue and quality of papers.

In the opinion of the participants, there was a balance in the preference of the plenary sessions.

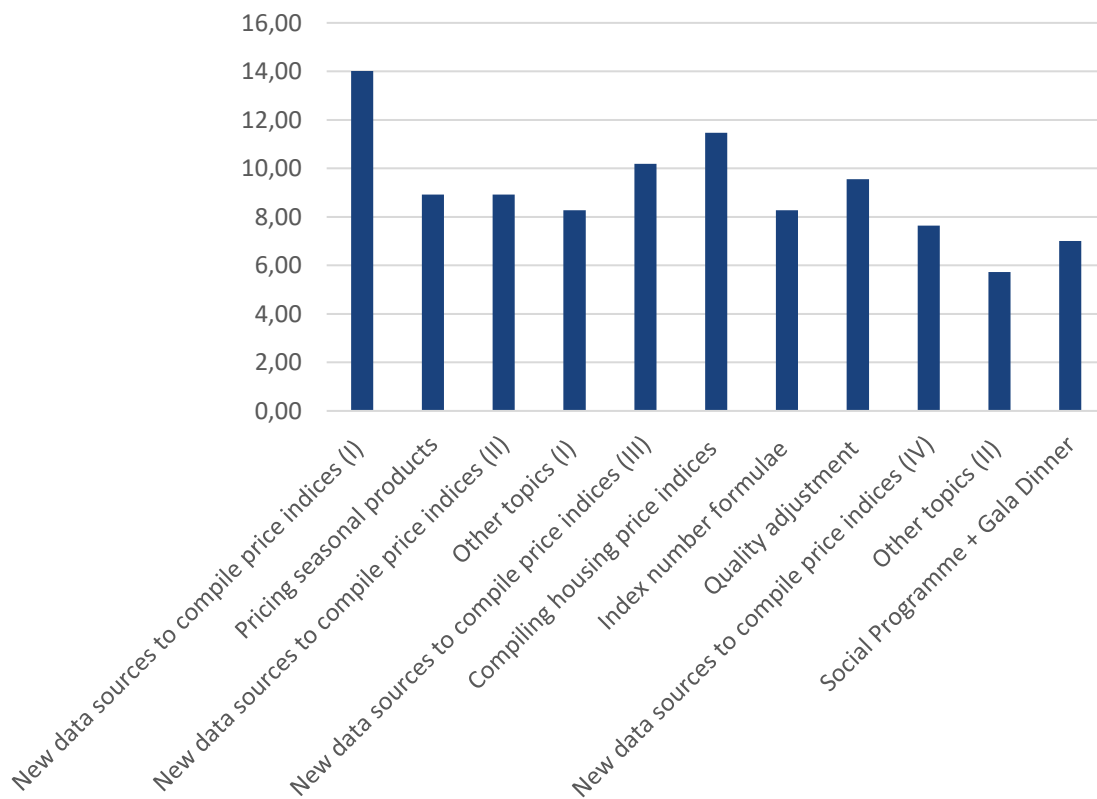
The poster session was evaluated as relevant by 93.48% of the participants who submitted their evaluations. The division of the poster session in two days proved to be adequate to allow greater integration and exchange of information among the participants of the meeting. Some criticisms were attributed to the lack of information on the size of the trestles.

Among the suggestions presented by the participants for the next meeting are greater diversity of topics, more focus on electronic data, inclusion of workshops, and more opportunity for discussion.

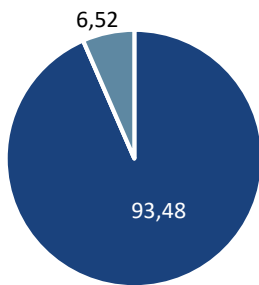
Ottawa Group 2019 evaluation



Which plenary did you find most interesting?

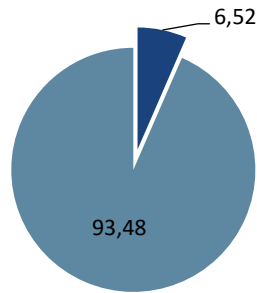


Did you consider the poster session valuable?



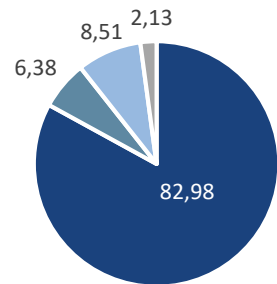
■ Yes ■ No ■ Do not know

About the division of time during plenary sessions?



■ Should have more time for discussions
■ Good balance

Please describe the organization to which you are affiliated?



■ Statistical office
■ Academic
■ Multilateral (IMF, ECB, UN)

ANNEX C – Suggestions for future meetings (*)

- I. Thee Ottawa Group Meetings should have with two different models. The first one for meetings in Europe and the second one for meetings in other continents. In Europe the social program should be on Thursday and the Gala dinner on Friday. For countries outside Europe the Gala Dinner should be on Friday and the social program on Saturday morning, offering more comfort to participants;
- II. A sub-committee composed of three scholars of the steering committee would carry out the selection of articles for the plenary and poster sessions. At each meeting, one of them would assume the coordination of such sub-committee, being responsible for organizing the program and selecting the chairperson for each session. In addition, the coordinator would undertake the task of reviewing the report of each chairperson;
- III. Evaluate the application of a fee charge for participants. This practice would reduce the net cost for the host of the meeting, and make it possible to a greater number of institutions to host it, avoiding the repetition of countries and budgetary problems;
- IV. Each member of the steering committee should have a mandate established at his election;
- V. To maximize integration and strengthen partnerships, the number of participants of the meetings should be limited to 90 people. In order for other interested parties to be able to follow the meeting, the event could be transmitted by an Internet link; The presenters of the selected papers for the plenary sessions should authorize the use of their image rights;
- VI. The inclusion of a lecture in the late afternoon of eve of the beginning of the meeting was very well come for the vast majority of the participants of the 2019 Meeting. This practice could be included in the agenda for the upcoming meetings, and also should be transmitted by an internet link;
- VII. To ensure the standardization of posters, the local organizer may be in charge of defining the standard and printing the posters;



VIII. Aiming for greater agility in the delivery of papers and better selection of articles for the plenary session, the call for papers should request a first version of the article instead of the abstract.

(*). These suggestions are personal views from Vagner Ardeo – the member of Steering Committee mainly responsible for the organization of the 16th Meeting- and they do not represent the view of the Ottawa Group.