Experimental clothing indexes using Australian web scraped data

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Informing Australia's important decisions

Background

- ABS in a transformation environment – seeking ways to utilise 'big data' for compilation of economic statistics
- March quarter 2014 – Transactions (scanner) data introduced into the Australian CPI
- December quarter 2017 – Expansion of transactions data and introduction of multilateral index methods

Background

- What alternative big data sources are available to obtain price information?

- Web scraping – the extraction and transformation of unstructured data from the web into structured data

- The ABS is currently expanding its use of web scraped data in the CPI
  - Progressively incorporated since March 2017

Background

- Clothing and footwear – high priority for ABS
- Challenges with clothing and footwear:
  - High collection and data editing costs
  - Competitive market environment
  - Strong seasonality

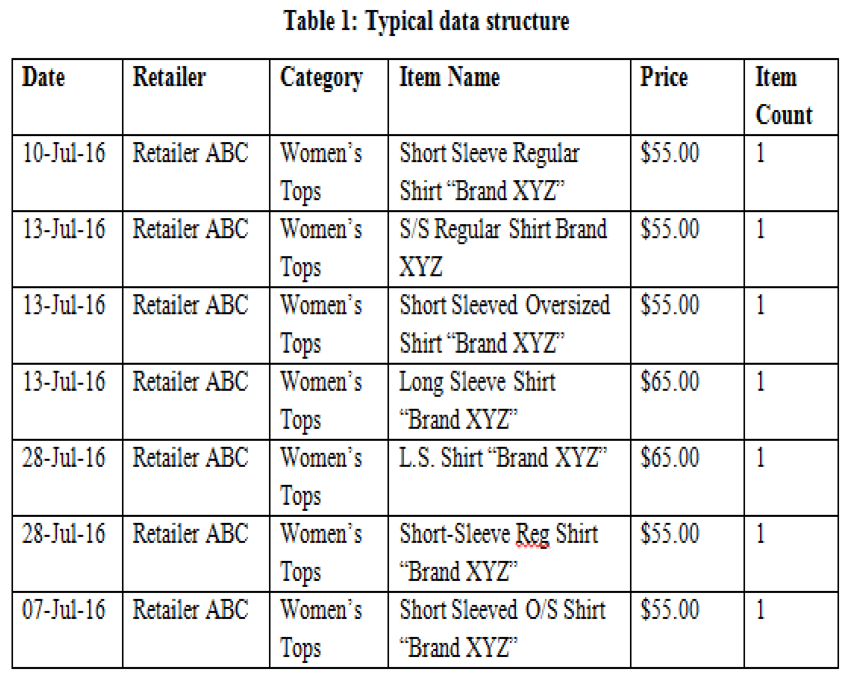


Table 1: Typical data structure

Date	Retailer	Category	Item Name	Price	Item Count
10-Jul-16	Retailer ABC	Women's Tops	Short Sleeve Regular Shirt "Brand XYZ"	$55.00	1
13-Jul-16	Retailer ABC	Women's Tops	S/S Regular Shirt Brand XYZ	$55.00	1
13-Jul-16	Retailer ABC	Women's Tops	Short Sleeved Oversized Shirt "Brand XYZ"	$55.00	1
13-Jul-16	Retailer ABC	Women's Tops	Long Sleeve Shirt "Brand XYZ"	$65.00	1
28-Jul-16	Retailer ABC	Women's Tops	L.S. Shirt "Brand XYZ"	$65.00	1
28-Jul-16	Retailer ABC	Women's Tops	Short-Sleeve Reg Shirt "Brand XYZ"	$55.00	1
07-Jul-16	Retailer ABC	Women's Tops	Short Sleeved O/S Shirt "Brand XYZ"	$55.00	1

