

# 17th Meeting of the Ottawa Group on Price Indices



**PROGRAMME**

ROME

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BANCA D'ITALIA  
CONFERENCE CENTRE  
"CARLO AZEGLIO CIAMPI"

VIA NAZIONALE, 190



# Introduction

The 17th Ottawa Group (OG) meeting among international CPI experts was held in Rome in June 2022 (from 7 to 10) in the Carlo Azeglio Ciampi Centre for Monetary and Financial Education (Via Nazionale, 91). It was co-organised by the National Statistical Institute (Istat) and the Italian Central Bank (Banca d'Italia) with the support and advice of the Steering Committee of the OG.

This was the first meeting of the OG held with a hybrid format (i.e. some participants attending in person and others attending remotely), as setbacks due to the COVID-19 pandemic - which made it necessary to reschedule the event from 2021 to 2022 - were still in place at the time of the conference.

## The seventeenth meeting: Summary

The papers submitted for discussion at the meeting were grouped into five topics and eight sessions. The sessions with their respective chairpersons are listed below; all the materials presented are available at the following link <https://www.istat.it/en/archivio/267717>.

- **Session 1: EXPENDITURE WEIGHTS IN THE CPI, INCLUDING NEW DATA SOURCES, FREQUENCY AND TIMELINESS**  
Chairperson: David Fenwick, Ottawa Group Steering Committee
- **Session 2: GOING BEYOND CPI – ALTERNATIVE/COMPLEMENTARY MEASURES OF INFLATION AND COST OF LIVING**  
Chairperson: Giordano Zevi, Banca d'Italia
- **Session 3: NEW DATA SOURCES AND NEW TECHNIQUES TO COMPILE PRICE INDICES, INCLUDING THE IMPLICATIONS ON INDEX FORMULAS (Part 1)**  
Chairperson: Leigh Merrington, ABS
- **Session 4: NEW DATA SOURCES AND NEW TECHNIQUES TO COMPILE PRICE INDICES, INCLUDING THE IMPLICATIONS ON INDEX FORMULAS (Part 2)**  
Chairperson: Jens Mehrhoff, IMF
- **Session 5: MEASUREMENT OF HOUSING IN THE CPI**  
Chairperson: Jan de Haan, Ottawa Group Steering Committee
- **Session 6: NEW DATA SOURCES AND NEW TECHNIQUES TO COMPILE PRICE INDICES, INCLUDING THE IMPLICATIONS ON INDEX FORMULAS (Part 3)**  
Chairperson: Carsten Boldsen, UNECE
- **Session 7: CHALLENGING AREAS OF MEASUREMENT (DIGITALISATION AND SHARED ECONOMY) AND QUALITY ADJUSTMENT (Part 1)**  
Chairperson: Randi Johannessen, Statistics Norway

- **Session 8: CHALLENGING AREAS OF MEASUREMENT (DIGITALISATION AND SHARED ECONOMY) AND QUALITY ADJUSTMENT (Part 2)**

Chairperson: Federico Polidoro, Istat

The figures of the event clearly tell about the success of the choice of adopting the hybrid formula: 74 participants attended at least one session physically (on average 46 attendees each day) and 136 attended remotely.

In all the eight sessions there were questions and interventions both from the audience hosted in the hall and from those connected on-line (also using the chat function).

The Webex platform for the video conference worked perfectly, allowing for a fluid and lively participation to the debate of all the attendees.

This is a very positive outcome of the hybrid formula, that was able to include also those experts who were not in the conditions to travel. At the same time, for the attendees in presence coffee breaks, lunch time and the social event have been the occasion to exchange opinions, comments and points of view about the topics discussed - and in some cases to meet each other - confirming the relevant value added represented by the social dimension of the physical meetings.

## The next meeting

The baton of hosting the 2024 meeting of the Ottawa Group is being passed to Canada. As for the 2022 event, the 2024 meeting will be co-organised by the National Statistical Institute and the Central Bank (Statistics Canada and Bank of Canada, respectively). While awaiting the official approval, the Canadian delegation - represented by Heidi Ertl from Statistics Canada – prepared a video presentation about Ottawa, which should host the meeting, ideally re-connecting in this way the meeting with the origin of the Group: 2024 will be the 30th anniversary of the Ottawa Group on Price Indices.

# Annex A: Chairperson's summary notes

## SESSION 1

### EXPENDITURE WEIGHTS IN THE CPI, INCLUDING NEW DATA SOURCES, FREQUENCY AND TIMELINESS

*Chair:* David Fenwick | Ottawa Group Steering Committee

#### Session summary

Three papers were presented. Only the paper by Statistics Canada was presented in person, the other two were presented online.

The common theme was measuring consumer inflation when there are significant changes in expenditure patterns in the short term.

All three papers generated lively discussion both with respect to determining the reliability and relevance of a CPI when expenditure patterns shift markedly over a very short time and with respect to the strategy that should be followed by the CPI compiler to produce an inflation measure which remains relevant and addresses the needs of policy makers and other users. It was noted that harmonisation of concepts and methodologies was an important issue, particularly in the context of the HICP.

#### **The impact of weight shifts on inflation: Evidence for the euro area HICP**

Thomas A. Knetsch, Patrick Schwind, Sebastian Weinand | Deutsche Bundesbank

The presentation entitled "The impact of weight shifts on inflation: Evidence for the euro area HICP" was motivated by the ECB's monetary policy strategy which raises some interesting inflation measurement issues. The paper addressed the question of how large weights shifts – resulting from the Covid-19 pandemic - have impacted euro area inflation. The feeling of the meeting was that the quantification of the impact of weight and quantity changes on euro area inflation was valuable information for HICP users and analysts. In the discussions, it was suggested to further differentiate the authors' decomposition from other but similar approaches. It was also mentioned that imputations significantly impacted the measure of euro area inflation during the Covid-19 pandemic.

