

The Ottawa Group on Price Indices

19th Meeting of the Ottawa Group

Statistics Poland, Narodowy Bank Polski,
Warsaw School of Economics

Warsaw, 13–15 May 2026

Meeting Report



Introduction

Statistics Poland, Narodowy Bank Polski and Warsaw School of Economics (SGH) hosted the 19th meeting of the Ottawa Group on Price Indices, which took place May 13-15, 2026 in Warsaw, Poland.

The meeting took place in the Warsaw School of Economics. Presenters and speakers were present in person. Participants who were unable to travel to Warsaw were able to follow the meeting virtually and ask questions via chat.

Over 130 on-site and over 50 online participants represented almost 50 countries. There were representatives of almost 40 national statistical offices, 10 central banks, approximately 10 academic institutions, 10 other organizations and independent participants.

The summary of the 19th meeting

The invitation and call for papers for the meeting outlined nine topics for discussion. These topics formed the basis of the meeting's agenda, which was structured into nine thematic sessions, an information session, a poster session and a panel discussion. The sessions, along with their respective chairpersons, are listed below.

Session number	Session title	Chairperson
1	Conceptual frameworks (modernisation of the CPI)	David Fenwick (International Price Statistics Expert, United Kingdom)
2	Conceptual frameworks (multilateral indices)	Jan de Haan (International Price Statistics Expert, Netherlands)
3	New data sources (cheapflation and product contributions)	Federico Polidoro (World Bank, Italy)
4	Econometric approach (hedonic indices)	Rob Cage (Bureau of Labour Statistics, United States of America)
5	Housing statistics (OOH, HPI)	Corinne Becker (Federal Statistical Office, Switzerland)
6	Conceptual frameworks (contributions to inflation, comparing index series)	Kevin Fox (University of New South Wales, Australia)
7	AI-QA (Machine Learning, Large Language Models)	Karol Szafraniek (Narodowy Bank Polski)
8	Challenging areas of price measurement (inflation in clothing, footwear and food)	Randi Johannessen (Statistics Norway)
9	Index number formulae (elementary and superlative indices)	Patrick Kelly (Statistics South Africa)
Info session		Jacek Białek (Statistics Poland, University of Łódź)
Poster session		
Panel discussion	Modern price measurement, new data sources, the retail revolution - challenges and perspectives of different stakeholders	Moderator: Jan de Haan (International Price Statistics Expert, Netherlands) Experts: • Marek Cierpiął-Wolan (President of Statistics Poland) • Magda Ciżkowicz-Pękała (Narodowy Bank Polski) • Erwin Diewert (University of British Columbia, University of New South Wales, Canada/Australia) • Federico Polidoro (World Bank, Italy) • Tanya Flower (Office for National Statistics UK)

Thirty four papers were presented for discussion in the plenary sessions and 16 papers were presented in a poster session. The poster session offered the opportunity to learn about the findings from all papers not selected for the plenary sessions given the very high number of excellent submissions. An additional valuable point on the agenda was a panel discussion with the participation of experts.

Papers were 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 price index methodologies. The summary of the sessions is presented in Annex A.

Participant reports indicated very positive opinions on various aspects of the meeting.

The success of the meeting was possible thanks to the involvement of:

- the Steering Committee (OGSC) members for their assistance in planning this meeting;
- the authors for presenting findings from their research, for the quality of their papers as well as for their valuable contributions to discussions;
- session chairs for leading the discussions and providing input to the meeting report;
- all participants for the fruitful discussions and feedback;
- the representatives of Narodowy Bank Polski, Statistics Poland and Warsaw School of Economics (SGH) for their help in organizing the meeting, social programme (NBP) and for the support they provided to participants.

The next meetings

The next Ottawa Group meeting will be hosted by Statistics South Africa and will take place in May 2028 in Pretoria. Possible topics for discussion at the next meeting include a continuation of the topics discussed at this year's meeting:

- new data sources to compile price indices (scanner/web-scraped data; quality adjustment);
- index numbers formulae;
- housing statistics (residential and commercial);
- challenging areas of price measurement (e.g. services);
- conceptual frameworks (index number formulae; multi-purpose price statistics).

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

At the end of the Ottawa Group meeting, participants were also informed about the Meeting of the Group of Experts on Consumer Price Indices in 2027.

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Annex A: Summary of the sessions

Opening speech

Representatives of Statistics Poland, the Narodowy Bank Polski, and the Warsaw School of Economics welcomed the participants of the meeting. The Ottawa Group's unique role was emphasized. Price indices are not just statistical data, but essential public goods. Price collection and inflation measurement are facing both new opportunities and new challenges—for example, in the context of recent shocks. The work conducted within the Ottawa Group enhances the credibility, comparability, and usefulness of price statistics across countries. The Narodowy Bank Polski also shared its experience in using granular data and scraped data in economic analyses, pointing out their informative capacity and utility for the central bank.



Session 1

Conceptual frameworks (modernisation of the CPI)

Chairperson: David Fenwick

1. W. Erwin Diewert, Chihiro Shimizu – *Challenges in Consumer Price Index Construction*
2. Vanda Guerreiro, Ken Van Loon – *Measuring Inflation for Different Income Groups: An Exercise Towards a Harmonised European Approach*
3. Satoshi Morimoto – *Further Expansion of the Use of Alternative Data in Japan's Consumer Price Index (Tentative)*



The first session was devoted to current methodological challenges in consumer price statistics. A common theme across all presentations was the need to adapt traditional price measurement methods to increasingly complex market conditions, the growing availability of microdata, and the rising expectations of users towards official statistics.

The opening presentation by Erwin Diewert addressed the main approaches to price index theory and indicated that the classical theory of bilateral indices does not solve many of the problems encountered in practice, particularly in the presence of missing prices, the introduction and disappearance of products, and dynamic quality changes. Next, the Eurostat team outlined experimental work on measuring inflation across different household income groups. The final part focused on Japan's experience in expanding the use of alternative data sources in the CPI, notably online data, scanner data, and rental market data.

Challenges in Consumer Price Index Construction

W. Erwin Diewert, Chihiro Shimizu

Delegates recognised the significant progress made in CPI research and practice over recent years, but acknowledged the problems confronted by compilers as reflected in the paper presented by Erwin Diewert. Diewert's paper, *Challenges in Consumer Price Index Construction* (W. Erwin Diewert, Chihiro Shimizu), reviewed the problems associated with the use of scanner data at the first stage of aggregation, most particularly, the chain drift problem and the lack of matching problem. Discussions took place in the context of an overview of the four approaches to bilateral index number theory: the basket approach; the stochastic approach; the test approach; and the economic approach. The discussions were wide-ranging covering a number of problems accentuated by high frequency scanner data and web scraped information, problems associated with discontinuities and dynamic patterns in consumer purchases, including chain drift, and the continuous churn of products and services on offer. Delegates accepted that there remained a number of problems that need to be addressed. During

discussions a number of references were made to the Consumer Price Index Manual: Theory, 2025, which is available on the IMF's website. It was suggested that Diewert's paper would be a useful annex to the manual.

Measuring Inflation for Different Income Groups: An Exercise Towards a Harmonised European Approach

Vanda Guerreiro, Ken Van Loon

The paper, *Measuring Inflation for Different Income Groups: An Exercise Towards a Harmonised European Approach*, by Vanda Guerreiro and Ken Van Loon on measuring inflation for different income groups also led to a great deal of discussion. Delegates were interested in the research results which showed significant variations in the inflation rates for different income groups. A number of comments were made concerning the volatility of the research results over time, including what appeared to be a cyclical effect particularly when owner-occupied housing was included. The marked differences between countries were also commented on. The inclusion of household cost indices in the analysis provided an additional insight. Delegates suggested that inflation rates by income would provide a very useful analytical tool to increase understanding of inflation as well as to be used as a benchmark for policy formulation, for example for the setting of social benefits. Also raised was the desirability of extending the analysis from income to other household types including pensioner households. The latter have very different spending patterns to other households. For example, they will purchase relatively small quantities and are less likely to do online shopping.

Further Expansion of the Use of Alternative Data in Japan's Consumer Price Index

Satoshi Morimoto

The final paper, *Further Expansion of the Use of Alternative Data in Japan's Consumer Price Index*, was by Satoshi Morimoto and reviewed the use of alternative data sources in Japan's Consumer Price Index, most particularly scanner and web scraping data. It was noted that currently alternative data sources were used to obtain information on a diverse range of products from personal computers to airplane fares and hotel charges. This contrasted with most statistical offices that restricted the use of these data sources to a more narrowly focused set of products. In addition, consideration is being given to using data from three major rental housing management companies to compile indices relating to private rental accommodation. Delegates discussed the motivation behind this change, most particularly the comparative advantages in terms of obtaining better data and of obtaining data at a lower cost. Also, the issue was raised as to whether in some cases the same data sources could also be used to construct weights, thus increasing the coherence of the CPI data whilst accepting this could be at the cost of a deviation from the correct coverage. Much material was presented and other challenges discussed were the need to keep specifications up-to-date particularly when there is a high rate of churn in the marketplace, whether looking at matched pairs or undertaking hedonics, the correct identification of outliers and resilience in data sources. Much of the work described in the paper was work in progress and delegates expressed an interest in being informed of the final outcome of this major research stream.

The discussion following the three presentations was extensive and concerned both theoretical issues and practical limitations related to the use of new data sources. One of the first important topics concerned the possibility of assigning transaction data to household income groups. A representative from Norway pointed out that scanner data usually do not contain information on the purchaser's income. In order to construct product samples specific to income groups, it would be necessary to use transaction-level data linked to households and subsequently linked to income information. However, such a scope of data raises serious issues related to privacy and personal data protection. Reference was made to the Norwegian experience, where attempts to obtain very detailed transaction data met

resistance from data protection authorities because such data would make it possible to reconstruct what a specific individual had purchased in a specific store and at a specific time.

In response, the Eurostat representative explained that the ongoing work does not assume a direct linkage between scanner data and purchaser income. Instead, the approach attempts to use knowledge derived from household surveys, consumer studies, and literature on food and purchasing behaviour in order to assign specific product segments to income groups indirectly. The approach is therefore probabilistic and analytical rather than based on direct identification of consumers. Transaction data provide a large number of price and product observations, while information on the behaviour of income groups comes from other sources.

Another topic concerned the relationship between purchases and consumption. In a question submitted online, it was noted that the economic approach often equates purchases with consumption within a given period, which may lead to intertemporal substitution bias. Consumers may purchase products in advance, use inventories, or shift purchases over time in response to promotions and price expectations. In response, it was stated that this is a fundamental problem for which no simple solution exists. In practice, price statistics often rely on the assumption of separability and operate using data available for specific product groups, such as food, even though consumer purchasing decisions are part of a broader budgetary and intertemporal framework. This discussion clearly demonstrated that even highly advanced index methods must rely on simplifications.

A question arose regarding the purpose of experimental inflation indices by income group. The question concerned whether these indices are intended to become part of regular HICP production in the future or rather serve as an analytical tool. In response, it was explained that the current work remains experimental and analytical in nature. Its purpose is to improve understanding of differences in inflation experiences across households and to provide information useful for social policy. At the same time, efforts were made to replicate the current HICP methodology as closely as possible, since any potential future use of these statistics would require consistency with the existing system.