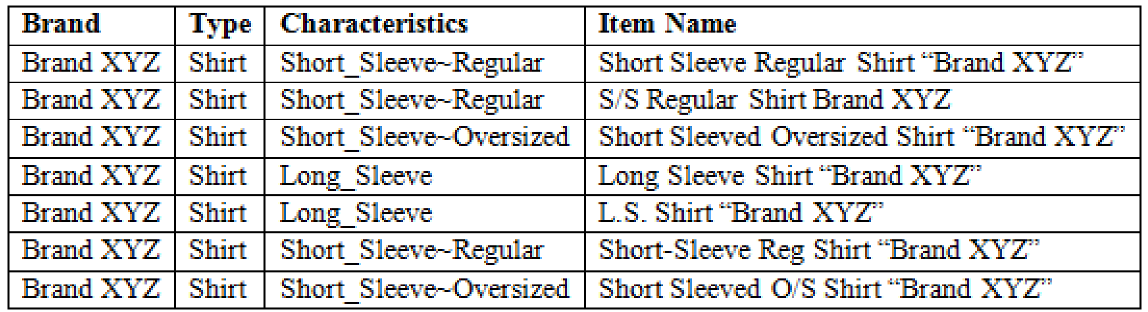
Product Definition

- Matched model indexes (e.g. Jevons, Törnqvist) rely on the ability of price analysts to identify which items are identical (i.e. homogenous) from the consumer's perspective
- Broader product definitions improve product matching over time but increase the risk of average price bias
- 3 alternative product definitions considered:
  - Item Name
  - Brand + Product Type
  - Brand + Product Type + Product Characteristics

Product Extraction

- A keyword approach was used to extract potentially important product information from item name strings

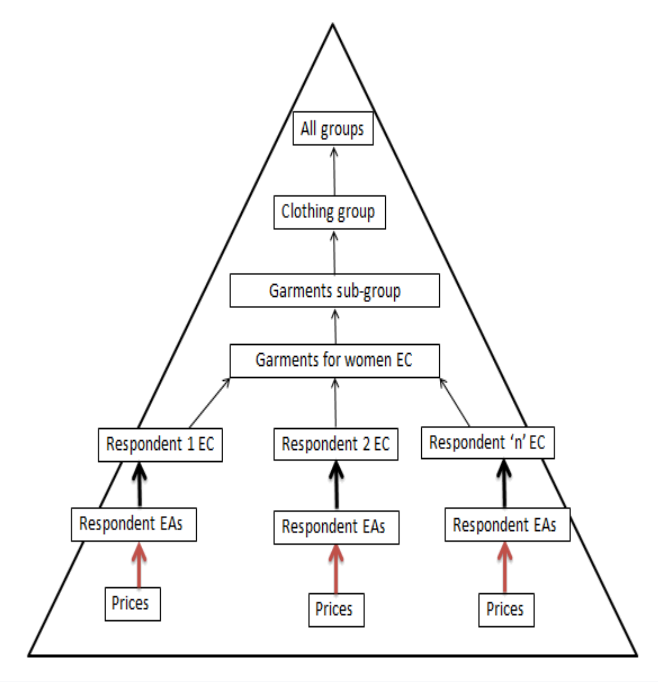
- Product information extracted included:
  - Brand
  - Product Type (e.g. t-shirt, dress, shorts)
  - Product characteristics (e.g. sleeve length, material, length)



Brand	Type	Characteristics	Item Name
Brand XYZ	Shirt	Short_Sleeve~Regular	Short Sleeve Regular Shirt “Brand XYZ”
Brand XYZ	Shirt	Short_Sleeve~Regular	S/S Regular Shirt Brand XYZ
Brand XYZ	Shirt	Short_Sleeve~Oversized	Short Sleeved Oversized Shirt “Brand XYZ”
Brand XYZ	Shirt	Long_Sleeve	Long Sleeve Shirt “Brand XYZ”
Brand XYZ	Shirt	Long_Sleeve	L.S. Shirt “Brand XYZ”
Brand XYZ	Shirt	Short_Sleeve~Regular	Short-Sleeve Reg Shirt “Brand XYZ”
Brand XYZ	Shirt	Short_Sleeve~Oversized	Short Sleeved O/S Shirt “Brand XYZ”

Aggregation Structure

- ABS currently aggregates clothing and footwear products across retailers to derive elementary aggregates (EAs)
- This presentation instead aggregates products to EAs within each retailer
- Aggregation across retailers is carried out at the Expenditure Class (EC) level



Multilateral Methods

- Unweighted index methods are required since web scraped data does not contain expenditure or quantity information

- Multilateral index methods can be used to match products across multiple time periods and resolve the “chain drift” problem with chained indexes

- 2 unweighted multilateral index methods are considered:
  - GEKS-Jevons (GEKS-J)
  - Time dummy hedonic (TDH) model with OLS weights