#### **The Adjusted Price Index and Monthly Adjusted Consumer Expenditure Basket Weights**

Gerry O'Donnell, Clément Yélou | Statistics Canada

The presentation entitled "The Adjusted Price Index and Monthly Adjusted Consumer Expenditure Basket Weights" addressed concerns expressed at the start of the COVID-19 pandemic in Spring 2020 that StatCan's CPI was based on old weights that were no longer representative. StatCan wanted to inform users what the CPI would be if it had used weights which took account of shifts in consumer preferences due to COVID. The discussion saw issues raised about the practicality of computing a CPI that reflected major weight changes over a short period. For example, the reliability of imputing price changes based on the All-Items CPI or a similar product when there is no consumption, and the potential difficulties relating to continued access to data from data suppliers. It was noted that, encouragingly, the results of the work reported in the paper were similar to Cavallo's.

## **Empirical findings on upper-level aggregation issues in the HICP**

Julika Herzberg, Thomas A. Knetsch, Dilyana Popova, Patrick Schwind, Sebastian Weinand | Deutsche Bundesbank

As with the first presentation by Deutsche Bundesbank, the third presentation entitled “Empirical findings on upper-level aggregation issues in the HICP” was motivated by the ECB’s monetary policy strategy, which prominently included inflation measurement issues. The paper was prepared as a background study for the dedicated workstream supporting monetary policy strategy and addressed the question of how large weights shifts – which occurred due to the Covid-19 pandemic - impacted euro area inflation. In the discussion, the issue of revisions was raised. It was mentioned that CPI producers are generally aware of revisions in source data for weight compilation. Preliminary releases of national accounts may be a concern. It turns out that newly incoming source data should not be taken for granted but judged by price statisticians to be appropriate for consideration in weight compilation.

## **SESSION 2**

### **GOING BEYOND CPI – ALTERNATIVE/COMPLEMENTARY MEASURES OF INFLATION AND COST OF LIVING**

*Chair:* Giordano Zevi | Banca d’Italia

#### **Session summary**

In this session, four papers exploring possible improvements in compiling CPI indices were presented. Such improvements include having more timely and more accurate house prices at higher frequency, employing services CPIs in order to estimate their counterparts in the PPI, sharpening the computation of COLI CPI indices and considering how best to treat and integrate seasonal products in the CPI. The papers, besides clearly describing the theory behind the improvements, have also a hands-on practical approach and represent useful blueprint for future application in CPIs indices.

#### **Combining Price Indices in Temporal Hierarchies**

Robert J. Hill | University of Graz, Daniel Melser | Monash University, Alicia Rambaldi | The University of Queensland, Michael Scholz | University of Klagenfurt

Hill and coauthors tackle the issue of providing higher frequency house price indices, for which there is a growing demand both from the private (investors, developers) and the public sector (government and central banks) but that are currently considered not reliable enough, as they are typically constructed based on less data than lower frequency indices. Hill et al. by combining lower and higher frequency indices in temporal hierarchies (from annual to monthly) obtain indices that are more reliable at all frequencies and are also more timely. They apply their method of time reconciliation to home transaction data (at monthly, quarterly and annual frequency) from a section of the suburbs of Sydney, Australia, covering the period 2001-2014.

## **Alignment of Methodology and Scope between Services Producer Price Indices (SPPIs) and Consumer Price Indices (CPIs): developing a framework for using CPIs in SPPI calculation**

Rohan Draper | Statistics Denmark, Nicklas Elversøe | Statistics Denmark, Melanie Santiago | US Bureau of Labor Statistics, Ruth Vaizner | Central Bureau of Statistics, Israel

Draper and coauthors explain a detailed framework for producing services PPIs utilizing selected Consumer Price Index (CPI) based indices. This has the potential to reduce collection costs and the statistical burden on respondents, and represents a route towards having higher levels of PPI coverage, which tends to be low for services. The methodology is more suitable when a large share of the services is directly sold to domestic consumers, while there are difficulties in capturing business to business prices; however many services fit in the “suitable” description, as seen by the supply and use table of the national accounts. A number of other practical obstacles are explored in the paper (chiefly the sectorial classification, which differs between PPIs and CPIs).

## **Cost of Living Index of an Estimated Generalized CES Utility Function that Accounts for Changes in Preferences for and Qualities of Goods**

Peter Zadrozny | BLS

Zadrozny develops and illustrates a new method for computing a cost of living index (COLI) based on an estimated newly proposed generalized constant elasticity of substitution utility function. The utility function is specified in terms of constant "substitution parameters", time-varying "preferences", and time-varying "qualities". The method is illustrated with an application to monthly data on 8 aggregate categories of goods in the U.S. CPI from 1990 to 2008: the resulting proposed COLI index lies about halfway between uniformly higher and lower Laspeyres and Törnqvist price indexes computed with the same data.

## **Seasonal Products**

W. Erwin Diewert | University of British Columbia and University of New South Wales, Yoel Finkel, Doron Sayag | Central Bureau of Statistics, Israel

Diewert and coauthors explore the issues connected with the construction of monthly CPIs for those components that consist largely of seasonal products. Some of these products are consumed (and available for sale) only in some months of the year. A number of alternative indices for such products are explored, based on the availability of quantity sold (or expenditure) at monthly or annual (lagged) frequency. The indices are constructed and compared using strongly seasonal data from Israel. A number of conclusions are drawn (among them the fact that carry-forward methods should generally be avoided) and a number of suggestions are given when it is necessary to integrate an elementary index for a strongly seasonal class of commodities with indexes for other elementary categories where the seasonality is scarce or absent. All such outcomes are of utter importance if we consider the statistical features of the pandemic period.



## **SESSION 3**

### **NEW DATA SOURCES AND NEW TECHNIQUES TO COMPILE PRICE INDICES, INCLUDING THE IMPLICATIONS ON INDEX FORMULAS (Part 1)**

*Chair:* Leigh Merrington | ABS

#### **Session summary**

This was the first of three sessions on the use of new data sources and techniques to compile the CPI. This indicates the level of research being undertaken by national statistical agencies in this area. The presentations highlighted the many opportunities of new data sources, but also the many challenges to deliver solutions that align to the statistical concepts. The presentations provided a mix of the conceptual, empirical and practical aspects to this work, which generated a lot of discussion and should provide helpful experience to statistical agencies undertaking similar research.