In the same intervention, attention was drawn to the limitations of the Household Budget Survey. The HBS sample is often not sufficiently large to produce stable estimates of detailed expenditure structures when divided into socio-economic groups. With deeper disaggregation, problems of small sample sizes and unstable weights emerge. In response, it was indicated that this is one of the major limitations of the current work. Therefore, the tested approach assumes the use of HBS data at the lowest possible, but still stable, level of aggregation, combined with other data sources, including large transaction datasets.

With regard to the Japanese presentation, a question was raised as to why work with alternative data sources had started with technological products, which are particularly difficult from the perspective of quality changes, rather than with simpler products such as food. In response, it was explained that technological products are an area where rich online data are available, while at the same time there is a strong need for improved measurement of quality and price changes. For this reason, an approach based on fixed specifications was developed. At the same time, it was noted that Japan plans to further expand the use of scanner data to food and other everyday consumer products.

An important contribution to the discussion concerned the possibility of separating the weight effect from the price effect in experimental indices for income groups. It was noted that the use of price segments represents an innovative way of partially addressing the absence of purchaser income information, but that it would be valuable to determine what proportion of the differences between groups results from expenditure weights and what proportion results from differences in prices and products themselves. For example, it was proposed to compare the weights of the lowest income group with the prices of product segments typical for the highest income group in order to better decompose the differences. In response, it was indicated that such an exercise had not yet been carried out, but could become a valuable direction for future work.

The issue of using loyalty card data as a potential source of information about home purchases was raised. It was noted that, in theory, loyalty card data could help link purchases with specific types of households. In response, it was explained that such an approach had already been considered, for example by asking Household Budget Survey participants to provide loyalty card identifiers instead of manually recording purchases. Such a model could reduce respondent burden, but would require close cooperation with retail chains and resolution of legal issues. At the same time, it was noted that loyalty cards themselves are becoming a source of price differentiation, since loyalty card users may pay different prices from other customers. This means that the inflation experienced by loyalty card users may differ from that experienced by consumers without such cards.

The discussion also addressed the issue of communication with users. Eurostat stressed that publishing many different measures of inflation may lead to misunderstandings. Therefore, experimental work aims to maintain maximum consistency with the existing HICP methodology. The objective is not to create a competing index, but rather to provide supplementary analytical information enabling better interpretation of the effects of inflation on different household groups.

In the final part of the discussion, the issue of rents and housing costs returned once again. It was noted that the share of housing expenditure may differ significantly between low-income and high-income households, while the current HICP coverage does not fully include owner-occupied housing costs. This is particularly important when analysing inflation by income groups, since housing is one of the most important expenditure categories for households. The Eurostat representative acknowledged that this is one of the greatest methodological challenges. She noted that separate work on rents and the OOH (Owner-Occupied Housing) index is ongoing, but that at the current stage it is still difficult to propose a clear solution. For this reason, work began in an area where data are more readily available, namely food and transaction data.

With regard to Japan, a question was asked about the representativeness of rental data obtained from property management companies and about the difference between rents in new contracts and rents actually paid under ongoing contracts. In response, it was explained that the Japanese work includes data from large property management companies and that one of the analysed issues is precisely the distinction between asking rents or new contract rents and rents paid in existing contracts. It was emphasised that data on actual rents paid are significantly more valuable for CPI purposes than asking price data from online portals.

Session 2

Conceptual frameworks (multilateral indices)

Chairperson: Jan de Haan

1. Kevin J. Fox – *The Curious Case of an Exploding GEKS Index*
2. Ludwig von Auer – *Multilateral Index Methods: A Test Approach with Scanner Data*
3. Helen Sands, Tony Liu – *Are Multilateral Methods the Holy Grail of Price Measurement? A Critical Examination of Their Promises and Practical Performance in Dynamic Datasets*



The second session of the meeting was devoted entirely to the issue of multilateral indices, which in recent years have become one of the key areas of methodological development in price statistics. In contrast to the first session, where the discussion was dominated by a broad perspective on index theory and its limitations, the discussion here was more focused – concentrating on the specific properties of multilateral methods, their behaviour in scanner data, and their practical implications for official statistics.

The presentations clearly demonstrated that although multilateral methods are often perceived as a natural response to the challenges posed by high-frequency and highly detailed data, their practical behaviour is much more complex than theory alone would suggest. In particular, three interrelated problems became evident: sensitivity to data structure, the importance of implementation decisions, and the difficulty of unambiguously assessing the quality of methods.

The Curious Case of an Exploding GEKS Index

Kevin J. Fox

The first presentation served as the starting point for the entire session, as it challenged one of the assumptions accompanying the use of multilateral methods – their stability. Kevin J. Fox focused on analysing the behaviour of the GEKS index, one of the most commonly used solutions in price statistics practice, particularly in the context of scanner data.

The starting point was the observation that the Fisher and Törnqvist indices, which in a bilateral framework are very similar and often treated as interchangeable, may behave very differently in their multilateral versions. While GEKS-Törnqvist demonstrates high stability, GEKS-Fisher may be vulnerable to sudden changes in value that do not result from overall price dynamics, but rather from individual observations in the data.

A key element of the analysis was the demonstration that the construction of the GEKS index – based on averaging price relationships between all pairs of periods – causes the influence of a single atypical

observation to become “propagated” throughout the entire index system. As a result, a phenomenon described as an “index explosion” may occur, meaning a sudden and unnatural jump in the index value.

Empirical examples showed that the source of the problem may be individual products with extreme prices or unusual sales structures. In scanner data, such cases are not uncommon and may result from promotions, recording errors, packaging changes, or the introduction of new products. In the classical bilateral approach, their influence is limited to a specific comparison, whereas in multilateral methods they may affect the entire comparison system.

The conclusions from this presentation were highly important for the subsequent discussion. First, they demonstrated that the choice of index formula (Fisher versus Törnqvist) also matters in the context of multilateral methods. Second, they highlighted the need for more rigorous control of input data and the identification of outlying observations. Third, they challenged the belief that GEKS methods are by definition stable and resistant to data-related problems.

Multilateral Index Methods: A Test Approach with Scanner Data

Ludwig von Auer

The second presentation shifted the discussion to a more fundamental level – the problem of assessing the quality of price indices. Ludwig von Auer pointed out that the main difficulty in this field is the absence of an observable “true” price index that could serve as a benchmark. As a result, most analyses rely on comparing different methods with one another, which does not allow for a clear determination of which method is closer to reality.

To address this problem, an innovative approach was proposed involving the construction of a synthetic benchmark based on real data. The key element was so-called “mirroring”, meaning the extension of the dataset in such a way that its second half becomes a reversal of the first. As a result, prices and quantities return to their initial levels in the final period, allowing direct testing of the chain drift phenomenon.

The application of this method enabled a systematic analysis of various multilateral indices and – importantly – different methods of linking them over time (splicing). The results showed that, with an appropriate choice of splicing method, the problem of chain drift can be practically eliminated. At the same time, differences between the indices themselves (GEKS, GK, TPD, etc.) proved to be relatively small.

This conclusion had important implications for statistical practice. It suggests that the key methodological decisions no longer concern only the choice of index formula, but above all the method of implementation. In particular, the way successive time windows are linked may have a greater impact on the final result than the index construction itself.

The speaker also drew attention to the operational aspect. More complex methods do not always produce significantly better results than simpler solutions, while being substantially more computationally expensive. In the context of official statistics production, this implies the need to seek a compromise between accuracy and feasibility.

Are Multilateral Methods the Holy Grail of Price Measurement? A Critical Examination of Their Promises and Practical Performance in Dynamic Datasets

Helen Sands, Tony Liu

The third presentation provided a synthetic and at the same time critical perspective on the role of multilateral methods. The authors posed the question of whether these methods can truly be regarded as the ultimate solution to price measurement problems, or rather as one of many tools that also has its own limitations.

The starting point was the characterisation of modern scanner data: high product turnover, short product life cycles, variability of prices and weights, and strong seasonality. Under such conditions, classical bilateral indices lose their desirable properties, which justifies the development of multilateral methods. However, as demonstrated, these methods are not immune to all problems.

Particular attention was devoted to products that appear only for a short period. Depending on the method applied, their impact on the index may differ substantially. GEKS-Törnqvist tends to “smooth” their influence, whereas methods such as WTPD may reflect it more strongly, especially when such products have high expenditure shares.

An important element of the analysis was also the role of the time window. It was shown that the choice of window length and the way in which the window is rolled forward may influence not only the level of the index, but also its interpretation. Even small changes in window construction may lead to significant differences in results, posing a challenge for the stability of indices published in official statistics.

The authors emphasised that multilateral methods are highly useful, but do not eliminate the need for methodological decisions. In particular, they require conscious choices regarding parameters such as window length, splicing method, and the treatment of short-lived products.

The discussion following the three presentations was highly coherent and concentrated around one fundamental issue: whether multilateral methods truly solve price measurement problems or rather shift them to another level.

One of the main themes concerned the stability of indices. The presentation by K. Fox demonstrated that even widely used methods may be vulnerable to data anomalies. Consequently, the importance of data pre-processing procedures, identification of outlying observations, and stability testing was strongly emphasised.

A second important theme concerned the role of implementation. The presentation by L. von Auer clearly demonstrated that the way indices are linked over time may be crucial for eliminating chain drift. The discussion stressed that such decisions are often treated as merely technical, whereas in reality they are fundamental for the quality of results.

A third element was reflection on the relationship between theory and practice. Multilateral methods possess very strong theoretical properties, such as transitivity, but their behaviour in real-world data depends on many factors not captured in theoretical models. In particular, data structure, product turnover, and weight variability may influence results in ways that are difficult to predict.

Finally, the need for further empirical research was emphasised. All presentations indicated that testing methods on real data – rather than analysing only their theoretical properties – is essential for further methodological development. Particularly important is the development of testing standards and guidelines for the practical application of multilateral methods.

Session 3

New data sources (cheapflation and product contributions)

Chairperson: Federico Polidoro

1. Espen Kristiansen, Sebastian Kolstad, Kjersti Nyborg Hov – *Assessing Cheapflation using Norwegian Scanner Data*
2. Federico Crescenzi, Gholamreza Hajargasht, Tiziana Laureti, Luigi Palumbo, D.S. Prasada Rao – *Cheapflation and Inflation Inequality: Quantile Time Product Dummy Indices from Italian Web Prices*

3. Jacek Białek – *Multiplicative Decompositions of GEKS-type Indices into the Contribution of Individual Commodities*
4. Deepti Srivastava – *Use of Administrative and Web Data in Comprehensive Updation of Indian CPI*



The third session of the meeting focused on the use of new data sources in inflation analysis and on deepening the understanding of inflation structure. Unlike the previous sessions, which concentrated primarily on the construction of indices and their theoretical properties, this session shifted the focus towards the interpretation of inflationary processes and the identification of their sources. Particular attention was devoted to the phenomenon of cheapflation, i.e. differences in price dynamics depending on product price levels, as well as to the possibility of decomposing inflation into the contributions of individual products.

All presentations shared the view that the traditional inflation index – although still essential – is not sufficient to describe contemporary price processes. New data sources, such as scanner data and online data, allow for much more detailed analysis, but at the same time require new methodological tools and new ways of interpreting results.

Assessing Cheapflation using Norwegian Scanner Data

Espen Kristiansen, Sebastian Kolstad, Kjersti Nyborg Hov

The first presentation concerned an empirical analysis of the cheapflation phenomenon based on Norwegian scanner data. The speakers attempted to answer the question of whether cheaper products actually experience faster price growth than more expensive products, and what the implications of such a phenomenon are for inflation measurement.