Elementary Aggregate Results

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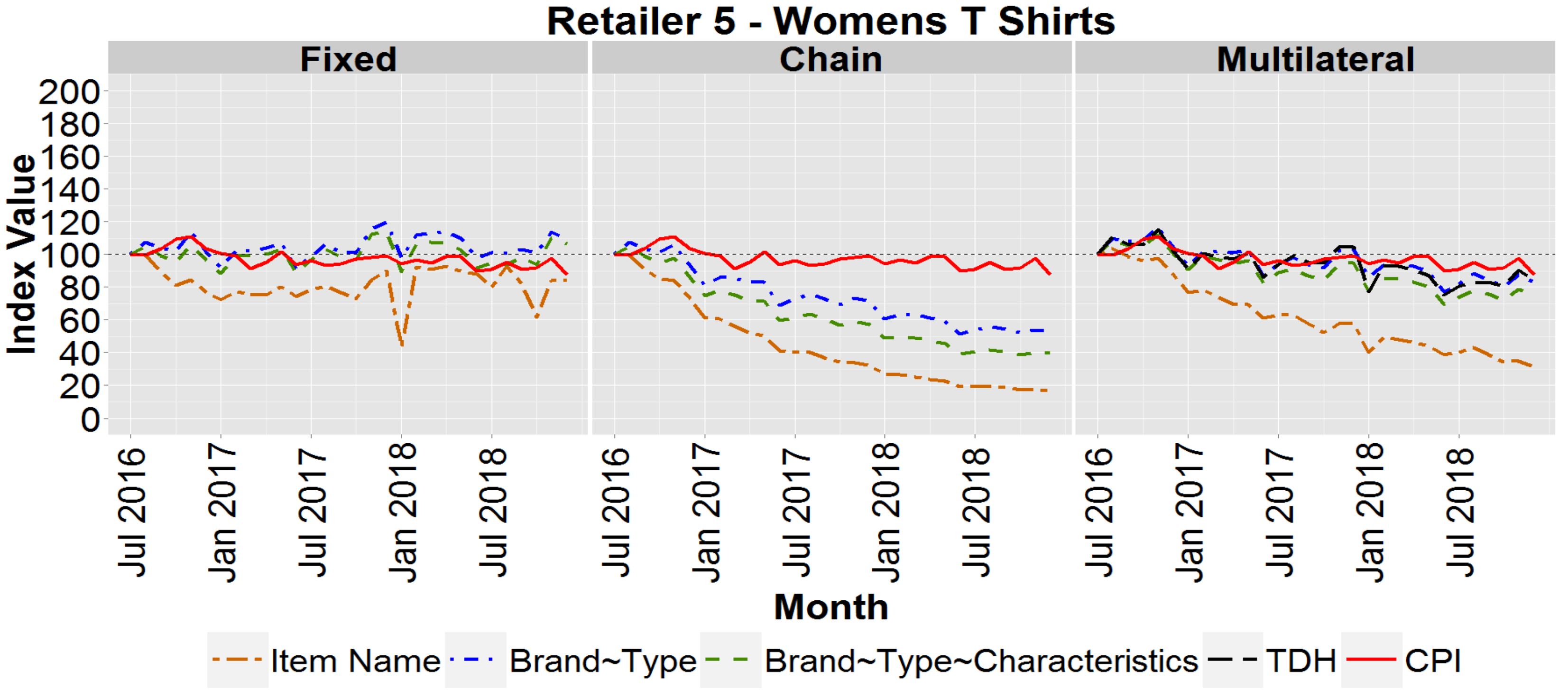
