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Status update on Scanner and online data integration projects

Ken Van Loon
Statistics Belgium

UN GWG on Big Data for Official Statistics
Training workshop on scanner and on-line data
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Bogota, Colombia

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Scanner data

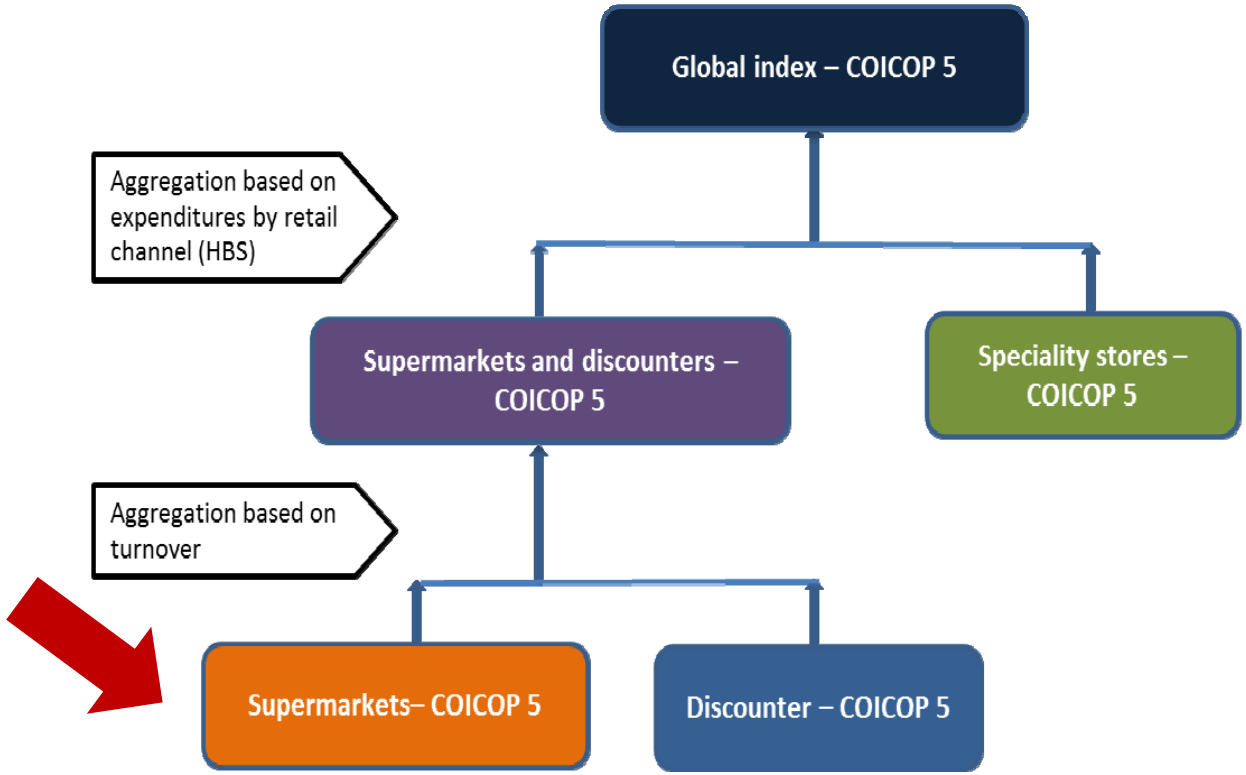
- Scanner data was implemented in the Belgian CPI from 2015
  - starting with a couple product groups and expanding each year.

- As of January 2017 scanner data is used in for following COICOP groups in the CPI and HICP:

ECOICOP	Description	Weight CPI (2017)
01	Food and non-alcoholic beverages	16.4%
02	Alcoholic beverages and tobacco	2.5%
05.5.2.2	Miscellaneous small tool accessories	0.3%
05.6.1	Non-durable household goods	1.1%
09.3.4.2	Products for pets	0.7%
09.5.4.1	Paper products	0.1%
09.5.4.9	Other stationery and drawing materials	0.2%
12.1.3	Other appliances, articles and products for personal care	1.7%
	Total	23.0%

Scanner data - stratification

- For most of these groups the scanner data is combined with other price data using a stratification model with purchase channel and outlet/retailer weights