The analysis was based on a very broad dataset covering almost the entire Norwegian food retail market, which made it possible to obtain high-quality results. One of the main methodological challenges, however, was the definition of “cheap products”. Several approaches were applied for this

purpose, ranging from classifications based on brands, through price rankings within categories, to more advanced product grouping methods.

The results clearly indicated that cheapflation exists and is significant in scale. The cheapest products exhibited higher price dynamics than more expensive products, and these differences were substantial and stable over time. At the same time, it was observed that the magnitude of the effect depends on the methodology adopted and the way products are classified.

The later part of the presentation attempted to provide an economic interpretation of the results. It was pointed out that households respond to rising prices by changing the structure of purchases and shifting towards cheaper products (“trading down”). However, the possibilities for such adjustment are limited, especially for low-income households that already consume products from the lowest price segment. As a result, cheapflation may contribute to increasing inflation inequality.

Cheapflation and Inflation Inequality: Quantile Time Product Dummy Indices from Italian Web Prices

Federico Crescenzi, Gholamreza Hajargasht, Tiziana Laureti, Luigi Palumbo, D.S. Prasada Rao

The second presentation developed the issue of cheapflation within the broader context of inflation inequality and the limitations of standard inflation measurement methods. The authors pointed out that the traditional CPI describes only the average change in prices and does not account for variation across the price distribution.

In response, they proposed the use of a quantile model (quantile TPD), which makes it possible to analyse price dynamics in different parts of the price distribution. This approach allows differences between product segments to be captured, which remain invisible under standard methods.

Application of this method to online data showed that inflation is not homogeneous. In particular, prices of cheaper products may increase faster than prices of more expensive products, confirming the cheapflation phenomenon. Importantly, these differences occur even within the same product categories, meaning that two households purchasing similar goods may experience different inflation rates.

The conclusions from this presentation had important implications for the interpretation of inflation. The authors emphasised that inflation may have a regressive character and place a greater burden on lower-income households. Consequently, there is a need to develop analytical tools capable of better capturing inflation heterogeneity.

Multiplicative Decompositions of GEKS-type Indices into the Contribution of Individual Commodities

Jacek Białek

The third presentation concerned the problem of interpreting multilateral indices through decomposition of their values into the contributions of individual products. The speaker proposed a multiplicative decomposition method consistent with the construction of GEKS-type indices and enabling analysis of the sources of price changes.

The proposed approach makes it possible to determine which products or product groups have the greatest impact on index changes and how their importance evolves over time. This is particularly important in the context of scanner data, where the number of observations is very large and the structure of the index is difficult to interpret.

The presentation emphasised that the development of index methods should be accompanied by the development of interpretative tools. Even the most advanced index does not provide complete information if the sources of its changes cannot be identified.

Use of Administrative and Web Data in Comprehensive Updation of Indian CPI

Deepti Srivastava

The final presentation had a practical character and concerned the use of administrative and online data in the revision of the CPI in India. A broad range of new data sources incorporated into the statistical process was presented, including fuel prices, public service tariffs, and data from online platforms.

The implementation of these solutions made it possible to significantly expand data coverage and improve data quality. At the same time, it was shown that this process requires substantial organisational and technological changes, including the use of digital tools for data collection and validation.

The presentation demonstrated that new data sources are no longer merely the subject of experimental research, but are becoming part of regular statistical production. At the same time, their use requires a cautious approach and methodological adaptation.

The discussion following the presentations focused primarily on the interpretation of the cheapflation phenomenon and its implications for inflation measurement. It was emphasised that analytical results are highly dependent on the adopted definition of “cheap products” and on the level of data aggregation, which makes international comparisons difficult.

An important theme was also the issue of inflation inequality. The discussion confirmed that differences in inflation between households arise not only from expenditure structures, but also from price differences within the same product categories. It was pointed out that new data sources allow these phenomena to be captured more effectively, but at the same time require new analytical methods.

With regard to index decomposition, its potential for inflation analysis was emphasised, particularly in the context of communicating results. At the same time, the need for further work on standardisation of these methods was highlighted.

Finally, in the context of using new data sources, attention was drawn to challenges related to their integration and to ensuring quality and representativeness. It was stressed that although new data sources significantly increase analytical possibilities, they do not eliminate fundamental methodological problems.

Session 4

Econometric approach (hedonic indices)

Chairperson: Rob Cage

1. Naohito Abe, D.S. Prasada Rao – *Commensurability in Hedonic Price Indices: The Necessity of Log Transformations*
2. Patrick Kelly, Sabelo Nkosi – *Brick by brick: Building a Hedonic model for South Africa’s Residential Property Price Index*
3. Sebastian Weinand, Stefan Hofbauer – *Econometric approaches to separate land prices from the prices of structures*



The increasing availability of scanner and web-scraped data means that price comparisons must be constructed from unbalanced data where the set of goods varies across time and space. The findings of the first presentation suggest that hedonic and imputation-based methods are best suited to relatively homogeneous product groups where unit comparability can be controlled, and they highlight the need for explicit commensurability checks in applied price measurement.

The starting point for the next presentation was that the 2008 Global Financial Crisis had highlighted critical data gaps, prompting the G20 Data Gaps Initiative to prioritise Residential Property Price Indices (RPPIs) for national statistical systems. While many countries developed RPPIs in the following decade, South Africa only began to investigate the development of a RPPI in 2016. A rolling window time dummy hedonic regression model was adopted as the optimal method for compiling the RPPI.

In the third presentation it was pointed out that the cost for owner-occupied housing is not included in the HICP. Practical and conceptual challenges hamper a harmonised inclusion among the countries in the European Union. One issue is the decomposition of housing prices into land and structure components, as it is conceptually only the structure that is often regarded as consumption.

Commensurability in Hedonic Price Indices: The Necessity of Log Transformations

Naohito Abe, D.S. Prasada Rao

The first presentation focused on empirical quantification of the effects of failure of commensurability axiom on price indices, based on Japanese beverage scanner data for the period 2017-2021. The increasing availability of scanner and web-scraped data results in data sets with frequent product entry, exit, and quality change between periods, so conventional matched-model index formulas are often no longer adequate. The standard alternative is hedonic adjustment. In practice, two approaches are widely used: the time-dummy hedonic method and the imputation method. But the choice of the price transformation remains unsettled. The findings suggest that hedonic and imputation-based methods are best suited to relatively homogeneous product groups where unit comparability can be controlled, and they highlight the need for explicit commensurability checks in applied price measurement.

Brick by brick: Building a Hedonic model for South Africa's Residential Property Price Index

Patrick Kelly, Sabelo Nkosi

The second presentation concerned the process of developing an official residential property price index for South Africa. The Global Financial Crisis of 2008 highlighted critical data gaps, prompting the G20 Data Gaps Initiative to prioritise Residential Property Price Indices (RPPIs) for national statistical systems. While many countries developed RPPIs in the following decade, South Africa only later began to investigate the development of a RPPI. The project began in 2016 with an unsuccessful attempt to obtain data from the government Deeds Registration Office, due to legal difficulties. Technical support from the IMF made it possible to develop guidelines for the official index, while consultations with users helped to precisely define its scope. The recommendations indicated that credit data should be used as the data source, but banks refused to provide the access. In 2019, the Reserve Bank proposed purchasing information on deeds from a private data provider.

The official RPPI index was published in 2024 for the country as a whole and at regional level. It is based on transaction records lodged with the government Deeds Registration Office via third-party provider, what has the advantage of additional spatial variables essential to the regression model being added. A rolling 13-month window time dummy hedonic regression model was adopted as the optimal method for compiling the RPPI. The characteristics used are property type, floor area in square metres, and location. Seasonal adjustment is applied. During the processing of raw data, a large proportion of records are eliminated, mainly due to the type of buyer not being a private individual or missing information on the buyer or seller. Due to the absence of address information, the data are aggregated by suburb, considered to be homogeneous. The index uses weights by province.

A challenge of the adopted regression model is that it performs optimally with large volumes of data. Thin property markets in certain parts of the country result in volatile indices and large revisions. This constraint limits the ability to produce RPPIs for more granular geographies – a common user request. To address volatility, a Henderson filter is applied for smoothing.

As the data are continuously updated, the RPPI is published with a five-month lag and revised for twelve months. This is due to the slow process of registering deeds after the transaction date, usually resulting in downward revisions, based on 2011–2025 data.

In 2025, amendments to the Statistics Act strengthened its status and made it possible to obtain data directly from the Deeds Registration Office free of charge. Future work will focus on raw data, generating results and enhancing the model with supplementary sources (web scraping, credit data) to improve robustness and geographic detail.

Econometric approaches to separate land prices from the prices of structures

Sebastian Weinand, Stefan Hofbauer

The third presentation focused on the issue of decomposition of housing prices into land and structure components. Currently, the cost for owner-occupied housing is not included in the HICP, as conceptually only the structure is often regarded as consumption. The study focuses on econometric (or hedonic regression) approach, based on 2015–2023 data on sales of detached houses and plots suitable for construction in Austria. In contrast to the typical approach of using exogenous construction costs for this exercise, the land prices are exogenously included in the estimation. To this end, a quarterly land price index is derived for Austria from transactions of plots of land. It was found that different model specifications lead to noticeably different results for the estimated land and structure components, which can be improved by including pure land transactions in the decomposition. It was further shown that the price indices of the two components become more volatile on a monthly basis while the overall trend in prices persists. Following the estimations, land and structure prices have roughly doubled in the period from 2015 to 2022 but started to decrease with the turn in interest rates in the middle of 2022. The period-to-period change rates, however, show unusually high fluctuations,

requiring the model estimations to be accompanied by some smoothening techniques. In line with the findings of related studies in the literature, the net depreciation rate is estimated to be around 1.5% per year.

During discussion following the presentations it was pointed out that multi-family properties are more problematic than single-family buildings with regard to separating land prices from building prices.

An important issue in real estate analysis is the number of available characteristics describing a property (e.g. floor area, number of rooms, location). Bank mortgage agreements were suggested as a potential data source in this context. However, such a source is not always available, and when the available data are insufficiently detailed, other data sources such as web scraping may be used as supplementary information.

It was noted that the possibility of regional disaggregation is often related to sample size and the number of transactions available.

Another frequently discussed issue concerns the large volatility of indices, which may be reduced by applying longer estimation windows or different models. In this context, the detection of outliers is particularly important, since models are often highly sensitive to such extreme values. Attention should be paid not only to extreme prices, but also to atypical property sizes.

An interesting topic was also the price trend observed for certain older buildings, particularly historical properties, which due to their uniqueness may exhibit a different – namely upward – price trend over time.

Another important issue is the highly delayed registration of data after the transaction date, sometimes by as much as one year, which usually necessitates revisions based on more complete datasets. It should be remembered that revisions are based on larger datasets (delayed availability of data), but also the applied models are affected by these more complete datasets.

