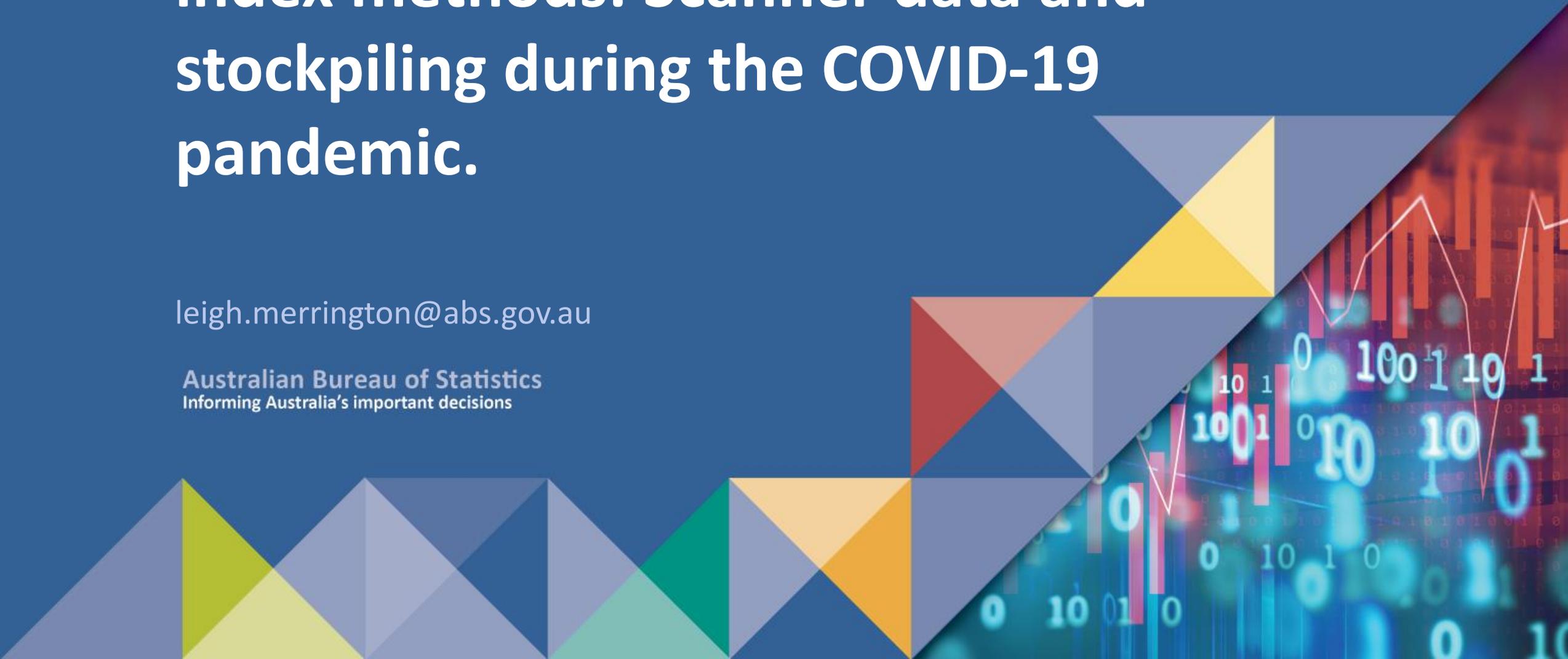


A comparison of multilateral price index methods: Scanner data and stockpiling during the COVID-19 pandemic.