#### **New ways of measuring price development on consumer electronics**

Kjersti Nyborg Hov, Ragnhild Nygaard | Statistics Norway

Kjersti Nyborg Hov presented this paper which describes the challenge of measuring consumer electronics due to high item churn and rapid technological changes often resulting in large and rapid quality improvements. Web scraped metadata was combined with scanner data to obtain more extensive and complete information to be used in hedonic regression models. Different hedonic techniques were tested empirically on data from different product categories including mobile phones and tablets from the leading retailers on the Norwegian market.

The paper presented a new technique of linking scanner data and web-scraped data in order to have sufficient information for hedonic adjustment. Despite the high quality nature of the data the results were inconclusive. The authors noted further research was required and to extend the time series beyond 12 months to adequately test before implementing into the CPI.

#### **Household Inventory, Temporally Sales, and Price Indices**

Kozo Ueda | Waseda University, Kota Watanabe | Canon Institute for Global Studies, Tsutomu Watanabe | University of Tokyo

Kozo Ueda presented this paper on changes in household inventories associated with temporary sales and proposed a methodology to estimate changes in household inventories at the product level using retail scanner data. A simple model was constructed on household stockpiling for the relationships between the quantity consumed and the quantity purchased and between consumption and purchase prices. Inferences were made about quantities consumed, consumption prices, and inventories. Empirical tests were presented which showed that there exists a bias in the Laspeyres, Paasche, and Tornqvist price indices and that intertemporal substitution bias disappears for a particular type of price index if we switch from purchase-based data to consumption-based data.

The issue of household inventories was also covered in session 7 and is particularly relevant in light of the stockpiling seen in some countries since the onset of the Covid-19 pandemic. The paper

makes the case that accounting for inventories aligns more closely to the concept of a cost of living measure. However, questions raised how this would be introduced in practice with many assumptions needed and whether introducing a lag to capturing price change was something users would not like, particularly for monetary policy purposes.

### **A MAP for the future of prices indexes at Stats NZ**

Matthew Stansfield, Frances Krsinich | Statistics New Zealand

Frances Krsinich presented the R-based Multilateral Application Pipeline (MAP) Stats NZ are developing to provide a consistent analytical interface with a common processing sequence, diagnostic reports and workflow. The aim is to make production processes more robust, transparent, and allow more rapid development of production processes for new data sources. MAP will provide a platform for testing and determining methods, and setting up the production processes, for supermarket scanner data and an official NZ house price index from valuation and sales data.

The paper demonstrated the system and its potential for making the development and production process more analyst-friendly and analytically informative.

The paper provides potential practical applications for other statistical agencies who are grappling with the same challenges in managing the different data sources and bespoke processes when making use of the new data sources and complex methods required.

### **What do missing prices mean for the choice of index number method with alternative data**

Ben Hillman, Alex Rose, Helen Sands | ONS

Ben Hillman presented this paper on price missingness and product churn in scanner and web-scraped data, which highlighted how it can be problematic for the calculation of price indices using multilateral methods. Splicing methods were used in conjunction with multilateral methods to avoid revising CPIs. However, these splicing methods can be shown to downwardly bias price indices, particularly for seasonal products and those with a high churn rate. In this presentation the authors looked at how big the problem of price missingness and product churn really is for the use of alternative data sources in CPIs, and whether price imputation could help resolve these challenges.

The paper makes an important contribution on the challenge of price missingness and the implications for various splicing methods. While the paper doesn't recommend a preferred approach, it introduces some important tests for determining the most appropriate splicing method.



## **SESSION 4**

### **NEW DATA SOURCES AND NEW TECHNIQUES TO COMPILE PRICE INDICES, INCLUDING THE IMPLICATIONS ON INDEX FORMULAS (Part 2)**

*Chair:* Jens Mehrhoff | IMF

#### **Session summary**

This session continued the discussions on new data sources and techniques to compile price indexes. A further seven presentations were delivered, and the session closed with a special communication by the chairperson of the UN Task Team on Scanner Data. A wide range of topics were covered; in addition to the current discussions related to multilateral indexes on the particular approach, the length of the estimation window, and the method for extending published indexes in real time, papers discussed chain drift, the Covid-19 pandemic, seasonal products, and product specifications.

#### **Scanner Data, Chain Drift, Superlative Price Indices and the Redding-Weinstein CES Common Varieties Price Index**

Naohito Abe | Hitotsubashi University, D.S. Prasada Rao | The University of Queensland and Hitotsubashi Institute for Advanced Study (HIAS)

Abe and Rao examined and demonstrated the suitability of the CES common varieties (CCV) price index by Redding and Weinstein (2020) for use with scanner data. Their utility function had time-varying taste parameters, while a traditional COLI assumes that the demand functions are fixed. Empirically, the Laspeyres-Paasche gap for face masks during the Covid-19 pandemic became negative, which they attributed to demand shocks.

They continued to show that the Redding-Weinstein CCV index is independent of the units of measurement, i.e., it satisfies commensurability. While the differences were not pronounced against the Jevons or GEKS-Sato-Vartia indexes for cereals, taste shocks were the driver behind the differences for face masks, particularly in the phase of the pandemic where supplies have gone up.

#### **Stress testing multilateral price index methods: Transactions data and stockpiling during the COVID-19 pandemic**

Joel Liffner, L. Merrington, Catherine Smyth, Julian Whiting | ABS Australia

Liffner, Merrington, Smyth, and Whiting motivated their study of stockpiling during the Covid-19 pandemic with the limitations of a fixed-weight approach. During previous cyclones in 2006 and 2011, prices for bananas or fruits more broadly have pushed up all-items inflation in Australia – based on fixed weights. Using a multilateral index instead, though, these impacts vanished.

Using detailed scanner data, they were able to show the effects at the beginning of the pandemic, with consumers stockpiling and panic buying items such as toilet paper and pasta. Differences at the product level were driven by changes in expenditure shares. Overall, the alternative multilateral index methods reacted similarly to the unusual consumer behaviour. But the GEKS-Tornqvist method behaved arguably more favourably in this extreme scenario.