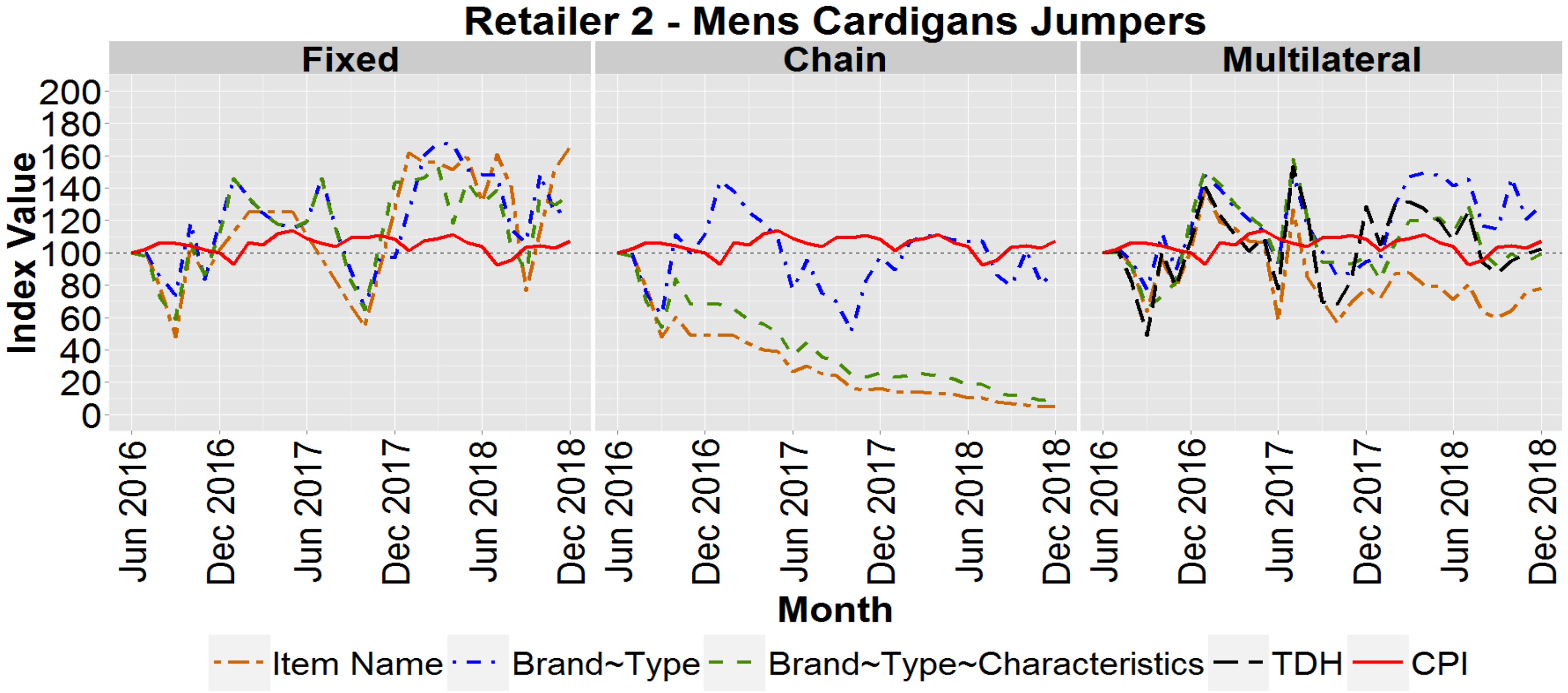
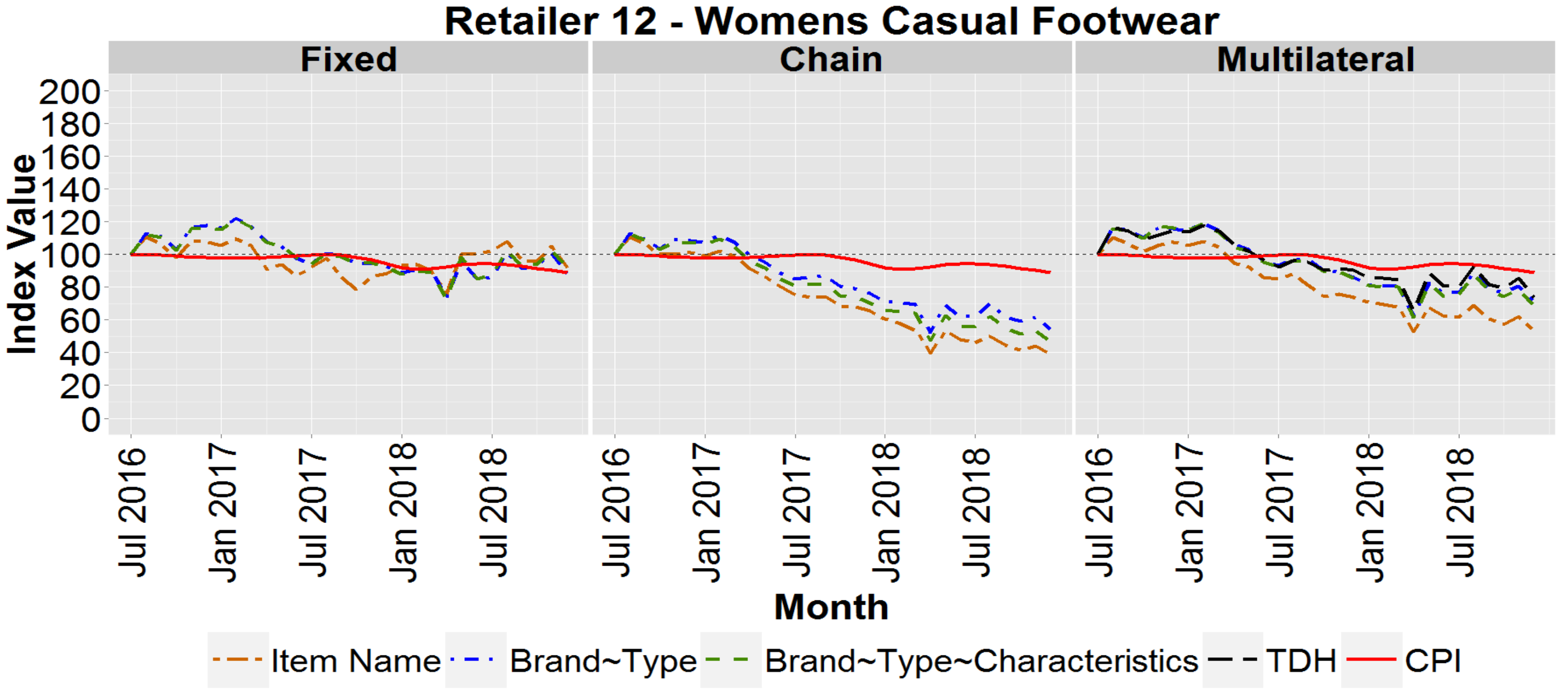