Info session

Chairperson: Jacek Biatek

1. Anastasios Saraidaris, Sebastian Reinecke – *Implementation of ECOICOP version 2 in the Harmonised Index of Consumer Prices (HICP)*
2. Brian Graf – *Updating the Producer Price Index Manual*
3. Peng Kong, Lijuan Dong, Jiaxiu Jiang, Jiaxin Wang – *CPI in China: Key Updates and Progress*
4. Tanya Flower, Federico Polidoro, Serge Goussev, Collin Brown, Vladimir Miranda, Helen Sands – *Are we FAIR? Using open data and making research projects reproducible in price statistics*
5. Tanya Flower, Federico Polidoro, Serge Goussev, Collin Brown, Vladimir Miranda, Helen Sands – *Summary update from UN Task Team*



Implementation of ECOICOP version 2 in the Harmonised Index of Consumer Prices (HICP)

Anastasios Saraidaris, Sebastian Reinecke

The first presentation provided an overview of the implementation of the HICP transition from the European Classification of Individual Consumption according to Purpose (ECOICOP) to ECOICOP version 2, aligning with the UN COICOP 2018. It presented the key components of the large-scale implementation project. The transition process entailed substantial changes with methodological, IT, operational, and legal aspects for all countries participating in the HICP. Eurostat, in collaboration with the EU Member States, EFTA countries, and enlargement countries, coordinated the necessary actions for the introduction of ECOICOP version 2 in the HICP as of January 2026.

Updating the Producer Price Index Manual

Brian Graf

The second presentation of the representative of the IMF's Statistics Department outlined plans to update the Producer Price Index Manual. The process is planned to start in September 2026 by the Technical Expert Group that will draft the updated version to be later published for review. A separation into Concepts and Methods parts is planned as well as presenting the draft for endorsement by the United Nations Statistical Commission, as in the case of the CPI Manual. The experiences not only of developed economies but also of emerging and developing ones are planned to be taken into account.

CPI in China: Key Updates and Progress

Peng Kong, Lijuan Dong, Jiaxiu Jiang, Jiaxin Wang

The third presentation informed about the improvement work for the CPI in China. The National Bureau of Statistics of China (NBS) has completed the rebasing of China's CPI from the base year of 2020 to 2025, starting from 2026 (adaptation to the latest consumption patterns and composition of goods and services purchased by households). Rebasing is done every 5 years and it takes 2 years to implement. During this rebasing practice other major work, key updates and progress was made:

publishing the weights of 13 main CPI aggregates for the first time, adjusting the CPI classification structure (reflecting the latest consumption trends), expanding survey scope (new items and new retail channels) and optimizing data collection methods (application of big data sources has expanded), further improving accuracy and reliability of weighting patterns (data and feedback from multiple sources). Further improvements are planned: shortening the CPI rebasing interval (to better reflect evolving consumption patterns), monthly real-time updates to representative items and outlets, publication of more detailed weights, enhancing data dissemination and interpretation.

Are we FAIR? Using open data and making research projects reproducible in price statistics

Tanya Flower, Federico Polidoro, Serge Goussev, Collin Brown, Vladimir Miranda, Helen Sands

The fourth presentation informed about a project aiming to simplify the process of reproducibility in price statistics and the use of FAIR data for research. This project is led by workstream 5 of the UN Task Team on Scanner data, part of the UN Committee of Experts on Big Data and Data Science for Official Statistics (UN-CEBD). The idea is to help researchers by providing approachable guidance on how all digital artefacts for their research projects (such as code) can be published openly, as well as help bring together all the open datasets so that input data for projects can be open.

The project site: <https://un-task-team-for-scanner-data.github.io/reproducibility-project/docs/>

Project roadmap: <https://github.com/orgs/UN-Task-Team-for-Scanner-Data/projects/1>

Summary update from UN Task Team

Tanya Flower, Federico Polidoro, Serge Goussev, Collin Brown, Vladimir Miranda, Helen Sands

The fifth presentation of the members of the UN Task Team on Scanner Data outlined the refreshed TT aim focusing on enabling and expanding the practical usage of alternative data sources (including scanner data) in consumer price statistics. Future work will look to develop the wider usage of these data (for example, in household expenditure statistics). The Handbook on utilising new data sources in the production of consumer price statistics, publicly available online since 2024, is being refreshed in 2026 (introductory sections, new feedback form). Work plans for the future include adding/improving methodological guidelines, improving implementation guidance, adding more country case studies, annual updates to include emerging research, introducing code information. Also planned is work on a new Guidance Note that will supplement the existing Chapter 10 on Scanner Data in the 2020 CPI Manual: Concepts and Methods (expanding the scope of the chapter beyond scanner data to include all relevant alternative data sources, e.g. web-scraping). While the CPI Manual consists of information on what and why (e.g. concepts), the Handbook will tell you how (e.g. detailed index methods and implementation variants, practical examples and case studies). Information on training courses was provided (already available and planned for July 2026).

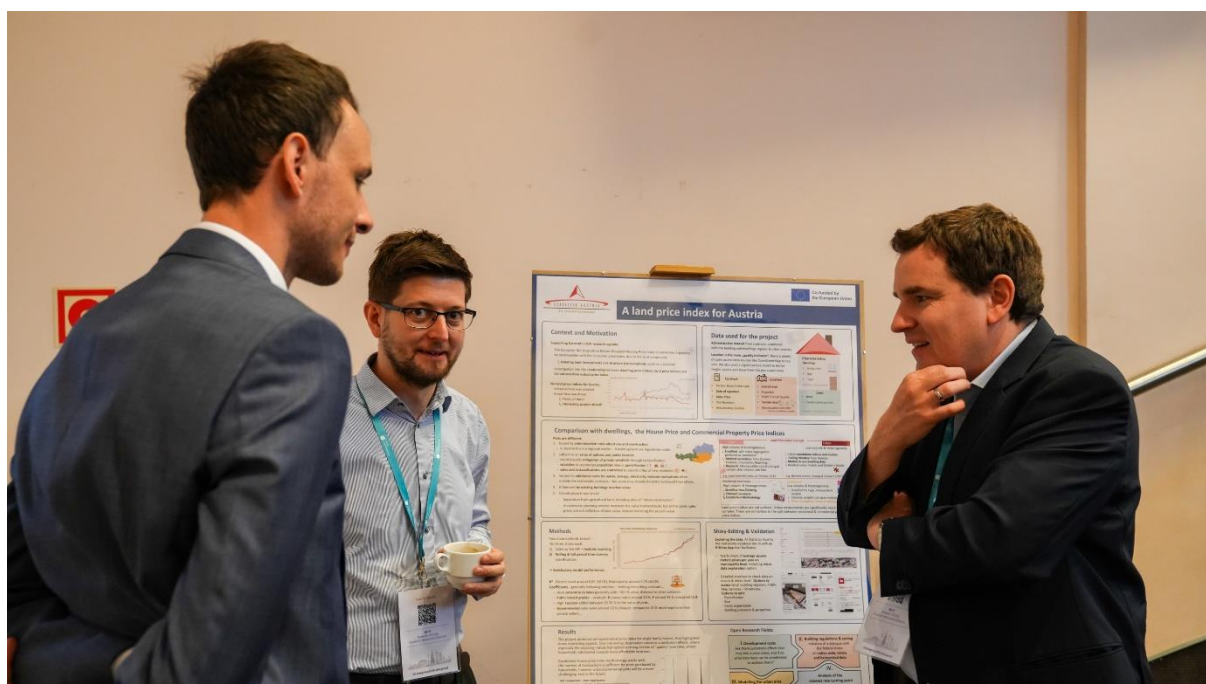
<https://unstats.un.org/wiki/spaces/GWGSD/pages/243073098/Training+material>).

See also poster *UN Task Team on Scanner Data and Alternative Data Sources for CPI compilation – Updates from Work Stream on Training materials*

Poster session

The poster session constituted an important element of the 19th meeting of the Ottawa Group, providing an opportunity to present interesting research work. There were 16 posters that covered a broad spectrum of topics related to modern price statistics, including the use of alternative data sources, web scraping, artificial intelligence, administrative data, imputation methods, and product classification in the environment of large datasets.

Many presentations focused on the practical experiences of national statistical offices related to the modernisation of CPI and HICP production processes and the implementation of new technologies and data sources. Important themes also included data quality issues, process automation and methodological challenges related to inflation measurement under conditions of rapidly changing markets and consumer behaviour.



1. UN Task Team on Scanner Data and Alternative Data Sources for CPI compilation – Updates from Work Stream on Training materials

Tanya Flower, Federico Polidoro, Serge Goussev, Collin Brown, Vladimir Miranda, Helen Sands

The poster presented the current status of work carried out by the UN Task Team on Scanner Data and Alternative Data Sources regarding the development of training materials for price statistics. The

structure of the e-learning programme under development was presented, covering the full process of using alternative data in CPI compilation – from data acquisition and classification, through filtering and index methods, to the integration of data with production systems. Particular attention was devoted to modules on scanner data, web scraping, and practical applications of multilateral methods and programming tools, including Python. The poster also presented the timetable for further work, project governance principles, and the development of the Learning Hub training platform, which is intended to support national statistical offices in implementing modern data sources for consumer price index compilation.

2. Voucher-Induced Seasonality in the Swedish Dental Care Services Price Index

Can Tongur, Olivia Ståhl, Martina Sundström

The poster concerned the impact of transaction data on the measurement of dental care service prices in the Swedish CPI and the issue of artificially generated seasonality resulting from the dental care subsidy system. The authors showed that after switching to transaction data covering actual prices paid by patients, the index began to exhibit strong seasonal fluctuations linked to the annual dental care “voucher” paid in July. This phenomenon did not result from changes in service prices, but from the structure of the subsidy system and the seasonality of dental care utilisation, leading to high month-to-month volatility of the index. The paper also proposed possible approaches to smoothing the index, including neutralising the impact of vouchers in transaction data, in order to reduce artificial seasonality while maintaining high precision of price measurement.

3. Putting windows in the black box: Developing a set of diagnostic and analytical tools to support multilateral price indexes in production

Serge Goussev, Frances Krsinich

The poster concerned the development of a set of diagnostic and analytical tools supporting the use of multilateral methods in the production of official price indices. The authors pointed out that modern methods such as GEKS, TPD, and TDH use very large and complex datasets, making them difficult to interpret and monitor in statistical practice. The paper presented the concept of “opening the black box” through the construction of diagnostic systems covering input data quality control, analysis of product churn, identification of outlying observations, and decomposition of the contribution of individual products to index results. Example analytical dashboards based on Dominick’s data were also presented, together with further development plans involving the extension of tools to TPD and TDH methods and the standardisation of code in the form of an open analytical package.

4. Impact of changes in consumption patterns on the HICP upper-level aggregation error: evidence from the COVID-19 phase and the recent high inflation period

Julika Herzberg, Thomas A. Knetsch, Dilyana Popova, Jannik Schaller, Patrick Schwind, Sebastian Weinand

The poster addressed the issue of upper-level aggregation error in the HICP resulting from changes in consumption patterns and delays in updating weights used for inflation calculation. The authors analysed the COVID-19 period and the high inflation period of 2022–2023, showing that during periods of sharp price changes the classical Laspeyres index may overestimate inflation due to insufficient accounting for consumption substitution. The paper distinguished two sources of error: the representativeness effect (substitution bias) and the effect related to the use of preliminary national accounts data in updating HICP weights. The results showed that in “normal” periods the aggregation error remained small, whereas during high inflation periods the representativeness effect increased substantially, reaching values much higher than in the long-term historical average.

5. Implementing COICOP18 and Reference Year 2020 in the Swedish CPI

Olivia Ståhl

The poster presented the process of implementing the COICOP18 classification in the Swedish CPI, CPIF (CPI with Fixed interest rate), and HICP from 2026 onwards. The authors presented a new common aggregation structure for all inflation measures, the change of the index reference year, and methods for constructing historical time series consistent with the new classification. Particular attention was devoted to two backcasting approaches – micro and macro – and the use of conversion matrices between the old and new COICOP structures. The material also included examples of the impact of revisions on selected product groups and estimates of the effects of methodological changes on inflation indicators.