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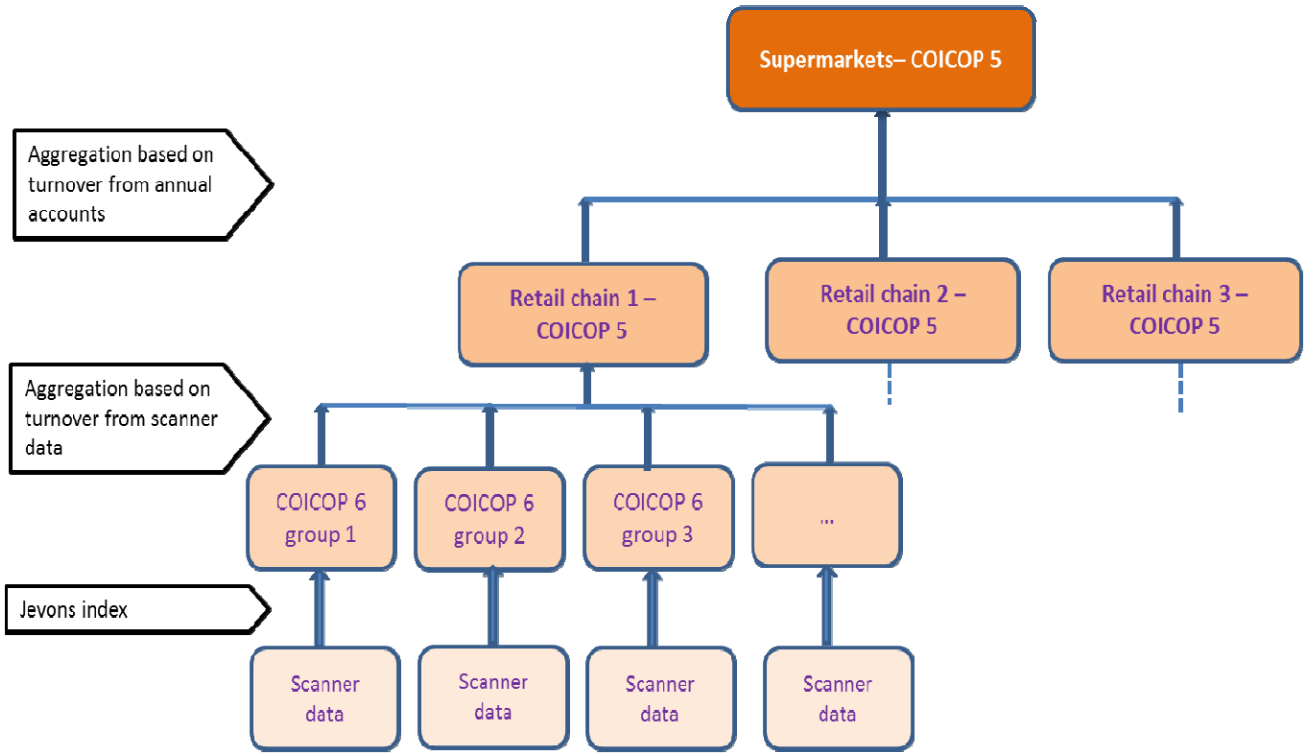
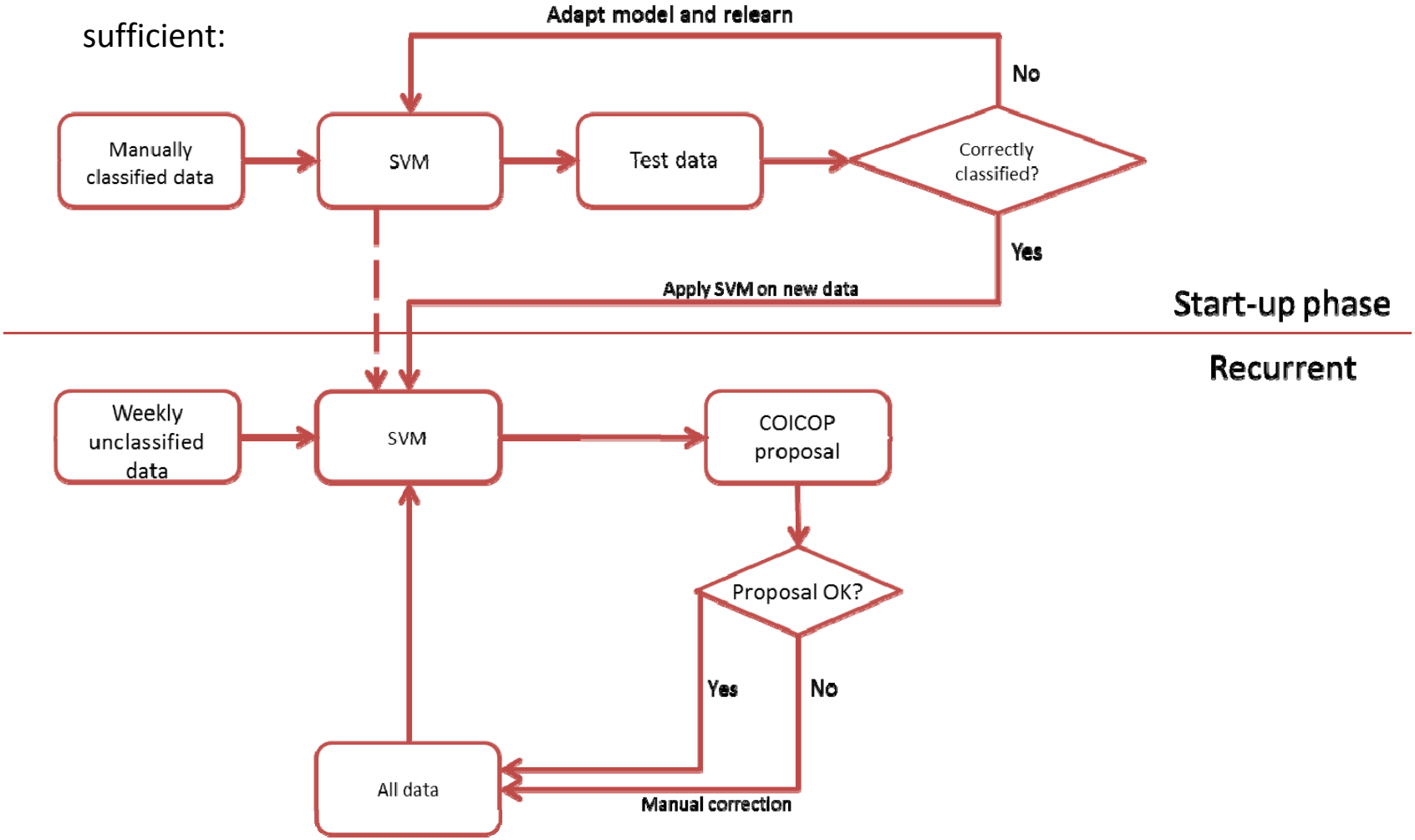