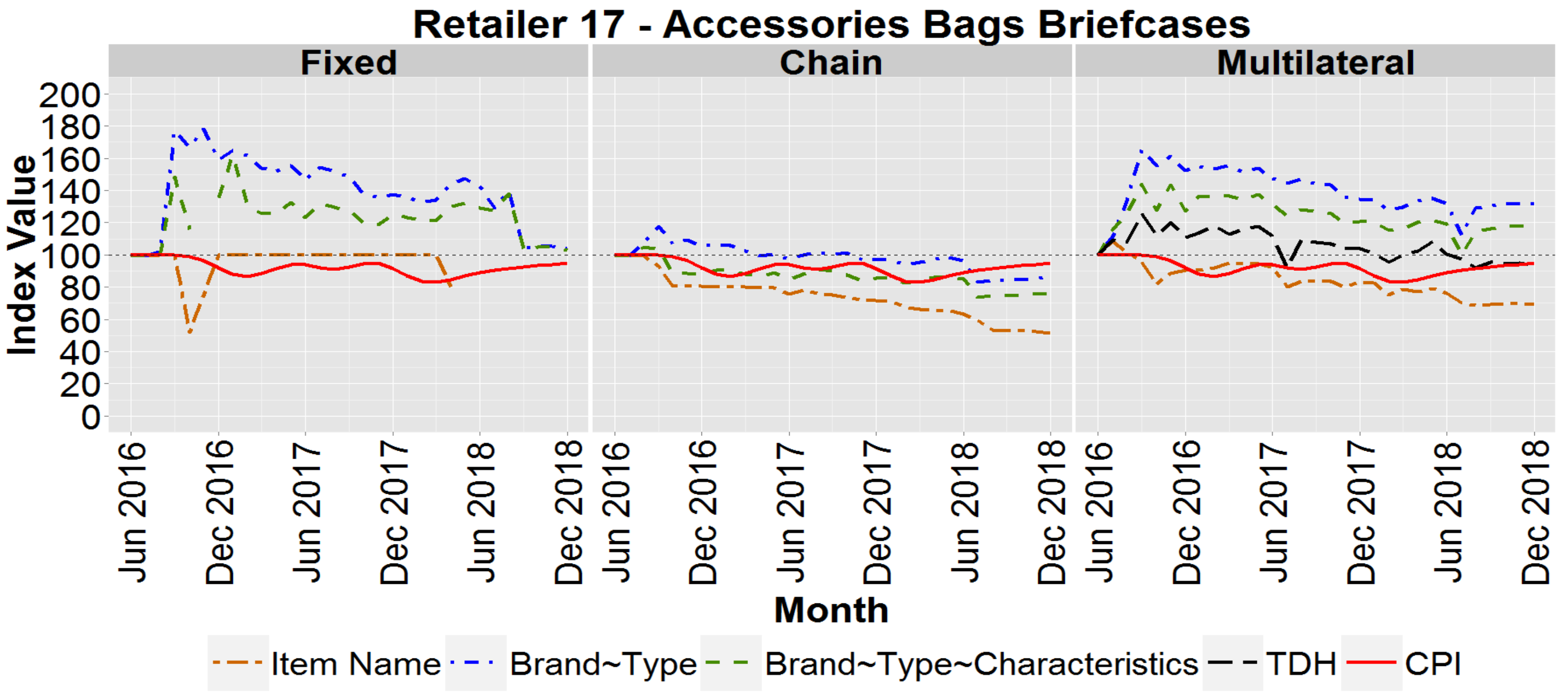
Elementary Aggregate Results



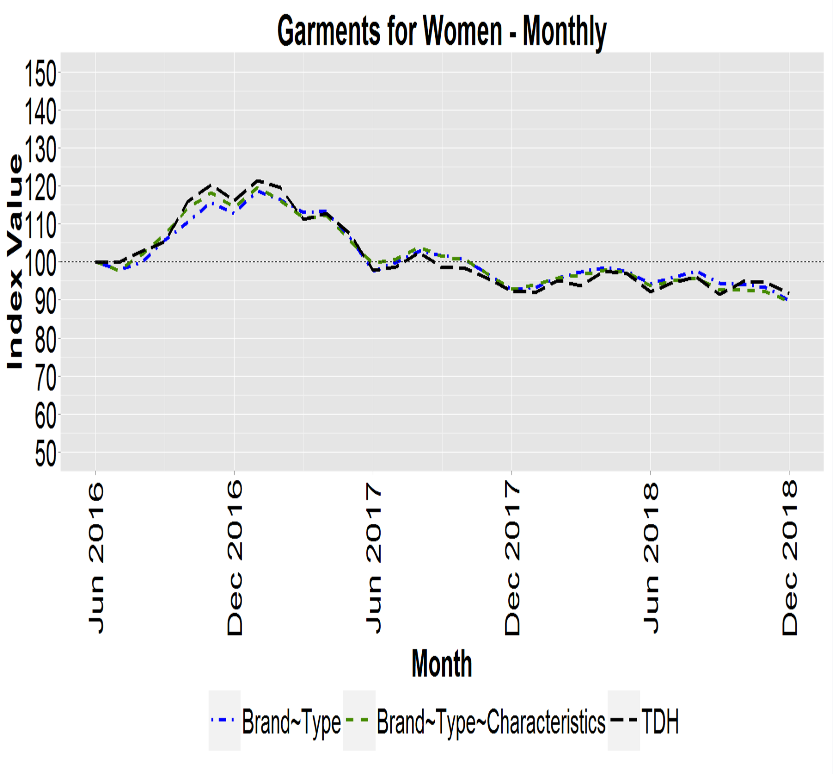
Elementary Aggregate Results

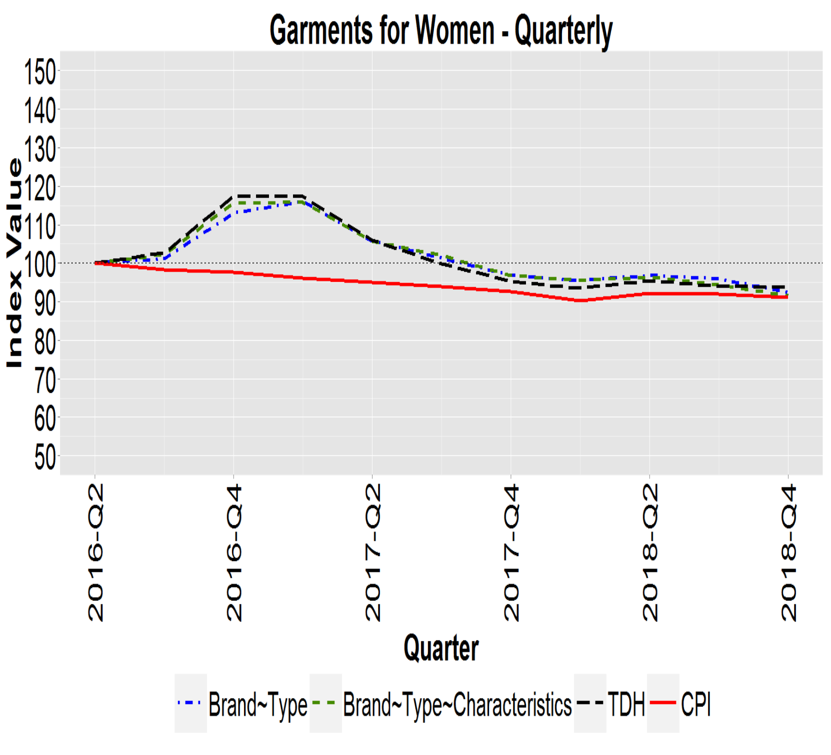