6. Expansion of Items Subject to Quality Adjustment through the Hedonic Method: New Passenger Vehicles, Microprocessors, and Interchangeable-Lens Cameras

Kentaro Fujii, Mihina Hirota, Yuriko Yamauchi, Ayako Masujima, Yasufumi Gemma

The poster presented the development of hedonic methods used by the Bank of Japan for quality adjustment in producer price indices (PPI). The authors presented the expansion of the range of products covered by hedonic models, including new passenger vehicles, microprocessors, and interchangeable-lens cameras, as well as the use of machine learning methods such as Adaptive Elastic Net to improve the selection of quality-related variables. Particular attention was devoted to incorporating advanced safety systems and autonomous driving functions into vehicle models, allowing more accurate identification of quality differences between models. The poster also presented the application of the Rolling Time Dummy approach for microprocessors and separate modelling of camera bodies and lenses, improving the measurement of quality and price changes in rapidly developing technological segments.

7. More than just systems: Statistics Canada's experience incorporating alternative data into the CPI

Matthew Macdonald, Elspeth Hazell, Serge Goussev, Collin Brown

The poster presented Statistics Canada's experience in implementing alternative data sources into the CPI, focusing not only on statistical methods themselves, but also on the organisational and technological challenges accompanying the modernisation of price statistics. The authors stressed that successful use of alternative data requires appropriate team structures, system architecture, data governance processes, and an organisational culture supporting collaboration and rapid implementation of changes. The poster presented, among other things, the concept of "Data Products", medallion architecture, the use of Reproducible Analytical Pipelines (RAPs), and an organisational approach based on Team Topologies and OKR management. Particular attention was drawn to the need to balance quality improvements resulting from alternative data with the costs, risks, and technical complexity of the entire CPI modernisation process.

8. Using Non-Traditional Data Sources for Nowcasting CPI in Central Bank of Armenia

Tigran Baghdasaryan, Kristine Karapetyan, Gor Lazyan

The poster concerned the use of non-traditional data sources, mainly web scraping, for CPI nowcasting at the Central Bank of Armenia. The authors presented a system for daily monitoring of online prices from five large retail chains, covering approximately 70 million observations and 48 product groups corresponding to nearly 30% of the CPI basket. The material compared the dynamics of online prices

with the official CPI and demonstrated the possibility of rapid inflation estimation and analysis of differences between household groups. It was emphasised that online data allow earlier detection of price changes and may in the future partially replace traditional field price collection, particularly for food and fast-changing consumer products.

9. A land price index for Austria

Stefan Hofbauer

The poster concerned work by Statistics Austria on the development of an experimental land price index and the decomposition of property prices into land and building components. The project was carried out in the context of Eurostat research on Owner-Occupied Housing (OOH) indices, where separating land value from building value could improve conceptual consistency with the CPI. The authors used administrative transaction data combined with building registers, geolocation data, and information on infrastructure and surroundings, applying among other methods hedonic models and time dummy and repricing approaches. The material also highlighted challenges related to land heterogeneity, changes in sample structure following increases in interest rates, and the need to account for local regulations, infrastructure, and spatial policies in constructing land price indices.

10. Ensuring Imputation Accuracy in PPI Compilation: Validations Based on Reported Price Data and Simulations

Issei Morita, Kenta Nomura, Ryo Aruga, Yasufumi Gemma

The poster concerned the evaluation of methods for imputing missing prices in Japanese producer price indices (PPI) compiled by the Bank of Japan. The authors conducted simulation studies comparing the traditional carry-forward method with imputation based on price changes of available products within the elementary aggregate. The results showed that the second method leads to smaller revision errors at the overall index level, particularly during periods of elevated inflation, where classical carry-forward methods may underestimate price dynamics. At the same time, it was noted that for products with very low frequency of price changes, the carry-forward method may still provide better results at the level of individual index items.

11. New data sources in the Irish Consumer Price Index

Anthony Dawson, Joseph Keating, Edel Flannery

The poster presented the experience of the Irish Central Statistics Office (CSO) in implementing alternative data sources in CPI and HICP compilation. The authors showed that after 2020 the traditional model based mainly on field price collection was gradually replaced by scanner data, web scraping, and other alternative sources, making it possible to reduce the number of field price collectors and broaden the scope of data used in price statistics. Particular attention was devoted to evaluating the quality of new data sources using the “Fitness of Use” questionnaire developed within the Voorburg Group and to systems for early detection of quality issues in scanner data. The material also presented future plans for alternative data use, including computer prices, flights, hotels, and gambling services.

12. Computing global PPPs for accommodation services with online travel agencies data

Luigi Palumbo, Federico Polidoro, Giovanni Tonutti

The poster concerned the possibility of using data obtained from online booking platforms to calculate global purchasing power parities (PPPs) for accommodation services within the International

Comparison Program (ICP). The authors presented a methodology for collecting hotel prices using APIs from major online travel agencies and compared the results obtained from online data with traditional field surveys used in the ICP. The study analysed accommodation prices across different countries and cities, taking into account hotel standard, room type, and cancellation conditions in order to enable quality adjustments. The material emphasised that online data may increase the frequency and geographical coverage of PPP surveys and help analyse price differences between capital cities and other regions.

13. Classification at scale: a Retrieval-Augmented Classification framework for COICOP 2018 Consumer Products

Inês Nunes, Luigi Palumbo, Luca Bacco, Tiziana Laureti, Luca Vollero

The poster concerned the use of a Retrieval-Augmented Classification (RAC) approach for automatic classification of consumer products into COICOP 2018 subclasses using web-scraped and scanner data. The authors proposed a framework combining embedding models, large language models, and a synthetic multilingual knowledge base generated from official COICOP definitions, making it possible to reduce problems related to limited labelled data, class imbalance, and high variability in product descriptions. The study was conducted on a dataset of nearly 5,000 real products from Italy, Malta, and Germany, achieving clearly better results than classical k-NN approaches, particularly at the most detailed classification level. The material also highlighted the interpretability of the solution, its multilingual applicability, and its potential use in high-frequency price statistics production processes.

14. Land registry data to produce two new statistics: a census of the number of property transactions and a price index for multi-family houses

Corinne Becker, Yves Carpy

The poster presented a project by the Swiss Federal Statistical Office concerning the use of land registry data to develop two new statistics: a complete property transaction census and a price index for multi-family buildings. The authors described the process of integrating land registry data, building and dwelling registers, and other administrative sources, highlighting advantages such as full market coverage, high data quality, and possibilities for automation of statistical processes. The material also discussed key project challenges, including multilingual text fields in registers, issues with data completeness and delays in transaction registration, and difficulties related to mapping different administrative registers. The planned implementation timetable was also presented: publication of the property transaction statistics is planned from the end of 2026, while publication of the multi-family building price index is planned from the end of 2027.

15. Thailand: Challenges in Integrating Artificial Intelligence to Design Automated Systems for Thailand's Consumer Price Index Compilation

Tanapon Poonthong, Varayut Boonyasri, Pakapon Ngiamphisal

The poster concerned challenges related to the implementation of artificial intelligence for automating CPI compilation processes in Thailand. The authors presented a developing system based on web scraping, OCR, AI models, and statistical analysis, aimed at reducing the labour intensity of traditional price collection and better capturing the growing importance of e-commerce and digital platforms. The material included automated online price collection, use of OCR for reading product data from images, multi-level data quality control, and a price anomaly detection system supported by LLM models. Organisational benefits of AI implementation were also emphasised, including faster data processing, reduction of human error, near real-time price monitoring, and improved communication between the central office and regional statistical units.

16. Shrinkflation in Singapore's Consumer Price Index

Sandra Lim

The poster concerned the phenomenon of shrinkflation in the Singapore CPI and methods for identifying package size changes using barcode data from supermarkets. The authors described how the Singapore Department of Statistics developed methods for monitoring changes in product quantities sold at the same or higher prices, noting that failure to account for such changes may lead to underestimation of inflation. The material presented experiences related to the use of alternative data, including automatic detection of product description changes using R scripts, as well as practical problems such as ambiguous barcode changes and difficulties distinguishing regular prices from promotional prices. The results for 2024–2025 showed that shrinkflation most frequently affected products such as instant coffee and tea, powdered milk, ice cream, diapers, and detergents, while accounting for package size changes resulted in higher estimates of price dynamics.

Session 5

Housing statistics (OOH, HPI)

Chairperson: Corinne Becker

1. Jan de Haan, Kai Cheung – *Three Non-Hedonic Methods for Constructing a House Price Index: SPAR, Time Property Dummy and Repeat Sales*
2. Ishtpreet Kaur, Sicong Ma, Patrick Sabourin, Faouzi Tarkhani – *Owned Accommodation in the Canadian CPI: A Comparative Analysis of Measurement Approaches, Including an Exploration of Asking-Rent Rental Equivalence*
3. Thomas A. Knetsch, Jannik Schaller, Patrick Schwind – *The impact of OOH augmentation on HICP measurement: Status-quo estimates for Germany*
4. W. Erwin Diewert, Chihiro Shimizu – *Alternative Methods for Measuring Owner-Occupied Housing Costs: Empirical Comparison of Rent, User Cost, Financial User Cost and Opportunity Cost Approaches*



The fifth session of the meeting focused on topics related to the real estate market and HPI and OOH indices. The presentations concerned various measurement methods. It was frequently emphasized

that there is no single correct approach, and the choice often depends on many factors (data availability, purpose of the index, specific characteristics of the market in a given country). One of the presentations was an attempt to quantify of the OOH inclusion effect in the context of the planned OOH inclusion in the HICP, stressing that timely data are crucial during housing market turning points. A suggestion was made to update and revise the Handbook on Residential Property Price Indices as a lot of research has been conducted since its publication in 2013.

Three Non-Hedonic Methods for Constructing a House Price Index: SPAR, Time Property Dummy and Repeat Sales

Jan de Haan, Kai Cheung

The first presentation by Statistics Netherlands covered an empirical comparison of different methods for a house price index: Repeat Sales, Time Property (Product) Dummy and three versions of SPAR (Sale Price Appraisal Ratio). The comparison for the entire country, the province of South Holland, and the city of Rotterdam is based on selling prices from the Dutch Land Registry and official property valuations.

The Dutch house price index is based on the Sale Price Appraisal Ratio (SPAR) method. A fresh look at the SPAR method was presented, considering the appraisals as potential quality adjustment parameters. Among the three versions of SPAR the geometric SPAR index was presented as the solution to the least squares problem when regressing the logarithm of price to appraisal ratios – viewed as quality-adjusted prices – on time dummy variables. Also discussed were two arithmetic versions of the SPAR approach, the unweighted version and a weighted one, and an approximation for the difference between the unweighted arithmetic index and the geometric index was derived. Two multilateral regression methods, Time Property Dummy and Repeat Sales, were discussed, which make use of selling prices only, and were compared to the geometric SPAR.