leigh.merrington@abs.gov.au

Australian Bureau of Statistics
Informing Australia's important decisions

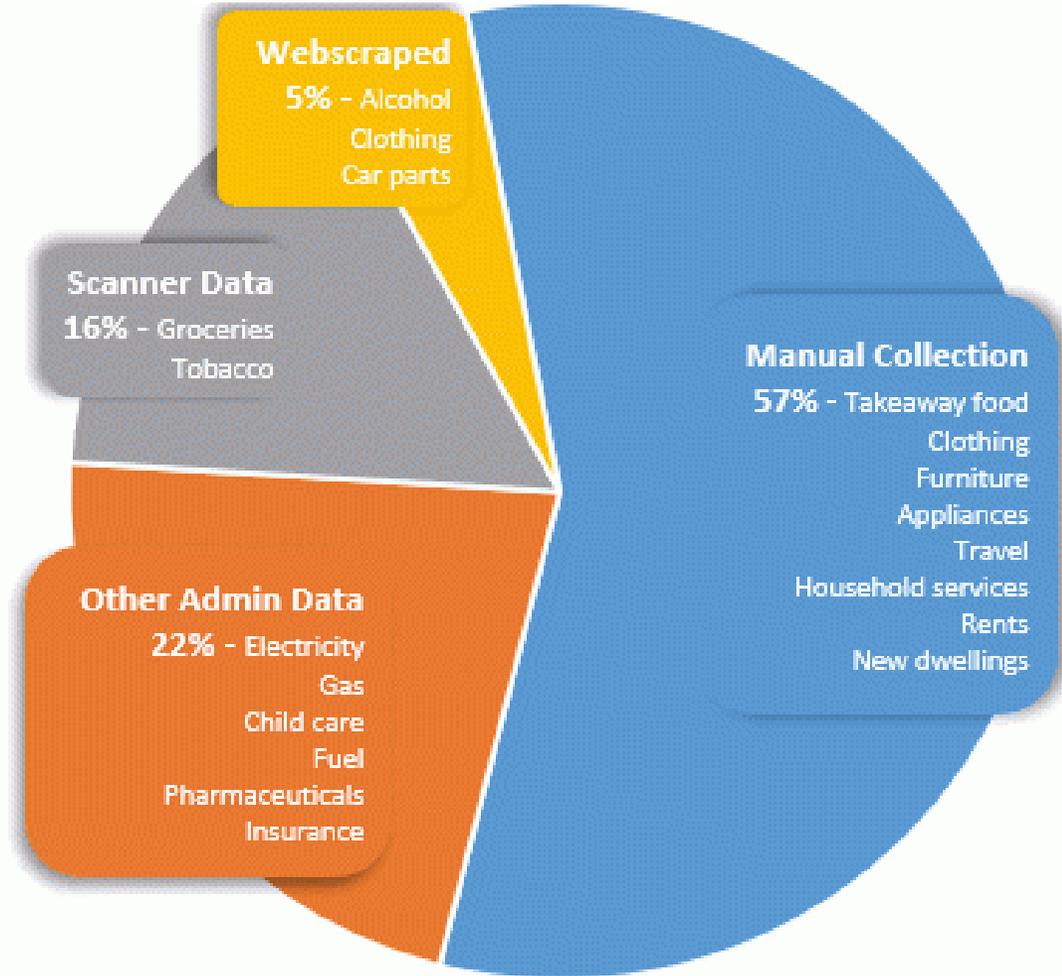


Acknowledgement

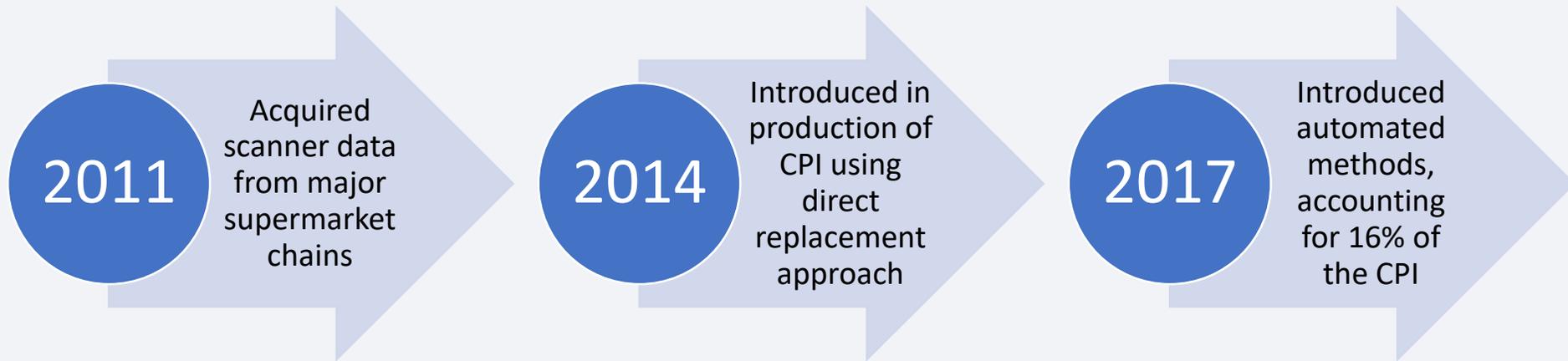
- ▶ Catherine Smyth, ABS CPI
- ▶ Joel Liffner, ABS Methodology
- ▶ Julian Whiting, ABS Methodology



Data sources used in the CPI



Scanner data in the CPI – a brief history



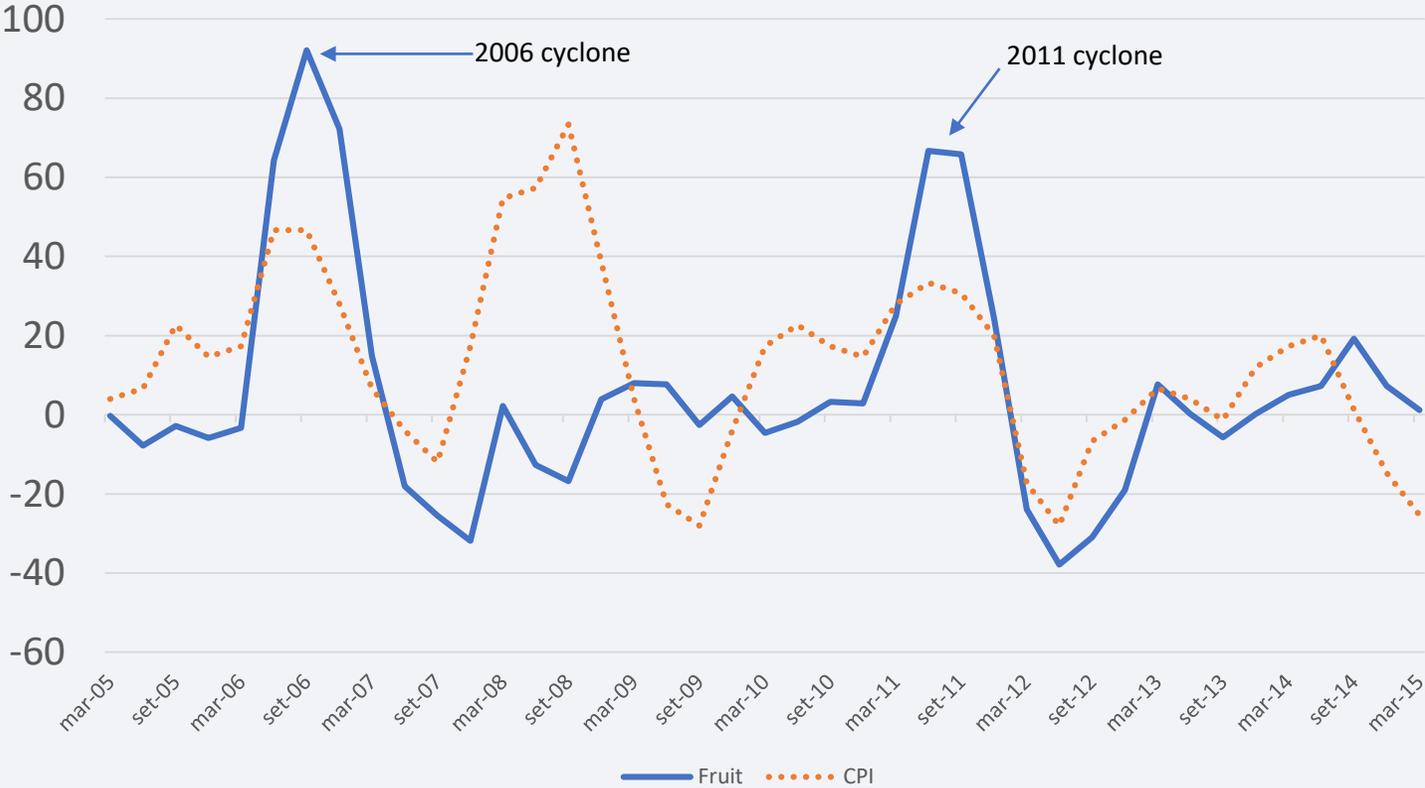
- Use an entire census of data
- Contribution within a component varies depending on relative expenditure
- Provides insight into consumer behaviour