## **Choice of window length and linking method for extending multilateral index series over time**

Antonio Chessa, Florin Barb, Stefan Boumans | Statistics Netherlands

Chessa, Barb, and Boumans reviewed the current extension method in the Dutch CPI that will be replaced in 2023 vis-à-vis alternatives. They empirically assessed the effects of choices on the window length and the extension method, using the Geary-Khamis index. They concluded that a 25-month window will be used in the future and that the extension will be performed using the half splice method, linking on the published index for the same month in the previous year.

While the window length of 25 months seems to be a general trend in countries using scanner data, allowing to better account for moving seasonality than a 13-months window, neither are empirical results on the extension method generalizable nor is particularly the transitive benchmark itself necessarily best if transitivity is bought at the expense of characteristicity.

## **The use of weighted GEKS for the calculation of consumer price indices: an experimental application to Italian scanner data**

Alessandro Brunetti, Stefania Fatello, Federico Polidoro | Istat, Tiziana Laureti | University of Tuscia, Italy

Brunetti, Fatello, Polidoro, and Laureti analyzed GEKS indexes where periods are weighted by reliability rather than being equally weighted. Reliability here takes into account the share or number of matched items, i.e., periods with higher overlaps in the sets of items observed in the two periods considered attained a higher weight and vice versa.

They found that the impact is limited but the distance between a rolling-window index and the full-window counterpart can be reduced. For seasonal products and groups with high churn differences can be higher. The discussion drew the (more general) conclusion that there needs to be some theoretical and conceptual work done to establish what the appropriate benchmark index should be, e.g., the optimum window length not being the full window with parameters estimated being fixed across that full window.

## **Seasonal Products and Multilateral Methods**

Botir Radjabov | Statec Luxembourg, Ken Van Loon | Statistics Belgium

Radjabov and Van Loon investigated the question of which method to prefer for seasonal products. They compared more traditional variable and fixed-weights (bilateral) methods to multilateral methods. Further, they looked at different spliced price indexes.

When using multilateral indexes, e.g., for scanner data when the traditional fixed-weights method with imputations becomes intractable to implement, they suggested the GEKS method since it is less sensitive to splicing choices. Also, the GEKS method is responsive to price imputations which might be an alternative if there are too few bilateral product matches.

## **Multilateral indices and the relaunch problem: product clustering and alternative solutions**

Jacco Daalmans | Statistics Netherlands

Daalmans dealt with the relaunch problem, where a product is replaced by an (almost) identical one. Classical matched-model methods would miss the price changes (if nothing is done) since there is little to no quality change. He compared the clustering of items, computing unit values for homogeneous items, with an imputation approach.

Through a simulation he showed that clustering can yield unit value bias, while an imputation approach hinges on the identification of the relaunches and thus matching each new product with a disappeared one. Genuinely new or disappearing products, however, are neither replacing a disappearing product nor are they replaced by a new product.

## **Matching, grouping and linking: What impact does the product specification have on a Fisher price index?**

Claude Lamboray | Eurostat

Lamboray analyzed the impacts of matching, grouping, and linking – thus the product specification – on a Fisher price index. The trade-off he investigated was between a too tight definition (matched-model bias) and a too broad definition (unit value bias). Starting from a matched Fisher index, a.k.a. a tight product specification, he considered a hybrid Fisher index, where items are first group together and the index is then calculated from the matched group of items. Finally, he considered an imputation Fisher index, which makes imputations for new and disappearing items.

In an attempt to formalize biases, he concluded that a broad product specification is preferred if the resulting unit value bias is smaller than the matched-model bias of a tight specification. If both biases are large, imputation should be considered.

## **Communication of the UN Task Team on Scanner Data**

Tanya Flower | ONS

Flower, in her capacity as chairperson of the UN Task Team on Scanner Data, presented two years of work under the umbrella of the UN Committee of Experts on Big Data and Data Science for Official Statistics. The objectives of the three workstreams include drafting methodological guidance, developing code supporting guidance, and developing training material; all of which including scanner data indexes and the classification of these new data sources.

Good progress has been made over the years 2020 through 2022. An e-handbook should be finished and published as next step, and the development of training material will continue. The next phase of the Task Team will cover the period 2022 through 2024. It is possible to get involved by contacting the steering group members, e.g., [tanya.flower@ons.gov.uk](mailto:tanya.flower@ons.gov.uk) (chairperson and workstream 1 leader).

## **SESSION 5**

### **MEASUREMENT OF HOUSING IN THE CPI**

*Chair:* Jan de Haan | Statistics Netherlands

#### **Session summary**

Five papers were presented in Session 5 on the measurement of housing in the CPI, covering a range of important topics. Two papers addressed the compilation of rental price indices using administrative data (rather than traditional survey data) in New Zealand and Italy, respectively. Another two papers discussed the treatment of owner-occupied housing, which is of the most difficult issues in the CPI from a conceptual perspective. One of the papers offered an empirical application of the various possible approaches to Canadian data. The fifth paper dealt with a specific type of hedonic regression method to adjust for quality changes in the construction of the Swiss house price index.

#### **Timely Rental Price Indices for thin markets: Revisiting a chained property fixed-effects estimator**

Alan Bentley and Frances Krsinich | Statistics NZ

The 'rentals for housing' class of New Zealand's CPI is estimated using a property fixed-effects (Time Product Dummy) estimator on administrative microdata in combination with splicing to extend the time series when data is added to the sample. Statistics New Zealand also publishes a 'flow measure' of rent change based on the same data. Monthly series are published around nine working days after the reference period. The paper investigates a potential enhancement that uses more of the data. It proposes a coherent practical approach to publication of timely rental price indices for national and broad regions, alongside small regions with thin rental markets. The strategy includes using a 'flash data subset' for provisional estimates to minimise potential bias due to revisions, whilst maximising the use of data once this becomes available. Differential reporting lags and rolling up monthly data are also proposed for some regions, dependent on the size of the rental market.