Owned Accommodation in the Canadian CPI: A Comparative Analysis of Measurement Approaches, Including an Exploration of Asking-Rent Rental Equivalence

Ishtpreet Kaur, Sicong Ma, Patrick Sabourin, Faouzi Tarkhani

The second presentation by Statistics Canada covered measurement approaches of Owned Accommodation in the CPI, including acquisition, net acquisition, rental equivalence, payments, and the existing Statistics Canada OA methodology (a variant of user-cost approach). This work updates and extends earlier published research covering January 2001 to April 2023 and produces analytical series up to March 2025, allowing an examination of OA dynamics during the post-COVID period of housing market adjustment, volatile shelter costs, and rapidly changing interest rates. In addition to the main analytical series, an exploratory research component is presented, focused on the use of asking rents from online listings as an alternative, timelier source of rental information (asking-rent-based rental equivalence series). Initial results highlight differences from official measures, while remaining preliminary and requiring further quality assessment. The analysis shows that while all approaches yield broadly similar long-run trends, they differ significantly in the magnitude and volatility of OA and overall inflation indicators in the short-run and in how they reflect turning points and pressures in housing and rental markets. The official OA methodology used in the Canadian CPI remains the most appropriate for Canada in the near-term, as it aligns with the CPI's role as an indexation tool, can be implemented with available data, and avoids the excessive volatility associated with approaches that directly embed house prices or turnover rental contracts. The analytical and exploratory series provide a useful framework for research, policy analysis, and international comparison and are positioned as complementary tools rather than as candidates for immediate methodological replacement.

The impact of OOH augmentation on HICP measurement: Status-quo estimates for Germany

Thomas A. Knetsch, Jannik Schaller, Patrick Schwind

The third presentation by Deutsche Bundesbank covered a quantification of the OOH inclusion effect on inflation measurement by comparing various estimates of the monthly OOH-augmented HICP, in the context of plans of inclusion of quarterly OOH in the monthly HICP. The variants are common in terms of compilation methods but differ with respect to the information set upon which these methods are applied. On the one hand, the time schedule of ongoing statistical production is mimicked (application of temporal disaggregation, interpolation, extrapolation and modelling using two different information sets). On the other hand, an approximation to the unknown “true” OOH-augmented HICP is considered (the results of applying the compilation methods using the full sample available). Evaluation of the year-on-year percentage changes of status-quo against full-information estimates using the mean absolute difference was made, to be interpreted as the maximum loss in inflation measurement accuracy incurred by the delayed availability of OOH components. The variant assuming nowcasting first and subsequently temporal disaggregation results in a smaller error (against temporal disaggregation > nowcasting). Based on the evaluation, it was additionally considered that inter- and extrapolation methods were incapable of accounting for unpredictable developments. When housing markets or construction activity are about to turn, it is particularly fallacious for statistical production not to rely on timely price observations.

Alternative Methods for Measuring Owner-Occupied Housing Costs: Empirical Comparison of Rent, User Cost, Financial User Cost and Opportunity Cost Approaches

W. Erwin Diewert, Chihiro Shimizu

The fourth presentation covered five approaches to OOH measurement (of IMF CPI Manual), in the context of OOH having a significant share in the CPI basket and no consensus on the used approach among national agencies. The empirical analysis was based on monthly Tokyo per-square-metre price and monthly rent indices for the period 1986-2025, and adopted the discounted intertemporal user-cost framework of Diewert (1974) as the unifying theoretical core. These approaches included: (A) acquisitions, distinguishing the gross variant (with land) from the net Eurostat HICP-OOHPI variant (structure only); (B) rental equivalence (new-contract and the Statistics Bureau of Japan official imputed rent); (C) the user-cost family (basic, the simplified Hill, Steurer, and Walzl, 2025 variant, and financial); (D) opportunity cost; and (E) payments. After evaluation of methods and the resulting elimination of some, three within-Manual methods survived: new-signed rent, the simplified user cost, and the Type-B financial user cost. The Tokyo experience over four decades demonstrated that the divergence is empirically large, persistent, and consequential. The choice among them turns on which mandate cost-of-living fidelity, macroeconomic monitoring, or fidelity to the leveraged household budget drives the index.

Panel discussion

Modern price measurement, new data sources, the retail revolution – challenges and perspectives of different stakeholders

Moderator: Jan de Haan

Experts: Marek Cierpiat-Wolan, Magda Ciżkowicz-Pękata, Erwin Diewert, Tanya Flower, Federico Polidoro



The panel discussion concluded the second day of the conference. The panellists were the President of Statistics Poland, the representative of the Narodowy Bank Polski and conference presenters representing academia, statistical offices and the World Bank.

Erwin Diewert mentioned typical problems related to indicators, such as aggregation or chain drift and highlighted that there is no method that works in all circumstances. He also reminded about the issue of decomposition of housing index into land and structure and reminded that no country has a good statistic on land component, while it is around half or more of the transaction price.

Tanya Flower reminded that with the new data sources we need to look at the practical side, as more is not better in many cases.

Magda Ciżkowicz-Pękała explained that although the official data are well recognised, when shocks happen (e.g. covid pandemic) it is not possible to wait for CPI data and this is when the new data source comes in, such as an e-commerce data source – it is very important as a complementary source (the Narodowy Bank Polski started the project based on e-commerce in 2009).

The moderator asked the panel participants if transparency is important or just publishing “a number”.

Erwin Diewert replied that some situations require very complicated methods, but yes, we need to be able to explain them.

Federico Polidoro also pointed to the issue of the retail revolution (which prices for which products, under which classifications, and from which data sources), the digital divide between advanced and emerging and developing economies, and new data sources and AI as a two-sided coin.

Erwin Diewert also pointed to the issue of durable goods in the CPI, which would require an alternative measure to be compiled by the statistical office or the central bank.

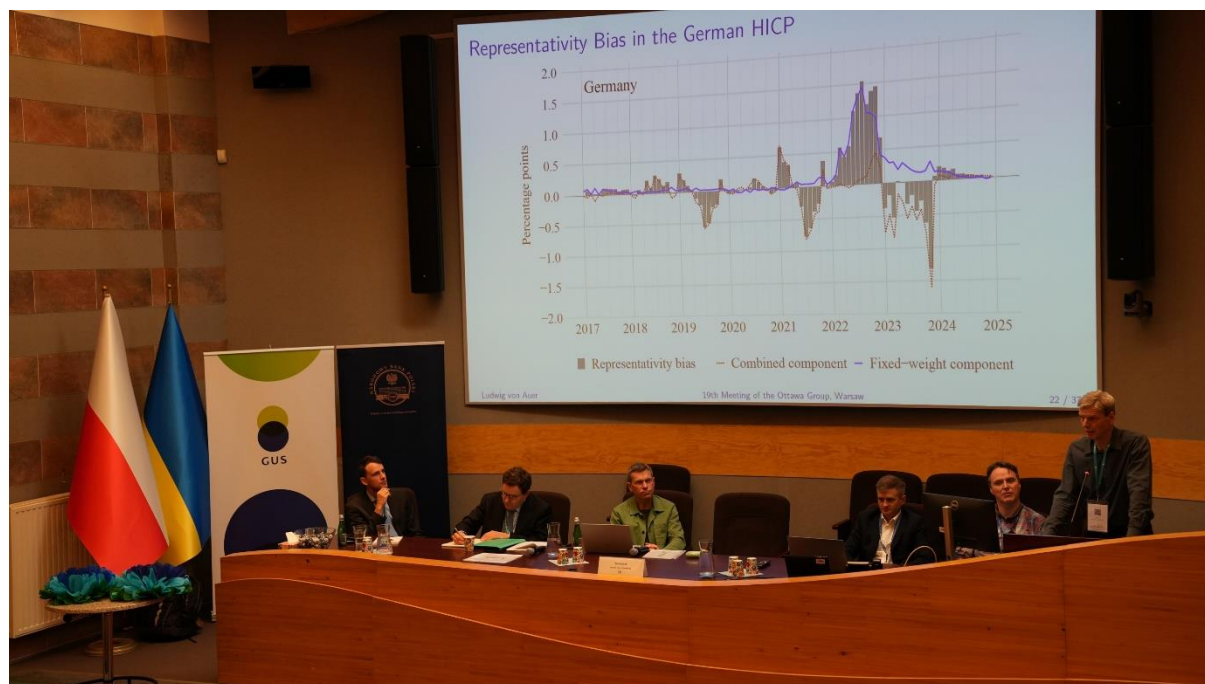
The President of Statistics Poland mentioned cooperation and competition as very important aspects in the development of modern price measurement.

Session 6

Conceptual frameworks (contributions to inflation, comparing index series)

Chairperson: Kevin Fox

1. Ludwig von Auer – *Decomposition of Official Price Indices into Price Change and Three Sources of Representativity Bias*
2. Patrick Schwind, Sebastian Weinand – *Contributions to euro area inflation over arbitrary time periods*
3. Bernhard Goldhammer, Miriam Steurer – *A Framework for Measuring Similarity of Index Time Series*



The sixth session of the meeting was devoted to an in-depth analysis of inflation structure and methods for comparing alternative series of price indices. Two complementary issues were at the centre of attention: on the one hand, the decomposition of inflation into the contributions of individual products and sources of change, and on the other hand, methods for assessing the similarity of different index series resulting from the application of different methodologies or data sources.

A common theme across all presentations was the need to increase the interpretability of price indices. It was emphasised that the inflation rate itself – even if calculated correctly from a methodological perspective – is not sufficient for users. What becomes crucial is understanding where inflation comes from, how it is distributed over time, and how different methodological approaches affect its measurement.

Decomposition of Official Price Indices into Price Change and Three Sources of Representativity Bias

Ludwig von Auer

The first presentation had a conceptual and analytical character and concerned the problem of representativeness of official inflation indices, especially under conditions of strong economic shocks. The starting point was the observation that during periods such as the COVID-19 pandemic or the energy crisis following Russia's invasion of Ukraine, scepticism emerged regarding official inflation measures based on fixed and often delayed expenditure weights.

The speaker proposed a formal decomposition of the so-called representativity bias, i.e. the deviation of official inflation from hypothetical inflation based on fully updated and representative weights. The key element was the decomposition of this deviation into three components:

- the component resulting from the use of estimated weights (estimation component),
- the component related to delayed weights (untimeliness component),
- the component resulting from failure to account for changes in expenditure structure (fixed-weight component).

As emphasised during the presentation, differences between alternative indices do not arise from the mathematical formula itself, but primarily from the weights applied.

In the empirical section, results for the HICP were presented. The analysis showed that before the pandemic, deviations between the official index and the benchmark index were small and did not display a persistent direction. However, after 2022 a clear positive deviation emerged, indicating overestimation of inflation resulting from the use of fixed weights. The main source of this effect was the fixed-weight component related to dynamic changes in household expenditure structures.

The presentation had important methodological implications because it demonstrated that even with a correctly constructed Laspeyres index, systematic deviations may arise under conditions of strong economic change. At the same time, the proposed decomposition provides a tool for identifying and interpreting such deviations.

Contributions to euro area inflation over arbitrary time periods

Patrick Schwind, Sebastian Weinand

The second presentation concerned methods for measuring the contributions of individual products and categories to inflation, with particular emphasis on analysing arbitrary time periods.

The starting point was the standard methodology used in the euro area, where inflation is measured as the annual change in the HICP. In analytical practice, however, a key question concerns which components are responsible for the observed price changes. The traditional Ribe approach allows decomposition of monthly inflation, but has important limitations – it does not allow analysis of changes for periods longer than one year or for annual averages.

The authors proposed a generalisation of this method enabling the calculation of contributions of individual components to inflation for arbitrarily defined periods, including multi-year periods and average indices. A key property of the proposed approach is the preservation of additivity – the contributions of individual components sum exactly to total inflation.

The empirical section demonstrated the application of the method to HICP data for the euro area. The results indicated that in the long run services were the main driver of inflation, while in shorter periods energy and food also played a significant role.

The presentation had considerable practical importance because it provides a tool enabling consistent analysis of inflation contributions across different time horizons, which is particularly relevant for monetary policy and macroeconomic analysis.