Currently used for the following Expenditure Classes:

- Bread
- Cakes & biscuits
- Breakfast cereals
- Other cereal products
- Beef & veal
- Pork
- Lamb & Goat
- Poultry
- Other meats
- Fish & other seafood
- Milk
- Cheese
- Ice cream & other dairy products
- Fruit
- Vegetables
- Eggs
- Jams, honey & spreads
- Food additives & condiments
- Oils & fats
- Snacks & confectionery
- Coffee, tea & cocoa
- Waters, soft drinks and juices
- Tobacco
- Cleaning and maintenance products
- Personal care products
- Other non-durable household products
- Pets and related products

Limitations of fixed weighted approach

Fruit & CPI annual movement (%)



Inflation stokes rate rise speculation but don't blame the bananas

July 28, 2011 4:00pm AEST



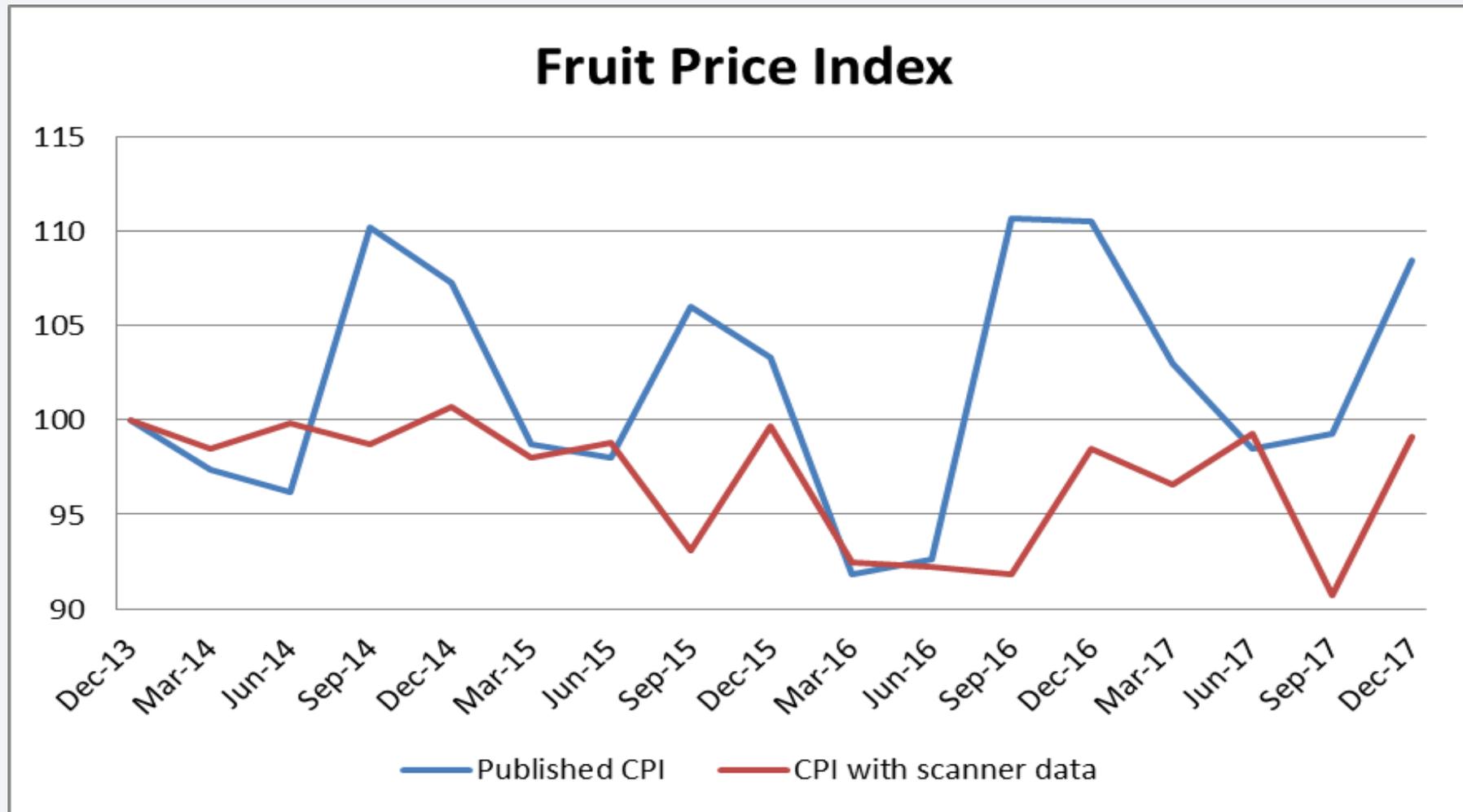
When it comes to bananas, demand outstrips supply. But it won't mean an interest rate rise. AAP

6
5
4
3
2
1
0

Has the banana's impact on the CPI been overestimated?