#### **Measuring the Services of Durables and Owner Occupied Housing**

W. Erwin Diewert | University of British Columbia and University of New South Wales, Chihiro Shimizu | Hitotsubashi University

Housing services typically account for approximately 25% of total household consumption. In most countries, a large fraction of housing services is the services of owner-occupied housing. The main approaches to measuring the services of owner-occupied housing are the acquisitions approach, the rental equivalence approach, and the user cost approach. Two other methods are sometimes used: the opportunity cost approach and the payments approach. The paper presents the different approaches and discusses the benefits and costs. Problems associated with forming imputations for the services of 'ordinary' consumer durable goods are also discussed. Note that this paper provides an update to the chapter on the treatment of durable goods in the previous Consumer Price Index Manual (2004).

## **Bringing the Hedonic-repricing method up to date to adjust for qualitative differences in the residential real estate price index**

Corinne Becker Vermeulen, Manuel Brand | Statistics Switzerland

The use of hedonic regressions to adjust for quality changes in the construction of house prices is well established and used in various countries. There are different possible approaches. The best-known method is probably the time dummy hedonic method. The Swiss statistical institute is using a method, known as hedonic repricing. Although this method is also applied in other countries to construct residential property price indices, it is not mentioned in all international manuals. The method has also been criticised for being non-symmetric and, more importantly, for using outdated regression coefficients. This paper discusses the hedonic repricing method, compares it with other hedonic methods and proposes a way to reduce the main weakness of hedonic repricing.

## **The Cost of a House versus the Cost of Housing: evaluating different approaches to measuring owned accommodation in the Canadian CPI**

Patrick Sabourin and Faouzi Tarkhani | Statistics Canada

The paper addresses two issues: the preferred treatment of owned accommodation in the CPI and the public confusion between the cost of a house and the cost of housing. Conceptually, an owner-occupied dwelling can be viewed as an investment good or as a consumption good, or both. One option would be to consider owned accommodation as pure investment and exclude it entirely from the CPI, but that does not seem useful. The paper reviews the different possible approaches to including owner-occupied housing, applies them to Canadian data, and shows the impact on the all items CPI. Practical considerations and data limitation are also discussed as well as implications for monetary policy. The paper ends with an assessment of the impact of the different approaches on the perception-measurement gap.

## **The use of administrative data for Italian private housing rental prices index compilation**

Alessandro Brunetti, Orietta Patacchia, Federico Polidoro | Istat

Starting in January 2022, the Italian price index for private sector housing rentals is based on administrative data. The data have been provided to Istat since 2017 by the Tax Office. The new data set, which has almost complete coverage, is used for two purposes: estimating the weight for “existing dwellings new to the household sector” in the owner-occupied housing price index (based on the net acquisitions approach) and replacing traditional survey data for the compilation of the index for private sector rentals. The main advantage of administrative data is the almost full coverage. This paper first discusses data cleaning, including integration with statistical registers, treatment of duplicates and removal of outliers. Then, the stratification strategy and strata weight construction are outlined. Finally, the method used to calculate rental price indices is explained and the results are presented and compared with the indices derived from the traditional data collection.

## **SESSION 6**

### **NEW DATA SOURCES AND NEW TECHNIQUES TO COMPILE PRICE INDICES, INCLUDING THE IMPLICATIONS ON INDEX FORMULAS (Part 3)**

*Chair:* Carsten Boldsen | UNECE

#### **Session summary**

This third session on new data sources included five presentations by ONS/UK, INSEE/France, statistics Sweden and the University of Lodz/Statistics Poland. The presentation discussed the use of scanner data and web scraped data, the restructuring or re-design of the statistical production process for the CPI to facilitate use and integration of multiple sources, variance estimation when multiple sources are used and a new proposed class of multilateral price indices.

#### **Modernising the measurement of clothing price indices using web-scraped data: classification and product grouping**

Liam Greenhough, Hazel Martindale, Helen Sands | ONS

Liam Greenhough presented an overview of ONS's work on the measurement of clothing prices using web scraped data. Clothing poses particular challenges because of constantly changing fashion and seasonal trends. Due to the large turnover of products – 30% monthly churn rate – there is a risk that price increases are not captured causing a downward bias in the clothing price index.

In the study, raw data are classified into consumption segments (elementary aggregates) by use of supervised machine learning. For each consumption segment, similar products are grouped into product groups. The aim is to have product groups balancing homogeneity and high match rates. Machine learning is used to form the product groups based on product descriptions. The price indices for the consumption segments are calculated based on average monthly product group prices. Hence, not all individual products have to be recorded in both periods being compared.

The clothing index based on average product group prices seems to reduce the downward bias in the index. Important lessons were learned in labelling and classifying products into consumption segments, crowd-sourcing and suitable algorithms. ONS plans to continue work on classifications and product groupings for compiling clothing price indices.

#### **Web scraping of booking.com: exploring new data and methodology for the hotel service consumer price index**

Adrien Montbroussous | INSEE

Adrien Montbroussous presented the outcome of an analysis of hotel services (renting of rooms) based on web scraped data from booking.com, a commonly used platform for booking of hotel rooms. The use of web scraped data aims to ensure more observations and better coverage of the index, including different timing of advance booking. Many booking platforms use so called yield management, a variable pricing strategy which aims to influence consumers' purchase of time-restricted services to maximize revenue. Yield management has become common in areas such as, air flight tickets, car rentals, entertainment and hotel services.

Daily web scraping was used to collect prices for rooms booked 0, 30 and 60 days in advance. Initial results showed significant differences in average prices depending on the timing of the booking. Micro indices are calculated for homogenous classes of rooms that are deemed substitutable. The classes were defined by use of price determining characteristics which were identified by use of regression trees and hedonic models.

INSEE plans to conduct further analysis of price determining characteristics, alternative advance booking times and possible substitution across different times of advance booking. The INSEE study may be useful to refer to for other analysis of compiling price indices for services where prices are set subject to yield management.

## **Integration of alternative data into consumer price statistics the UK approach**

Helen Sands | ONS

Helen Sands presented the plans to develop the production system of the UK CPI to facilitate the use of scanner data and web scraped data. The integration of new data sources in the regular CPI production alongside data collected from traditional sources (surveys) while ensuring the representation of the basket is a key challenge.