A Framework for Measuring Similarity of Index Time Series

Bernhard Goldhammer, Miriam Steurer

The third presentation concerned the problem of comparing different price index series that may arise from the use of different methods or data sources.

The authors pointed out that in statistical practice different series are often compared “visually”, which does not allow clear identification of the sources of differences. The proposed framework is based on

the assumption that similarity between index series is multidimensional and cannot be described by a single measure.

In particular, several key dimensions of similarity were identified:

- similarity of short-term dynamics,
- consistency of trends,
- similarity of volatility,
- time synchronisation (lead–lag),
- consistency in the direction of changes.

As emphasised during the presentation, differences between series may arise from multiple aspects simultaneously, and therefore instead of relying on a single distance measure, it is necessary to analyse a similarity profile across multiple dimensions.

A central element of the approach consists of measures based on growth rates, which eliminate the effect of index levels and focus on the dynamics of changes. A distinction was also introduced between measures of the magnitude of differences and directional diagnostics, which make it possible to determine whether a given series is, for example, more volatile or lagging behind another.

The presentation demonstrated that comparing indices is a much more complex problem than simple comparison of values or charts and requires a structured analytical approach.

The discussion following the session focused on the interpretation of differences between indices and their significance for data users.

With regard to the first presentation, it was emphasised that the problem of weight representativeness is particularly important during periods of rapid economic change. It was noted that although the decomposition proposed by the author is analytically very useful, its application in regular production may be limited by the availability of data on current household expenditures.

In the context of the second presentation, participants discussed the importance of being able to analyse inflation contributions over longer periods. It was stressed that previous approaches were insufficient for analysing inflation trends and for communication with users, who expect information on the sources of inflation across different time horizons.

Regarding the third presentation, attention was drawn to practical applications of the proposed framework, especially in the context of comparing indices based on different data sources such as traditional data, scanner data, and online data. It was emphasised that a multidimensional approach to similarity may support methodological decision-making, but at the same time increases the complexity of analysis.

An important theme of the discussion was also the communication of results. It was noted that more advanced analytical methods increase interpretative possibilities, but at the same time require greater caution when presenting results to users.

Session 7

AI-QA (Machine Learning, Large Language Models)

Chairperson: Karol Szafranek

1. William Spackman, Collin Brown, Ekram Hoque, Serge Goussev – *Large Language Models (LLM) in Price Statistics: Applications beyond classification*
2. Claude Lamoray, Lucien May – *How can Machine Learning improve constant quality price measurement?*

3. Manuel Koller – *It is expensive, so it must be high quality?! The danger of index drift as a result of fluctuating product characteristics in combination with pronounced price patterns over a product's lifespan*



The seventh session was devoted to the use of modern analytical methods – in particular artificial intelligence and machine learning – in price statistics. Unlike earlier sessions, which focused mainly on index construction, the emphasis here shifted towards supporting production processes, improving data quality, and addressing new methodological challenges arising from the use of alternative data sources.

A common theme across all presentations was the attempt to answer the question of to what extent new technologies can support price statistics without undermining its theoretical foundations. The presentations highlighted the tension between the “data-driven” approach characteristic of machine learning and the theory-based approach that constitutes the foundation of official price indices.

Large Language Models (LLM) in Price Statistics: Applications beyond classification

William Spackman, Collin Brown, Ekram Hoque, Serge Goussev

The first presentation concerned the use of large language models (LLMs) in price statistics, with particular emphasis on applications extending beyond classical uses such as product classification.

The starting point was the observation that the increasing use of alternative data sources – such as scanner data and web scraping – significantly increases the complexity of production processes. This concerns not only data processing itself, but also validation, documentation, and knowledge management within organisations.

The authors emphasised that previous applications of AI in price statistics had focused mainly on classification and selected modelling tasks, while many labour-intensive supporting processes remained outside the scope of automation.

Within the project, four main areas of LLM application were tested:

- product classification,

- feature extraction (e.g. for hedonic models),
- information retrieval in documentation (RAG),
- automation of web scraping.

The results showed that:

- LLMs achieve lower accuracy than classical ML models in classification, but do not require training data,
- in feature extraction they may outperform traditional rule-based methods,
- they have considerable potential in knowledge retrieval and documentation processing,
- they may significantly simplify web scraping processes by reducing sensitivity to changes in website structures.

However, the key conclusion was that the use of LLMs should focus on operational processes rather than on inflation measurement itself. The authors also stressed the need for caution due to the “black box” nature of these models and the risk of measurement errors.

How can Machine Learning improve constant quality price measurement?

Claude Lamboray, Lucien May

The second presentation had a more methodological character and concerned the integration of machine learning with the theory of constant-quality price measurement.

The authors pointed out the fundamental difference between the ML approach – based on data and prediction – and the classical statistical approach, which relies on price index theory and clearly defined economic assumptions.

The central question of the analysis was whether ML models can be used for price imputation in a way consistent with the concept of constant-quality price indices. To address this issue, an extension of the classical hedonic approach was proposed.

The starting point was the standard time-dummy hedonic model, which suffers from the so-called “taste change” problem resulting from the assumption of constant parameters over time. In response, the authors proposed an approach based on models estimated separately for individual periods and averaging the results.

The most important contribution of the paper was demonstrating that:

- the hedonic approach can be generalised to arbitrary ML models,
- consistency with index number theory requires fulfilment of the so-called orthogonality property (mean predictions = mean observations),
- it is possible to construct a coherent framework combining the flexibility of ML with the methodological rigour of price statistics.

In practice, this means that ML can be used to improve price imputation, particularly for products with short life cycles and rich characteristics (e.g. electronics), but its application must remain grounded within a theoretical framework.

It is expensive, so it must be high quality?! The danger of index drift as a result of fluctuating product characteristics in combination with pronounced price patterns over a product’s lifespan

Manuel Koller

The third presentation concerned a very specific methodological issue: the risk of index drift arising from the combination of hedonic models, changing product characteristics, and characteristic price patterns over product life cycles.

The starting point was the observation that alternative data – especially in the clothing sector – exhibit high product turnover together with strong price patterns: high prices at product launch and low prices at product withdrawal.

Under such conditions, hedonic models estimated on rolling time windows may generate unstable parameters, leading to index drift. Particularly problematic are:

- new brands with high initial prices,
- brands leaving the market with promotional prices.

The model interprets the high price of a new product as an indicator of high quality, which leads to overestimation of quality parameters and subsequently to artificial changes in the index once prices decline.

The empirical analysis showed that:

- index drift may be substantial and systematic,
- its direction depends on market structure (e.g. dominance of new or disappearing products),
- the choice of splicing method is crucial for index stability.

Several solutions were tested, including:

- exclusion of short-lived products,
- inclusion of additional variables (e.g. “new brand dummy”),
- model regularisation.

However, none of these solutions proved fully satisfactory, indicating the need for further research and development of diagnostic methods.

The discussion following the session focused on the practical implications of using AI and ML in price statistics.

With regard to LLMs, it was emphasised that their greatest potential lies in automating supporting processes such as data processing, documentation, and information retrieval. At the same time, participants stressed the need for a very cautious approach when using them in areas directly affecting statistical outputs.

In the context of machine learning as a tool for price imputation, the discussion focused mainly on consistency with theory. It was pointed out that the flexibility of ML models is simultaneously their strength and their weakness – without appropriate constraints they may generate results that are difficult to interpret and inconsistent with the assumptions of price indices.

The most lively part of the discussion concerned the issue of index drift. It was emphasised that with the growing use of scanner data and web-scraped data, this problem will become increasingly important. Participants also highlighted the need to develop tools for monitoring index quality and identifying situations in which results may be distorted by specific data characteristics.

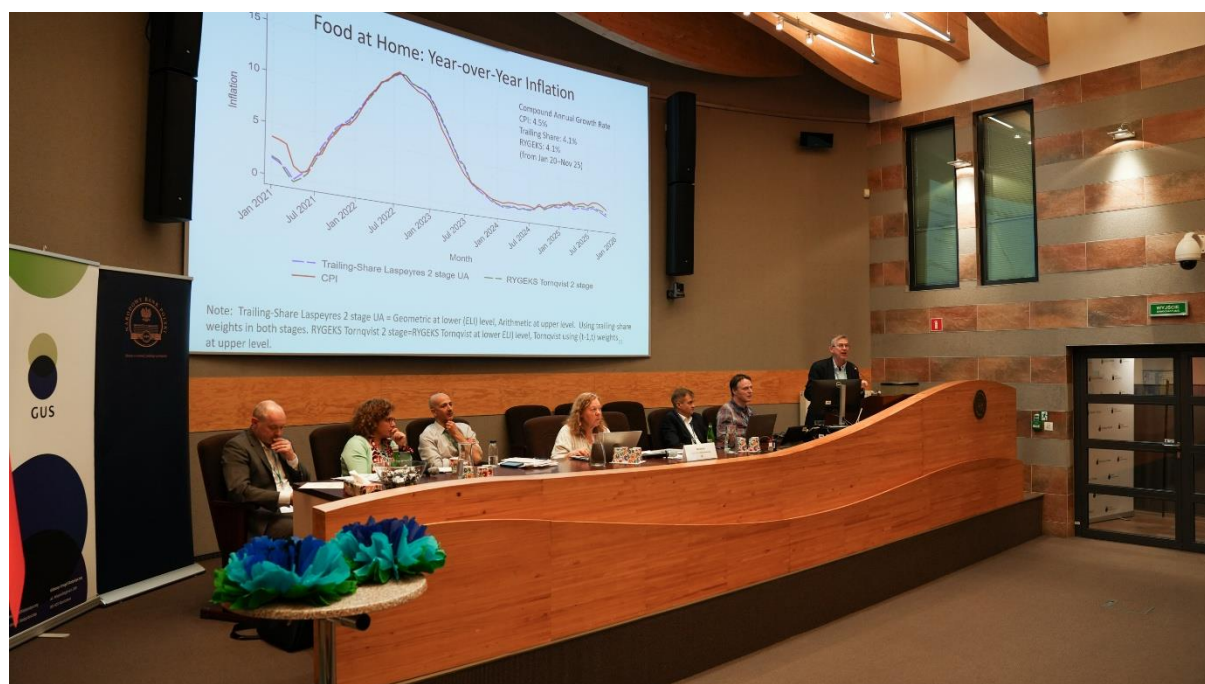
Session 8

Challenging areas of price measurement (inflation in clothing, footwear and food)

Chairperson: Randi Johannessen

1. Sofie Öhman, Martina Sundström, Can Tongur – *Transaction Data on Clothing and Footwear in the Swedish CPI*
2. Antonietta D’Amore, Paola Pompei, Rosabel Ricci – *Consumer price survey: collection of data on clothing and footwear prices using web scraping techniques*

3. Matthew MacDonald, Clément Yérou, Greg DeVilliers, Jacob Milner – *An Empirical Comparison of Alternative Price Index Approaches Based on Canadian Scanner Data for Food Categories in the Consumer Price Index*
4. Steve Coffey, Gabriel Ehrlich, John Haltiwanger, David Johnson, Tod Johnson, Matthew D. Shapiro – *Inflation in Food at Home: Early Results from the RESET Demonstration Project*



This session on challenging areas of price measurement covered challenges and possible methods for measuring price development of Clothing and Footwear by either transaction data (Scanner data) or web scraped data. The session also covered price development for food and non-alcoholic beverages based on transaction data from different sources and analyses of methods by using large-scale data.