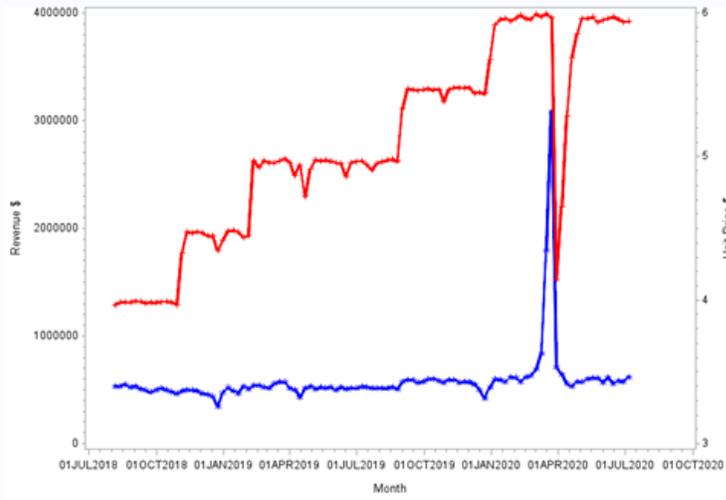
We're told that the banana price blow-out has hit the Consumer Price Index. According to the Australian Bureau of Statistics, fruit contributed 0.6 percentage points to the 4.0% through-the-year Consumer Price Index increase. And the rise in fruit prices was mainly attributable to an increase of approximately 250% in the price of bananas during the [...]