For products where new data sources provide full or almost full coverage it is possible to introduce 'consumption segments' in the aggregation structure. Consumption segments facilitate integration of data sources and may include scanner data for some retailers and web scraped data or traditional sources for others. The mix of data sources affects the index calculation methods. For consumption segments where scanner data is available, the intention is to implement a multilateral index formula, a variant of the GEKS with a 25-months window. Elementary aggregates covered by traditional data sources will continue to be compiled by bilateral formulas. To integrate multilateral and bilateral indices, the former will be re-referenced to the fixed price reference period of the bilateral indices. After this, the indices can be aggregated into higher-level indices.

A series of checks will be performed to ensure the quality of the new data sources. Data filtering and cleaning is required to ensure that only the relevant observations are allocated to the consumption segments. ONS will continue to explore cleaning methods for new data sources, imputation methods and multilateral indices and their interaction with higher-level chaining. For web-scraped data, challenges include the lack of weighting information and classification. ONS publishes bi-annual research articles on progress in research and development on their website.

## **Balancing the Swedish CPI**

Anders Norberg, Can Tongur | Statistics Sweden

Statistics Sweden successively has replaced traditional data collection for the CPI by complimentary data sources such as transaction data, web scraped data and API (application programming interface) data. This transition should in theory lead to less uncertainty by reducing price collector variations as well as increasing sample sizes.

Can Tongur presented variance estimation results for different product groups (food and non-alcoholic beverages, clothing and footwear, furniture, air travels and restaurants) of the Swedish CPI where data are derived from multiple sources. The variance estimations are used for measures of accuracy (95% confidence interval) of the Swedish CPI that is published as part of the Quality



Declaration of the CPI statistics. A bootstrap resampling method is used to derive the variance estimations. However, the use of multiple data sources and sample designs create challenges for estimating variances.

Based on the analysis, the study concludes that no single method for variance estimation fits for all product groups and periods. Changes in the CPI (basket/method/data source) appear to influence less 'traditional' sample designs utilising new data sources. Effective sample sizes are potentially smaller than presumed, which means that simple estimators tend to underestimate the variance and there are significant effects of the sample design (except for furniture). Clothing and footwear exhibit disproportionately high variance compared to other product groups despite high survey costs

### **The general class of multilateral indices and its two special cases**

Jacek Białek | University of Lodz, Statistics Poland

Multilateral indices are becoming more and more common when transaction data (Scanner data) are available. However, some commonly used multilateral indices (GEKS, CCDI, GK, TPD, TDH) do not meet the identity test and, hence, do not return to unity when prices return to their original value. Jacek Białek presented a proposal for a general class of multilateral semi-GEKS indices, labelled GS-GEKS. Each index in this class satisfies the identity test. Under different assumptions, each GS-GEKS index satisfy many other axiomatic tests, e.g. transitivity, identity, continuity, commensurability, price proportionality and homogeneity in prices and quantities.

The paper suggests two new multilateral price indices belong to the GS-GEKS class: the GEKS-L that uses the Laspeyres price index formular, and the GEKS-GL that uses the geometric Laspeyres price index formula. The GEKS-L index can be seen as a generalization of the Fisher price index to the multi-period case. GEKS-GL can be seen as a generalization of the Törnqvist price index formula to the multi-period case. Both indices satisfy most axiomatic tests. Empirical studies compare the two proposed indices with other multilateral indices, including the SPQ index based on the relative price and quantity similarity proposed by Diewert. The axiomatic properties and the empirical results confirm the potential usefulness of the two proposed indices.

## **SESSION 7**

### **CHALLENGING AREAS OF MEASUREMENT (DIGITALISATION AND SHARED ECONOMY) AND QUALITY ADJUSTMENT (Part 1)**

*Chair:* Randi Johannessen | Statistics Norway

#### **Session summary**

This session on challenging areas of measurement covers price behaviour in online markets, the impact of quality adjustment and a review of substitution bias. The first research, conducted by Waseda University and University of Tokyo, using data from South Korea to empirically examine price levels, price stickiness, and price dispersion in online markets by comparing online and offline prices for the same products. The next research covers the impact of quality adjustment on consumer price inflation on a macrolevel looking at Germany, but also examine the effect of quality adjustment methods in the Euro area based on micro price data for washing machines. The Deutsche Bundesbank conducted the research. The third research is a joint research NSI Austria,

Bank of Italy, Bank of Austria and ECB, investigating measurement bias from quality adjustment in Austria and Italy. The last research, conducted by the IMF, is discussing substitution bias considering the economic approach and introducing the consumer inventory models.

During session 7, Carsten Boldsen Hansen from UNECE promoted the Meeting of the Group of Experts on CPI that will take place in Geneva in 2023. Heidi Ertl, Statistics Canada, informed about the next meeting of the Ottawa group that will take place in Ottawa in 2024.

### **Price Setting in Online and Offline Markets Evidence from Korea**

Kozo Ueda | Waseda University, Kota Watanabe | Canon Institute for Global Studies, Tsutomu Watanabe | University of Tokyo

The paper, presented by Tsutomu Watanabe, empirically examined how the spread of online transactions has affected price levels, price stickiness, and price dispersion in online and offline markets. The research is based on data provided by a South Korea's leading multinational conglomerate corporation, with department stores, supermarkets, drugstores, electronics stores, convenience stores, etc. under its umbrella.

The dataset contains offline and online prices for unique products available both through offline and online channels. The data set contains both list and transaction prices, thus giving information of customer/transaction-specific price discounts, referred to as "personalized discounts."

One of the main findings is that online prices tend to be lower, more flexible, and less dispersed than offline prices. Dispersion of offline prices for those products available both offline and online is smaller than that for those products available only offline, suggesting the presence of the convergence of prices at various offline shops of a particular product to the corresponding online price. This convergence can be regarded as evidence supporting the presence of the Amazon effect; prices offered at various offline stores would converge to online prices, thus reducing the price dispersion across offline stores. Another main finding is that personalized discounts are, on average, greater for online transactions, and their dispersion across transactions is also greater for online transactions.

Questions raised during the discussion covered whether a democratic CPI is to be preferred to a plutocratic CPI and how we should treat personal discounts in the future.