The first presentation from Statistics Sweden focused on whether transaction data could replace the current CPI/HICP methodology for clothing and footwear.

The second presentation evaluated whether web scraping can complement or replace traditional (municipal) price collection in Italy's CPI for clothing and footwear

The third presentation examined how scanner (transaction) data can improve CPI measurement for food in Canada, focusing on the shift from traditional price collection to data-rich methods and the implications for index methodology.

The fourth presentation focused on the RESET Demonstration Project, which measures inflation of Food at Home based on prices and sales statistics from item-level transaction (scanner) data. The aim was to redesign official statistics using modern data systems, replacing traditional survey-based approaches.

Transaction Data on Clothing and Footwear in the Swedish CPI

Sofie Öhman, Martina Sundström, Can Tongur

Sofie Öhman, Martina Sundström, Can Tongur – all representing Statistics Sweden. Statistics Sweden has tested transaction data for clothing chains with respect to identification, classification, storage, and data quality. The aim of the project has been to elaborate the potential of using transaction data

in price indices for clothing and footwear. Both the guidance from the MARS approach and Eurostat's guidelines on multilateral methods have underpinned the project.

Main findings:

- Transaction data provide large and detailed datasets, but are difficult to structure
- The clothing and footwear markets in Sweden are fragmented
- Product information varies widely, complicating classification
- Items have short life cycles and strong seasonal patterns
- The current hedonic approach becomes less relevant
- Product categories are unstable over time
- Significant effort is needed for cleaning, filtering, and adapting data

A full transition to transaction data would be complex and resource intensive. In practice, such data would likely need to run in parallel with the current survey-based method, as they do not fully cover the market.

Consumer price survey: collection of data on clothing and footwear prices using web scraping techniques

Antonietta D'Amore, Paola Pompei, Rosabel Ricci

Antonietta D'Amore, Paola Pompei, Rosabel Ricci – all representing ISTAT. The paper evaluates whether web scraping can complement or replace traditional municipal price collection in Italy's CPI for clothing and footwear. The project covers pilot scraping of major retailers. The aim of the project is to assess the feasibility of replacing traditional territorial price collection with web scraped data for clothing in the CPI compilation.

Main findings:

- Web-scraped data are heavily concentrated in mid-price segments, while local data better cover high-end products
- Scraped prices show larger and faster short-term price changes
- Local data are more stable, due to tracking fixed "representative" items
- Web scraped data cover large data volumes and national coverage
- Web scraped data give a better capture of price dynamics, promotions, and product turnover
- Potentially improved quality adjustment and less imputation
- Underrepresentation of premium/high-end products
- Loss of local representativity
- Technical and methodological challenges such as classification and handling of discounts

A full replacement is not advisable. Instead, a strategy with web scraping for large online retailers and dynamic pricing in combination with local surveys to capture physical stores, high-end segments, and local variation is recommended. This would improve the overall representativeness and quality of CPI estimates.

An Empirical Comparison of Alternative Price Index Approaches Based on Canadian Scanner Data for Food Categories in the Consumer Price Index

Matthew MacDonald, Clément Yélou, Greg DeVilliers, Jacob Milner

Matthew MacDonald, Clément Yélou, Greg DeVilliers, Jacob Milner – representing Statistics Canada. The paper examines how scanner (transaction) data can improve CPI measurement for food and non-

alcoholic beverages in Canada, focusing on the shift from traditional price collection to data-rich methods and the implications for index methodology.

Main findings:

- Bilateral indices systematically show lower inflation than multilateral indices, confirming the presence of chain drift
- Multilateral methods (e.g. GEKS-type indexes) eliminate chain drift within estimation windows and produce more stable and reliable results
- Different multilateral formulas yield very similar results, especially GEKS-family indexes
- The Geary-Khamis method shows more volatility and sensitivity to methodological choices
- Among multilateral approaches, GEKS-Törnqvist is identified as the most robust and suitable
- *Movement splice* performs worse and should be avoided
- *Mean splice* is preferred conceptually and empirically
- 25-month rolling windows perform slightly better than 13-month windows
- Hybrid CPI series (combining traditional data and multilateral scanner-based indices) closely match the official CPI

Scanner data significantly enhance CPI measurement but require multilateral index methods to be fully exploited. A recommended approach is GEKS-Törnqvist with mean splice and a rolling window, which balances methodological robustness and practical implementation. Despite methodological improvements, results show that the current CPI system is remarkably robust, as it closely aligns with more data-intensive approaches.

Inflation in Food at Home: Early Results from the RESET Demonstration Project

Steve Coffey, Gabriel Ehrlich, John Haltiwanger, Ron Jarmin, David Johnson, Tod Johnson, Matthew D. Shapiro

Steve Coffey (Circana), Gabriel Ehrlich (University of Michigan), John Haltiwanger (University of Maryland and NBER), Ron Jarmin (U.S. Census Bureau), David Johnson (International Association for Research in Income and Wealth), Tod Johnson (Circana), Matthew D. Shapiro (University of Michigan and NBER). The paper introduces and presents early results from a new infrastructure, Re-engineering Statistics using Economic Transactions (RESET) Demonstration Project. The aim is to demonstrate how official statistics can be built from transaction data based on analyses of large-scale retail transaction data from Circana, leading aggregator of retail transactions data.

Main findings:

- Overall inflation trends (2020–2025) are very similar across methods except for spring 2020 where CPI was temporarily higher due to pandemic-related changes in data collection. Also, in 2025 CPI shows somewhat higher inflation than transaction-based measures
- Transaction data capture substitution even at item level, a major advantage over official statistics
- High-frequency data introduce challenges such as chain drift and data volatility due to promotions, seasonality, and consumer behaviour
- Methods like RYGEKS Törnqvist help address these issues
- Statistics based on transaction data offer greater timeliness and granularity, consistent price–quantity measurement and better treatment of substitution

The RESET project shows that a new data-driven statistical system is feasible and can improve economic measurement. While results are promising, especially for food, challenges remain,

particularly for sectors with high product turnover and quality change, where benefits are expected to be even larger.

The discussion following the session focused on comparing different approaches to the use of new data sources and their implications for price statistics.

With regard to the clothing sector, it was emphasised that this is one of the most problematic areas due to high product turnover, seasonality, and the absence of stable quality characteristics. It was pointed out that transaction data reveal these problems much more clearly than traditional data, thereby requiring new analytical methods.

In the context of web scraping, attention was drawn to its considerable operational potential, but also to the need for caution in interpreting data, especially regarding differences between sales channels.

The most intensive discussion concerned index methods for scanner data. It was stressed that moving to transaction data without changing methodology leads to systematic errors such as chain drift. Participants also pointed to a growing international consensus regarding the use of multilateral methods.

The RESET project was perceived as an example of a possible future for statistics, although participants also highlighted its high infrastructural and institutional requirements.

Session 9

Index number formulae (elementary and superlative indices)

Chairperson: Patrick Kelly

1. Yuri Dikhanov – *Range of possible results for certain classes of superlative price indices*
2. Jacek Białek, Yuri Dikhanov – *Properties of the Young-Balk-Mehrhoff-Dikhanov elementary price index*



The final session was distinctly more theoretical than the previous ones and constituted a kind of closing chapter to the methodological theme of the entire meeting. It focused on the fundamental properties of index formulae – both at the level of elementary indices and more advanced superlative

indices. The discussion concerned not only the formulae themselves, but above all their interrelationships, the range of possible outcomes, and the implications of choosing a particular index for inflation measurement.

Already at the beginning of the session it was emphasised that although index formulae are well known and widely described in the literature, their properties – especially in the context of modern data – still require deeper analysis.

Range of possible results for certain classes of superlative price indices

Yuri Dikhanov

The first presentation had a synthetic and conceptual character. Yuri Dikhanov proposed a unified analytical framework covering a broad class of price indices – both superlative and elementary – by embedding them within one family of functions based on weighted arithmetic-harmonic power means.

The key element of the presentation was demonstrating that many well-known indices – such as the Fisher, Törnqvist, and Diewert indices – can be treated as special cases of a single general parametric formula. The parameter α determines the choice of a particular index formula, allowing their properties to be analysed continuously rather than discretely.

An important contribution of the paper was the use of Taylor expansions (up to the third order, and in some cases even the fifth order), which made it possible to:

- approximate the values of different indices,
- express their deviations relative to the Törnqvist index,
- identify the role of the moments of the distribution of price changes, particularly variance and skewness ($\langle d^2 \rangle$ and $\langle d^3 \rangle$).

The most important result was the determination of the range of possible index values. The author demonstrated that:

- for direct indices, the upper bound of the range is limited by the Fisher-Törnqvist combination,
- the lower bound is determined by the minimum value within the family of power mean indices,
- the Walsh index lies within this range and may be treated as a stable benchmark.

Monte Carlo simulation results confirmed the high accuracy of the obtained approximations, which is of significant practical importance. In particular, it was shown that in typical CPI applications – where distributions of price changes are asymmetric – certain indices may systematically take higher or lower values relative to others.

As a consequence, the presentation provided tools for interpreting differences between indices that had previously often been treated merely empirically.

Properties of the Young-Balk-Mehrhoff-Dikhanov elementary price index

Jacek Białek, Yuri Dikhanov

The second presentation focused on the elementary level, analysing the properties of a relatively little-known index – the Young-Balk-Mehrhoff-Dikhanov (YBMD) index.

The authors began by recalling classical elementary indices such as Dutot, Carli, and Jevons, pointing out their well-known limitations – in particular the lack of invariance to unit changes (Dutot) and the tendency to overestimate inflation (Carli).

Against this background, the YBMD index was presented. Although formally “new”, it in fact has a long history dating back to Young’s work in the 1920s. More recently, it has been rediscovered and described by various authors, including Balk, Mehrhoff, and Dikhanov.

The key part of the presentation was the analysis of the axiomatic properties of this index. It was shown that the index satisfies a number of desirable conditions, including:

- time reversibility,
- monotonicity,
- homogeneity,
- absence of systematic bias.

At the same time – similarly to other indices – it does not satisfy the circularity test or the “price bouncing” test.

An important element was also the positioning of the YBMD index within a broader context. The authors demonstrated that it belongs to a general family of elementary indices parameterised by α , where:

- for $\alpha = 0$ Jevons index,
- for $\alpha = \frac{1}{2}$ YBMD index,
- for $\alpha = 1$ CSWD index.

The mathematical analysis showed that the YBMD index represents an “intermediate” case between Jevons and CSWD, and that its deviation from the Jevons index is relatively small and depends on the third moment of the distribution of price changes.

Simulation studies and empirical analyses (both for traditional data and web-scraped data) confirmed that:

- the YBMD index produces results very close to those of the Jevons index,
- at the same time, it possesses better theoretical properties,
- it may constitute a realistic alternative to the currently used Jevons index at the elementary level.

The discussion following the session was highly substantive and focused on the interpretation of the obtained results and their significance for statistical practice.

With regard to the first presentation, it was emphasised that the proposed approach finally makes it possible to organise the relationships between superlative indices and understand why they differ from one another in specific applications. Particular attention was drawn to the role of skewness in the distribution of price changes – a factor that had previously been underestimated in practical CPI analyses.

In the context of the YBMD index, the discussion concerned its potential implementation in official statistics. It was stressed that although the Jevons index is currently the recommended standard in many countries, the emergence of an index with better axiomatic properties and very similar results may provide an argument for revising existing practices.

At the same time, attention was drawn to a typical implementation problem: even small methodological differences may have important consequences for the continuity of time series and international comparability.