Fixed weighted vs. multilateral

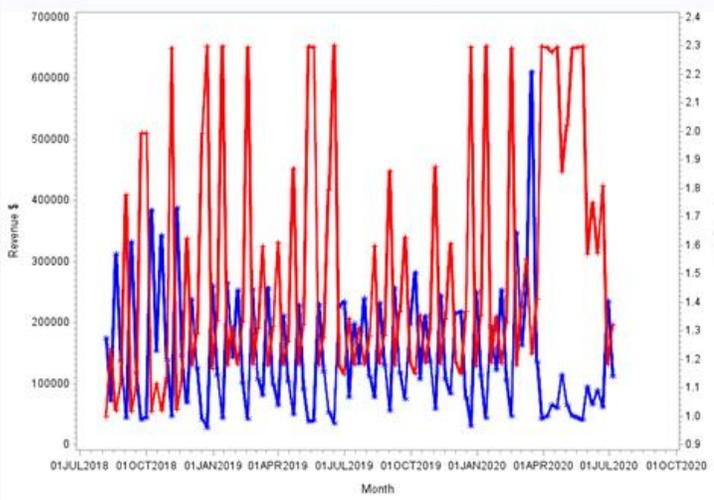


Beginning of COVID-19: Stockpiling and panic buying

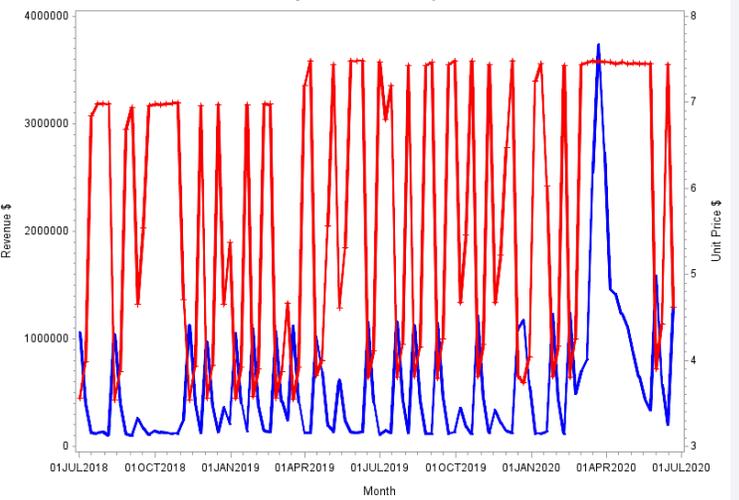
Beef Mince



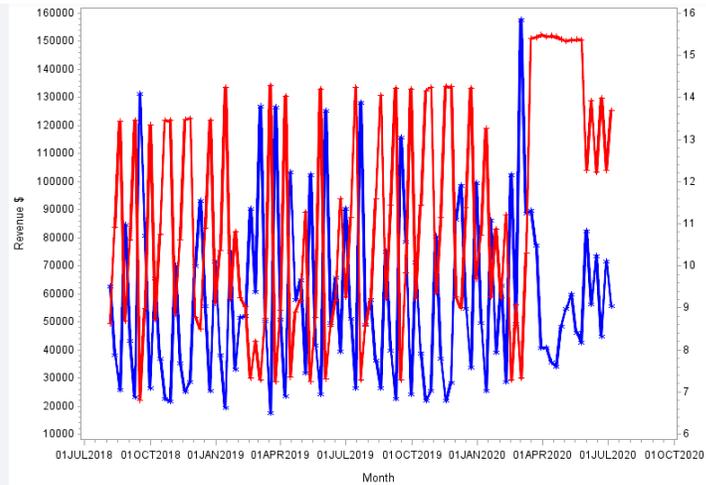
Canned Tuna



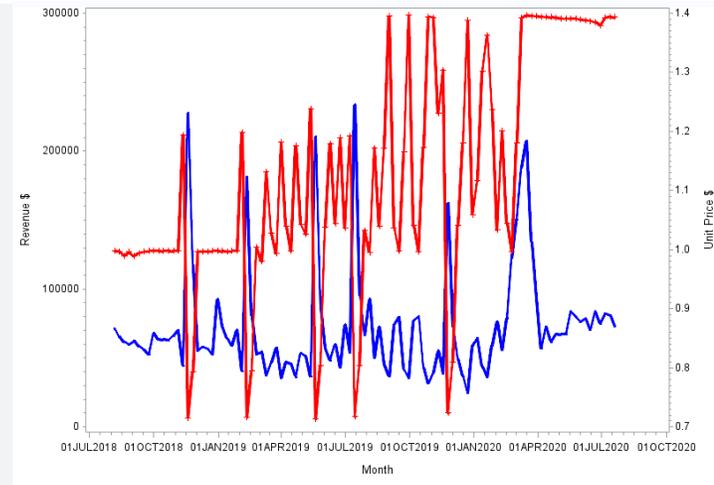
Toilet Paper



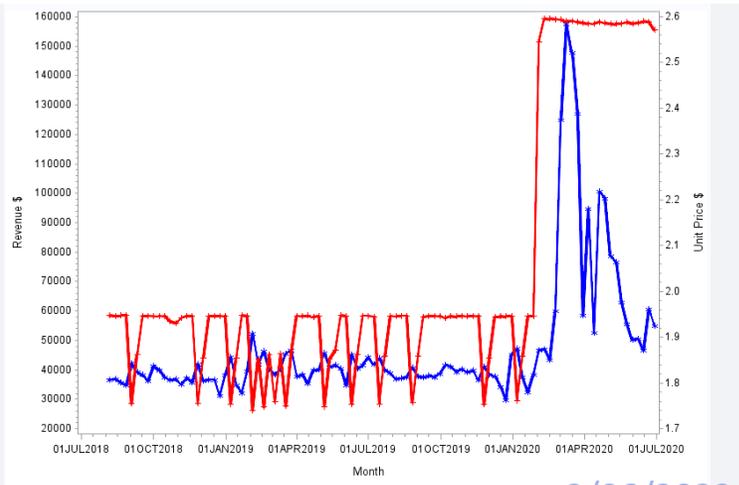
Meat Pies



Canned Tomato



Pasta



PLOT2 — unit_price
PLOT — revenue

PLOT2 — unit_price
PLOT — revenue

PLOT2 — unit_price
PLOT — revenue

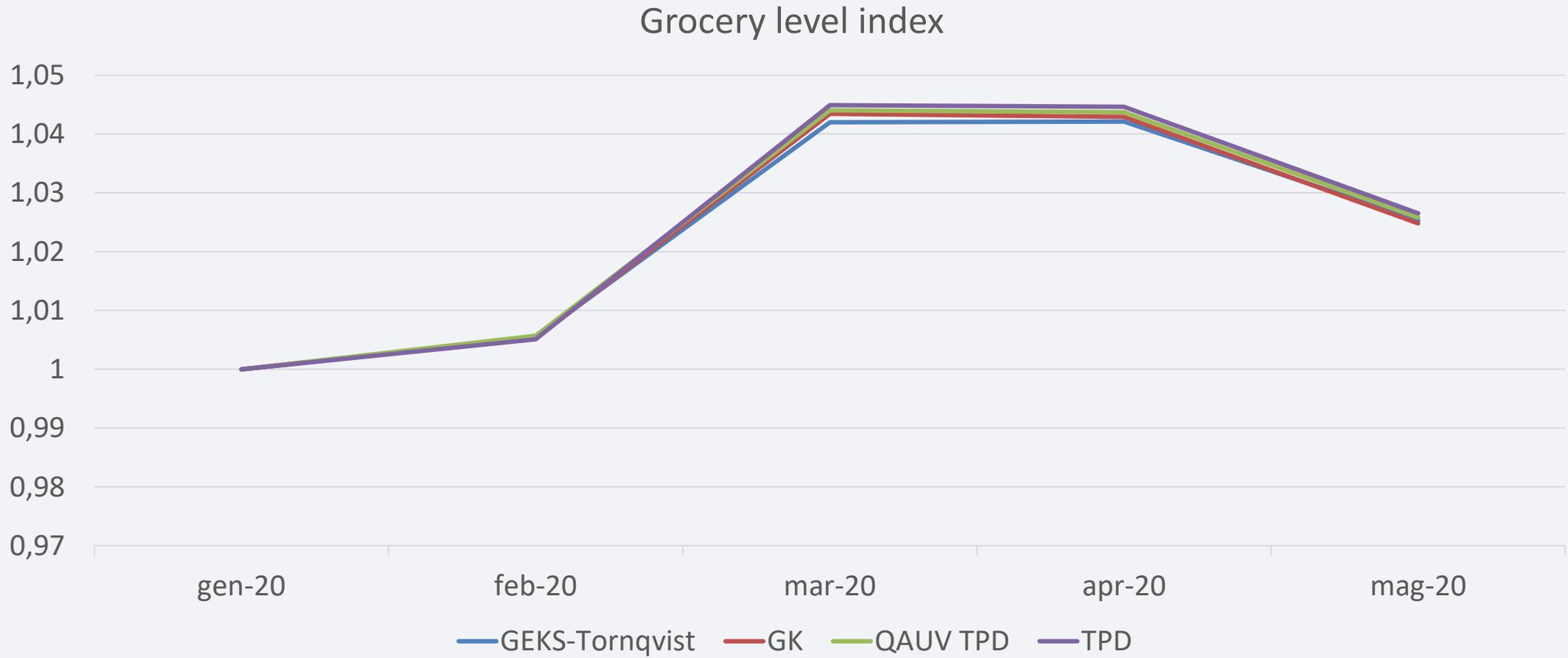
Four multilateral index methods reviewed

- ▶ Atypical, and in some cases, extreme changes in spending patterns at the onset of the pandemic provides a unique opportunity to ‘stress test’ the multilateral methods. The methods reviewed were:
 1. GEKS-Tornqvist
 2. Weighted Time Product Dummy (TPD)
 3. Geary-Khamis (GK)
 4. Quality Adjusted Unit Value using TPD (QAUV TPD)