### **Estimating the Impact of Quality Adjustment on Consumer Price Inflation**

Jan-Oliver Menz, Elisabeth Wieland, Jens Mehrhoff | Deutsche Bundesbank

This paper, presented by Jan-Oliver Menz, focus on the impact of quality adjustment (QA) on consumer price inflation in Germany and the Euro area. The research is based on both micro and macro price data and emphasises the following facts. First, for Germany, QA applies to a large range of goods and services but, on average, price adjustments due to quality changes reduces headline inflation only by 0.06 percentage points, which is balanced out by an increase due to quantity adjustment (e.g., a smaller package size) of the same amount. Second, the research estimate, that the impact of quality adjustment varies between  $\pm 0.2$  and 0.6 percentage points for headline inflation and between  $\pm 0.3$  and 0.8 percentage points for core inflation. Controlling for income differentials between countries, the impact of QA is reduced up to  $\pm 0.2$  for headline inflation and  $\pm 0.1$  to 0.3 for core inflation.

The impact of heterogeneous QA methods in the Euro area is analysed at product level based on GfK data for washing machines for the period 2000 to 2005. The main finding is that Euro area inflation of washing machines would have been between 2 and 4 percentage points lower if prices had been quality-adjusted in the same way across countries. Overall, the estimate of the impact of heterogeneous QA methods on euro area inflation is quite substantial and of similar magnitude in comparison to measurement biases in the HICP due to substitution or the lack of owner-occupied housing. Hence, this would call for a further harmonization of QA methods across member states to reduce or eliminate their impact on euro area inflation. More efforts should be made to quantify both the size and the direction of the impact of quality adjustment in Euro area inflation with greater accuracy, such as regularly done by Statistics Sweden. Concerning future research, it would be worth to repeat this exercise with more recent micro price data, importantly by covering more euro area countries and a larger set of products and even services.

During the discussion it was suggested that price collectors tend to choose match prices when doing replacements rather than the most sold variant that may differ in price. Another question raised was the calculation of the matched model index as this is not an optimal approach when using scanner data for items with high “churn”.

### **Is there a measurement bias from quality adjustment in Austria and Italy?**

Bernhard Goldhammer | ECB, Cristina Conflitti | Banca d'Italia, Fabio Rumler | Oesterreichische Nationalbank, Michaela Maier | Statistics Austria

The aim of this paper, presented by Bernhard Goldhammer, is to show and demonstrate a new approach for determining a potential measurement bias in the CPI caused by improper quality adjustment (QA). Based on micro data from several selected non-energy industrial goods, the paper analyses whether the QA practices in Austria and Italy happen within reasonable boundaries (corridors) or whether they lead to possible bias in the measurement of item-specific inflation.

Determining a meaningful corridor for quality-adjusted indices also takes care of the impossibility to define quality in an undisputed way and the necessity of subjective judgements by the statistician conducting QA. The results for Austria, that widely use explicit QA, indicate that for most of the products and time periods the QA leads to inflation rates that are lower than when no QA is implemented and higher when QA completely offset the price changes. For some of the products considered, such as bedroom furniture, toothbrush and washing machine, QA is rather small such that resulting inflation rates resemble the case when there would be no quality adjustment. For other products, however, such as sofa set, sink and laundry detergent, QA is so strong to almost compensate the whole price change. Only for PC (in the period from 2013 to 2014) and for electrical razor (in 2016 and 2017) the research finds evidence of excessive QA that overcompensates price changes and should therefore be interpreted with care. However, there is no evidence of systematically overstated QA across many products in Austria that would lead to a bias in the measurement of inflation.

For Italy, where ISTAT mainly use implicit methods of QA, results are reasonable and give no evidence of major QA biases in price indices and inflation rates. However, the official index for the products examined, is except for two cases, close to the lower bound, meaning that the Italian CPI might be close to a minimum of reasonable quality adjusted indices. The differences between the explicit and implicit QA methods used by Statistic Austria and ISTAT eventually calls for more harmonization of QA, sampling, and replacements among euro area countries in the future. The research itself may be a trigger for more microdata-driven studies on QA.

Some remarks during the discussion indicated that the use of “corridors” was more appropriate in the past with less information. Nowadays new methods utilizing transaction data requires different methods when treating quality differences.

## **Le substitution bias est mort, vive le substitution bias**

Jens Mehrhoff | IMF

This research, presented by *Jens Mehrhoff*, introduce a weighted average costs index that is supposed to increase at a systematically lower rate compared to e.g., the Tornqvist index due to dampening effect of stockpiling. The intention of this research is to start the search for a new yardstick for economic indices. Using the assumption of homothetic preferences, the traditional economic approach allows to compile price indices that are free of cross-product substitution bias, using only observable price and quantity data. According the traditional economic approach all income elasticities of demand are unity. However, this fairly restrictive assumption leads to income bias, empirical evidence suggests however that consumers do not buy a second Volkswagen Beetle but rather one Porsche 911 if their income allows.

The more fundamental problem with the economic approach lies in equalling purchases and consumption in any given period. It is a well-established fact that consumers stockpile a product when it goes on sale. For storable products, the economic approach thus suffers from intertemporal substitution bias. The presentation introduced the concept consumer inventory models derived from the large economics and marketing literature. The major difference between the inventory model and the economic approach lies in the intertemporal utility maximization. This means that the utility does not only depend on current prices but also on current inventories (and future expected prices), thus for storable goods, quantity not consumed is kept as inventory for future consumption.

Using scanner data from Dominick’s Finer Foods, seven different types of indices is calculated, including the weighted average costs index based on a so-called consumption price (the average acquisition cost of the items in the inventory) and quantities. The exercise illustrates the differences in formulas and the assumption of prices, e.g., unit value prices, purchase prices, replacement cost, non-sales prices.

Questions raised during the discussion where if we need several types of CPIs in the future and how close is the weighted average costs index to a COLI. Another remark was that this index may work as an economic tool, but not as a CPI used for monetary policy purposes.