Elementary Aggregate Results



Expenditure Class Results





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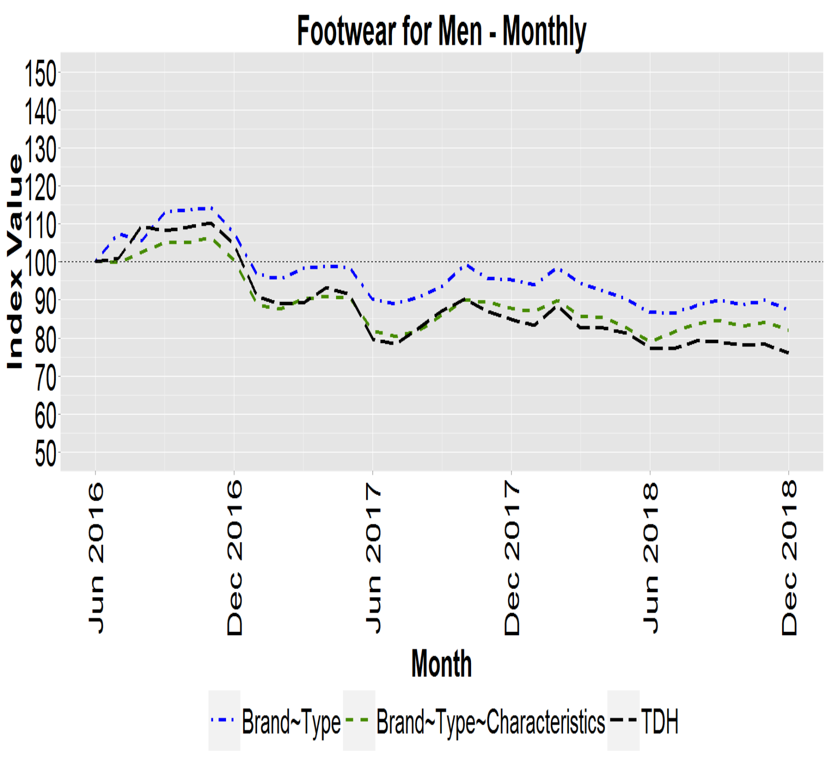