Key findings

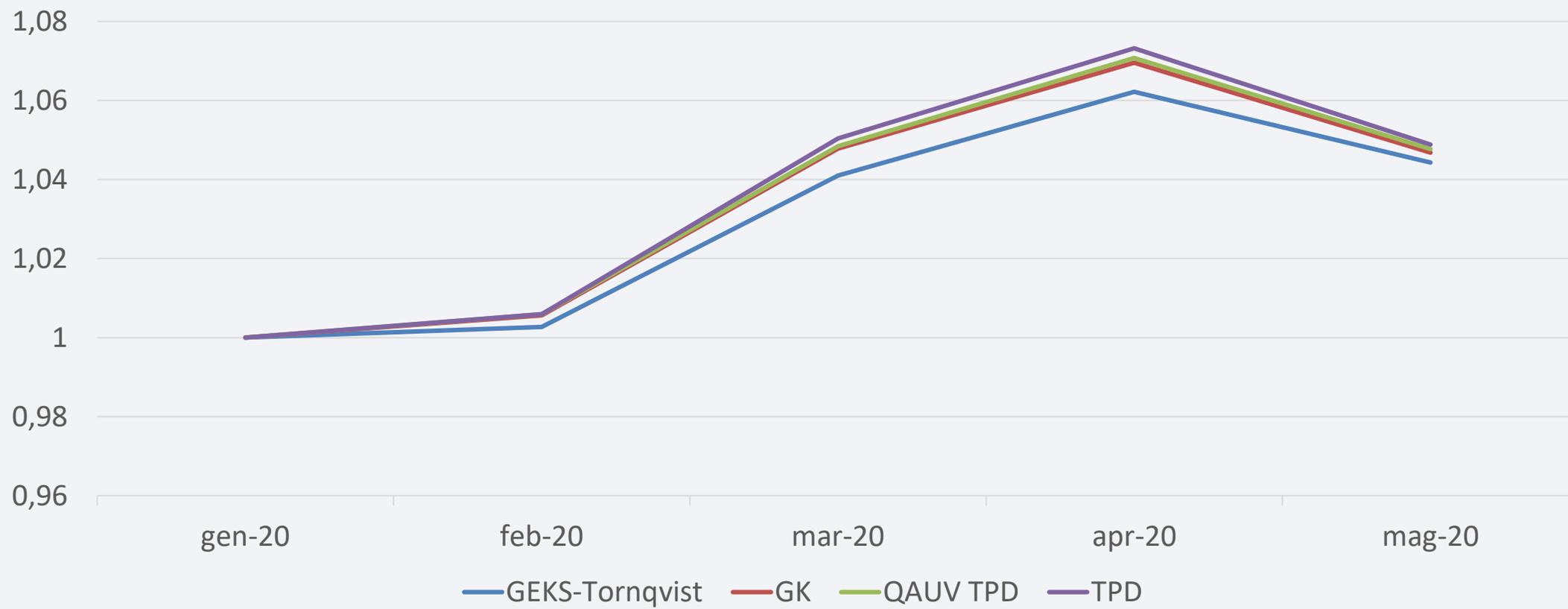
1. Multilateral index methods perform well under extreme changes to spending patterns.
2. All four multilateral methods tested performed similarly at the aggregate level.
3. Some differences evident at lower (EA) levels.
4. GEKS-Tornqvist is less sensitive to large changes in product expenditure shares than the other multilateral methods.

Multilateral methods produced similar results at the aggregate level (all supermarket products)



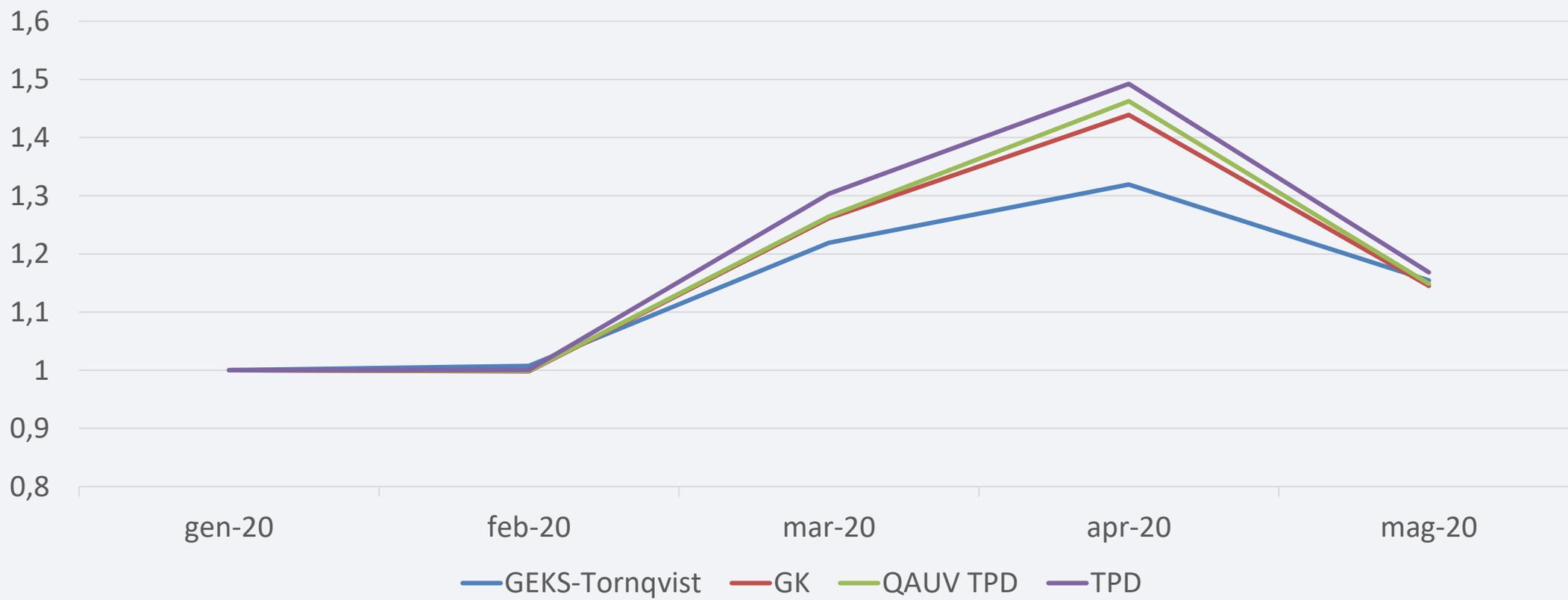
Larger differences at Non-food level

Non-food groceries



Differences at product level

Toilet paper



Significant changes in expenditure shares leads to differences in multilateral methods

- ▶ Product X_3's expenditure share increased from 0.88% to 10.78% resulting in a large difference between GEKS (1.0174) and TPD (1.0524) (using decomposition from Webster and Tarnow 2019)

Product	Feb exp share (%)	Mar exp share (%)	Price relative	Exp share relative	GEKS-Tornqvist	TPD	Difference
X_1	12.37	18.76	1.8430	1.5161	1.1016	1.1221	0.0205
Y_1	2.16	11.91	1.7504	5.5025	1.0291	1.0593	0.0302
X_2	8.27	8.43	1.8418	1.0196	1.0526	1.0554	0.0028
X_3	0.88	10.78	1.0373	12.3119	1.0174	1.0524	0.0351
Y_2	5.14	6.32	1.8027	1.2310	1.0320	1.0409	0.0089
X_4	0.70	5.68	1.6359	8.0718	1.0072	1.0189	0.0117
Y_3	3.76	3.53	1.4280	0.9388	1.0160	1.0141	-0.0019
Y_4	2.95	5.72	1.2372	1.9381	1.0094	1.0126	0.0032
X_5	6.13	4.03	1.1298	0.6570	1.0063	1.0067	0.0003
X_6	1.28	1.67	1.5277	1.3034	1.0061	1.0063	0.0002