## **SESSION 8**

### **CHALLENGING AREAS OF MEASUREMENT (DIGITALISATION AND SHARED ECONOMY) AND QUALITY ADJUSTMENT (Part 2)**

*Chair:* Federico Polidoro | Istat

#### **Session summary**

Two papers were presented: that by Erwin Diewert (Quality Adjustment Methods) was presented in person and that by Kevin Roche, Lance Taylor, Roobina Keshishbanoosy (Applying advanced techniques to the estimation of Multipurpose Digital Devices price indices) was presented remotely by Kevin Roche of Statistics Canada.

The session for its nature was heterogeneous and the topics discussed in the two papers were strongly different. The first one was related to a never ending issue of the consumer prices methodology, whereas the second was focused on one of the most important present challenge for CPI estimation. Anyway both of them deal with crucial aspects at the of the debate of consumer price experts.

#### **Quality Adjustment Methods**

W. Erwin Diewert | University of British Columbia and University of New South Wales

The paper was presented by Erwin Diewert and had as main objective to present a unified approach to the problem of adjusting products for changes in quality by using a consumer perspective. The focus was on how to identify the relative utility of a unit of the new product relative to a unit of the old product when the old product is replaced by a product with similar (but not exactly the same) characteristics.

The attempt carried out by Erwin was to place several quality adjustment methods into a common framework. Taking a consumer demand perspective to the problem of adjusting product prices for quality change, various approaches (mainly three, which two were introduced by Erwin in the presentation) to the problem of quality adjustment are considered as special cases of the general framework. The special cases considered are (i) the use of inflation adjusted carry forward and carry backward prices, (ii) the use of hedonic regressions and (iii) the estimation of Hicksian reservation prices.

The starting point of the reasoning was the definition of the properties of a utility function. Some very interesting conclusions were summarised at the end of the presentation. It is worth to recall that the paper behind the presentation will be the chapter 8 in the forthcoming CPI Theory volume. Unfortunately, there was no so much space for the debate but it was clear the general appreciation the paper that provides a very useful theoretical setting for such a challenging topic as that of the quality adjustment.

## **Applying advanced techniques to the estimation of Multipurpose Digital Devices price indices**

Kevin Roche, Lance Taylor, Roobina Keshishbanoosy | Statistics Canada

The paper was presented (remotely) by Kevin Roche who illustrated the news implemented by Statistics Canada to estimate consumer prices evolution of smartphones, smartwatches and tablets which contribute to the compilation of MDDI (Multipurpose Digital Devices Index). This news was possible for the availability of web-scraped data for the MDDI and adjacent products, that replaced the previous ones collected manually, for a very few brands and with a lot of difficulties to adjust prices for quality differences.

The first part of the presentation was focussed on the data treatment, the second on the weight construction (for retailer and brand), the third part on the data modelling (hedonic imputation, hedonic Time Dummy, Double Machine Learning Time Dummy), the fourth to the aggregation issues, missing covariates (conclusion that no justification to use observations with missing covariates in MDDI) and capping (Uncapped indices preferred to 10% capped because capping led to alteration in trend without appearing to lower volatility).

Indices obtained were discussed at the end together with concluding remarks. The debate, although short, was lively given the importance of the topic. The interventions agreed about the necessity to deal with the issue of estimating CPI for this increasingly widespread in consumers' behaviour category of products, agreeing that crucial challenges are in front of NSOs in this field.

## **Annex B: Summary of the participants' feedback**

A questionnaire was distributed to the attendees in person to collect the feedback about the meeting. For the following statements, it was asked to use this rating scale: 1=Strongly Disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly Agree:

1. The hybrid meeting for the OG2022 was appropriate
2. The length of each session was suitable
3. The items discussed will be helpful in my work
4. I found the papers/presentations useful and will be helpful in my work
5. Attending this meeting was a good investment of my time
6. The organization of the meeting was appropriate
7. The hybrid formula is recommended for the next OG meeting

Afterwards, it was asked to reply to these three questions:

1. What did you like best about the meeting?
2. What areas of the meeting can be improved?
3. What suggestions do you have for future meetings of the Ottawa Group?

The opinions expressed by the participants for the various statements were positioned at the top of the scale (4 and 5, above all). The hybrid mode was much appreciated, even if a strong point was the possibility of having moments of exchange and interaction in presence.

The program also received a lot of support, although for some it was very intense and long, especially on the second day.

As a suggestion for future initiatives it was recommended to include a poster session (this issue was long debated within the Steering Committee, but practical experiences of that in the case of other hybrid events formula tilted the balance towards excluding poster sessions). Finally, the location and organization of the event was positively judged.

## **Annex C – Suggestions for future meetings**

The next OG meeting will be held in Canada and the formula chosen by Statistics Canada and Bank of Canada should be the in-person meeting. The standard formula of a meeting in person encourages the occasions of informal interactions and exchange of views that are so important in such a meeting. Moreover, it allows to have one or more poster sessions that would allow to enlarge the number of papers and participants.

But it is also important to stress - borrowing from the 2022 Rome experience – that the hybrid formula, whenever feasible, not only does not discourage the participation, but is instead very inclusive, allowing for the participation of the experts who are not able to travel, hence widening the room and the possibility to contribute to the debate. Also last-minute defections could be accommodated thanks to the hybrid formula, leaving the original agenda unaffected. It has however to be said that the hybrid format has some limitations in terms of time constraints due to the time lags. This means that, as in the case of the meeting in Rome, the meeting should last at least four days (better five, if the venue allows) and that the agenda is more difficult to be setup to allow the speakers who intervene remotely not to be forced to act too early in the morning or too late in the night. As a whole, if we put on a scale advantages and disadvantages of the two formats, it seems that the hybrid prevails for a while.

The composition of the agenda is another important challenge. Among the topics included in the call for papers, which are discussed and established by the Steering Committee, some bring more attention and receive more proposals of paper, producing, as a consequence, the need to split some topics in more than one session (as it was in the meeting held in Rome). For example, “new data sources and new techniques to compile price indices, including the implications on index formulas” brought a lot of attention and 16 papers related to that topic were selected. Maybe a more detailed specification of the topics could allow a better management of the agenda, with a closer relation between topics and sessions.