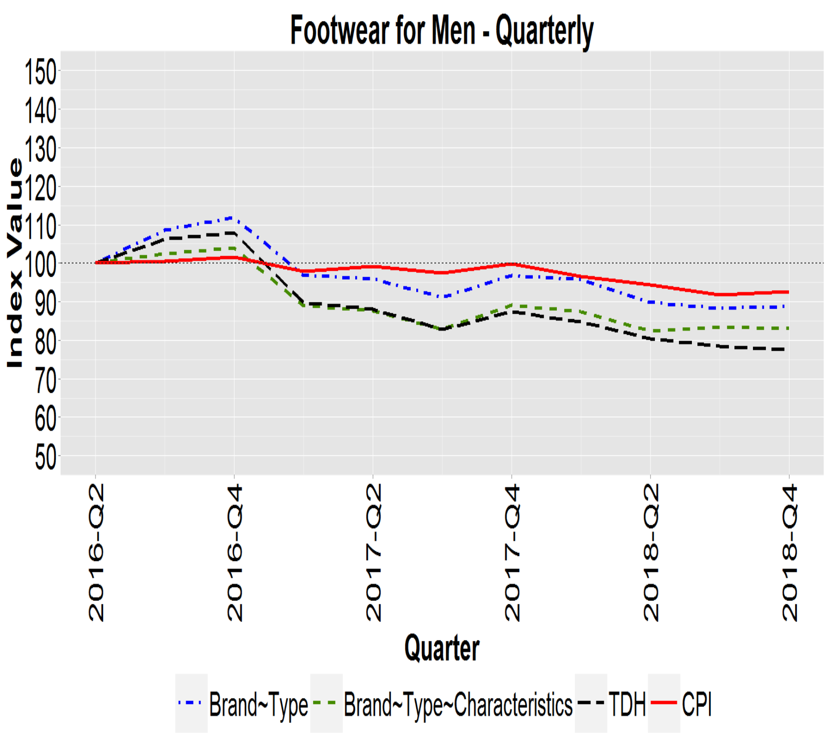

Expenditure Class Results

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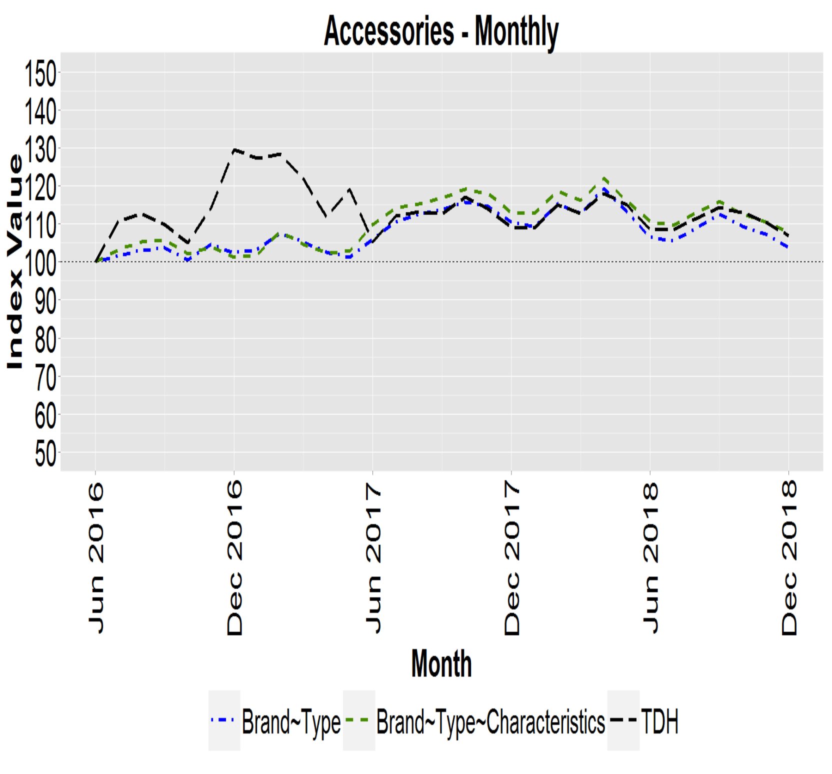

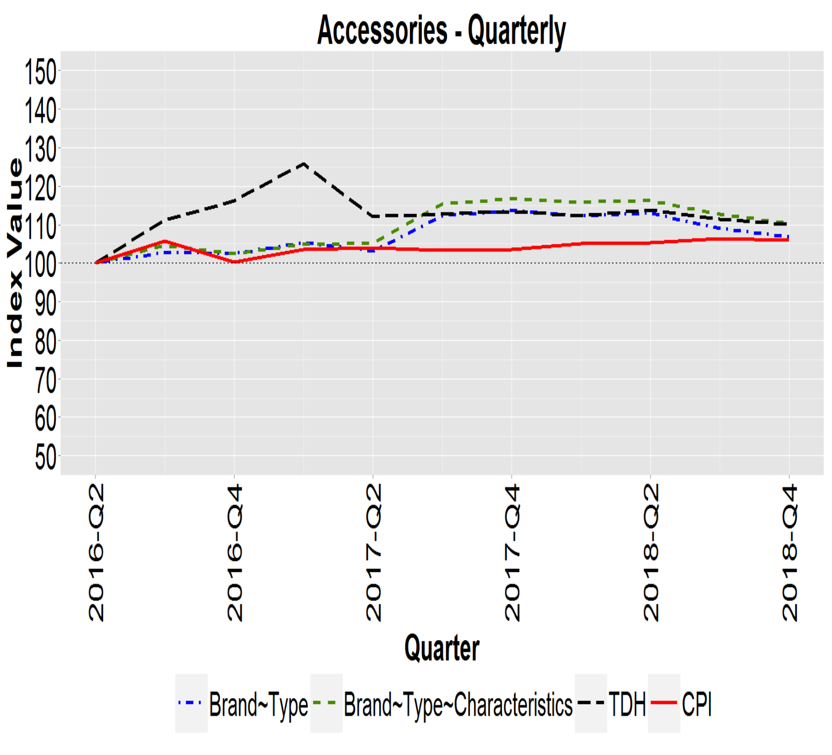

Conclusions

- Pre-processing to form ‘clustered’ homogenous products is one viable strategy for NSOs to consider for ‘dynamic’ basket categories
- At the elementary level, our clothing results exhibit downward drift for chained indexes
- Fixed and multilateral indexes produced the ‘most plausible’ results with broader clothing product definitions

Conclusions

- Characteristic extraction more difficult with some footwear and accessory indexes – sparse text data means some heterogeneity still exists in our broader product definitions
- At the published level, experimental multilateral results broadly comparable with CPI equivalent

Further development

- Web scrapers maintained by ABS Prices Branch – funding attempts to expand across organisation
- Alternative strategies for forming clustered homogenous products
- Alternative strategies for respondent aggregation
- Alternative strategies for weighting individual products within clustered homogenous definitions

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Questions?