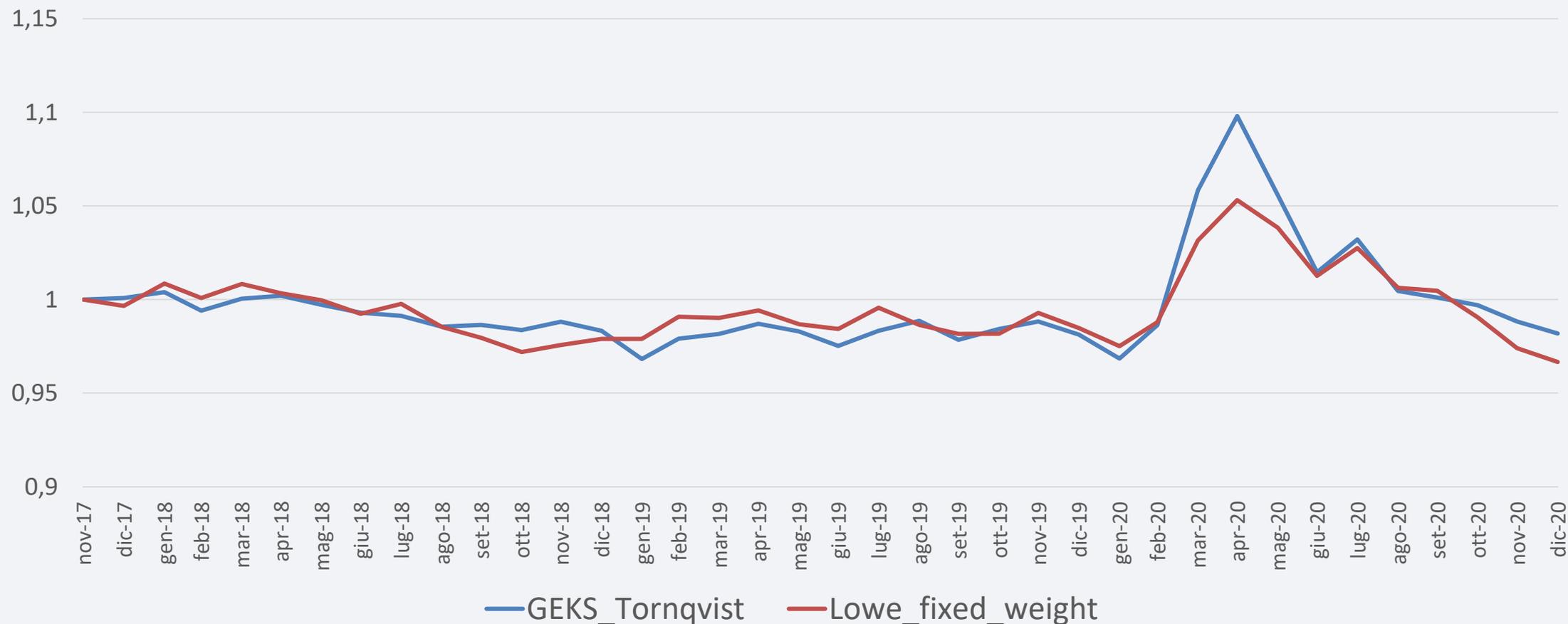
Multilaterals sensitive to large changes in expenditure shares

- ▶ Product Y_6 TPD index <1 even though price relative >1

Product	Feb exp share (%)	Mar exp share (%)	Price relative	Exp share relative	GEKS-Tornqvist	TPD	Difference
X_2	8.27	8.43	1.8418	1.0196	1.0526	1.0554	0.0028
Y_5	1.01	0.32	1.6693	0.3133	1.0013	1.0023	0.0009
X_6	1.28	1.67	1.5277	1.3034	1.0061	1.0063	0.0002
X_7	0.80	0.52	1.5151	0.6532	1.0021	1.0030	0.0009
Y_3	3.76	3.53	1.4280	0.9388	1.0160	1.0141	-0.0019
X_8	0.08	0.03	1.3230	0.3424	1.0000	1.0001	0.0001
X_9	0.77	0.42	1.2558	0.5399	1.0018	1.0013	-0.0004
Y_6	0.84	0.17	1.1602	0.2073	1.0004	0.9997	-0.0008
X_5	6.13	4.03	1.1298	0.6570	1.0063	1.0067	0.0003