Scanner data – linking to ECOICOP

- Using machine learning to classify products where retailers own classification isn't sufficient:



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Scanner data - methodology

- Index calculation is done using a method described by Eurostat as the “dynamic method” (with our own adaptations)

- Uses a chained Jevons index with a dynamic threshold
  - Products are included in the sample if the turnover in two consecutive months is above a dynamically determined threshold

- Imputation of prices out of the sample

- Own adaptations:
  - Using Stock Keeping Units (SKU) used by the stores themselves to track sales instead of official barcodes (GTIN)
  - Linking of product relaunches via SKU, manual verification and text mining

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Scanner data - research

- Multilateral methods currently not allowed by Eurostat
- Objective for the next 2 years, comparing the current method with multilateral methods:
  - Quality-adjusted unit value - Geary-Khamis method
  - (Augmented) Lehr index
  - RYGEKS
  - FEWS
- With different splicing options and window lengths
  - Movement splice
  - Window splice
  - Half splice
  - Fixed base monthly expanding window
- Handling of relaunch problem in the aforementioned methods

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Web scraping

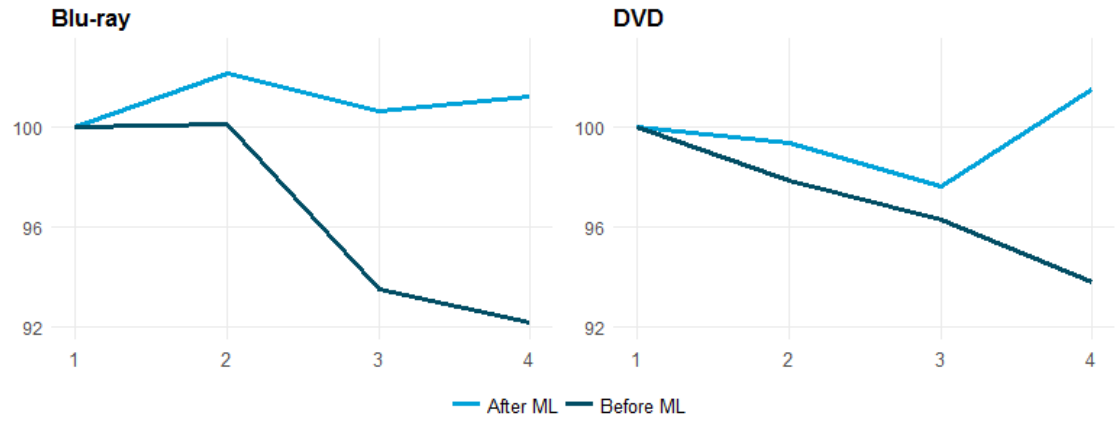
- Started with web scraping in 2014
- All work is being carried out by Statistics Belgium in the price statistics unit
- All scraping is done using R
- Linux server
- Around 60 scripts running:
  - some in production (one discounter, multimedia, international train travel, …)
  - others in test/research phase

Web scraping - research

- Overview of segments for which scripts are running:
  - Clothing
  - Footwear
  - Hotels
  - Airfares
  - Train tickets
  - Second-hand cars
  - Department stores
  - Books
  - DVD & Blu-ray
  - Video games
  - Consumer electronics
  - Student rooms
  - Supermarkets
  - …
- Examining whether web scraping:
  - is an extra source of information (e.g. e-commerce)
  - is a proxy for measuring “offline” price evolution (e.g. billion prices project by MIT)
  - can be used to include new segments in de CPI that were not covered before (e.g. used cars)

Web scraping - research

- Examining whether machine learning can be used to classify data and exclude data:
  - KNN, Naïve Bayes, Random Forests and SVM
- Example for movies:



- Future research (next two years):
  - Evaluating short term dynamic behavior of online prices vs long-term measured price evolution
  - Incorporating new product segments that are offered on a website automatically in index calculations
  - Using explicit quality adjustment methods (hedonics) with online data
  - Testing image recognition