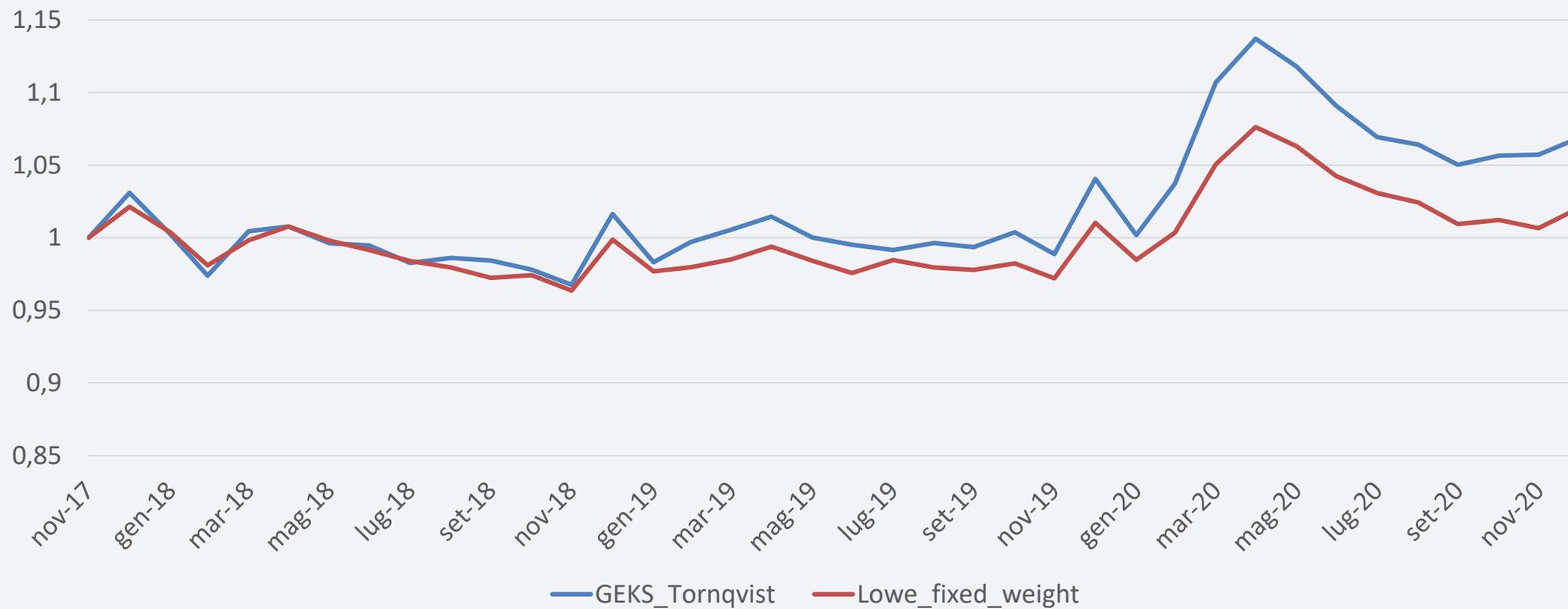
Multilateral index vs. fixed weight index

Other non-durable household products (e.g. toilet paper)

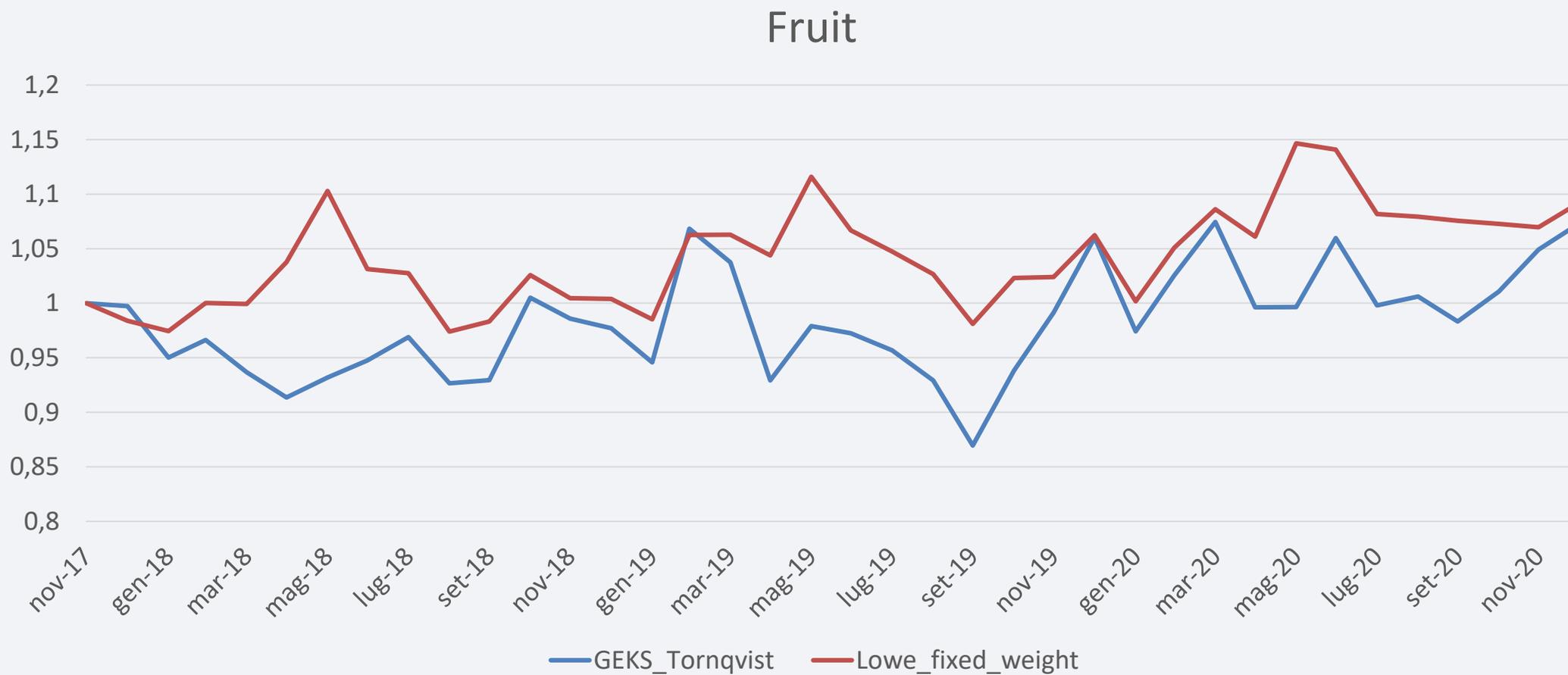


Multilateral index vs. fixed weight index

Other cereal products (e.g. pasta, rice)



Multilateral index vs. fixed weight index



- ▶ Multilateral index methods performed similarly to the unusual consumer behaviour, and differences are largely attributable to one product class which exhibited particularly extreme behaviours.
- ▶ The GEKS-Tornqvist method was observed to behave more conservatively and arguably more favourably in this extreme scenario because it was less influenced by the extreme changes to expenditure shares of individual products.
- ▶ Products that were found to contribute more to TPD than GEKS-Tornqvist in most cases had large increases in expenditure shares
- ▶ Following the one-off shock of stockpiling and panic buying, the indexes converged to similar levels for each of the multilateral methods.