

“Evaluating unit-value price indices in a dynamic item universe”

16th Meeting of the Ottawa Group, 8-10 May 2019
Rio de Janeiro, Brazil

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Background

- Strategy: Increase the use of scanner data in Norwegian CPI/HICP
- Current official index methods do not fully make use of scanner data potential
 - Until now mostly focus on stable long-lived items
 - Possible to use scanner data of **dynamic items** in regular production?
- Requires **new methods** to be implemented
- Aims of Eurostat grant 2018-2020:
 1. Generic calculation method to be applied across different commodity groups
 2. Incorporate expenditure shares at most detailed level
- No international consensus on scanner data calculation method – NSIs choose differently

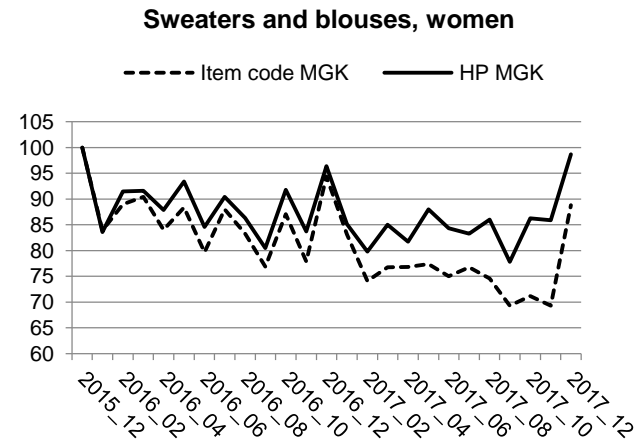
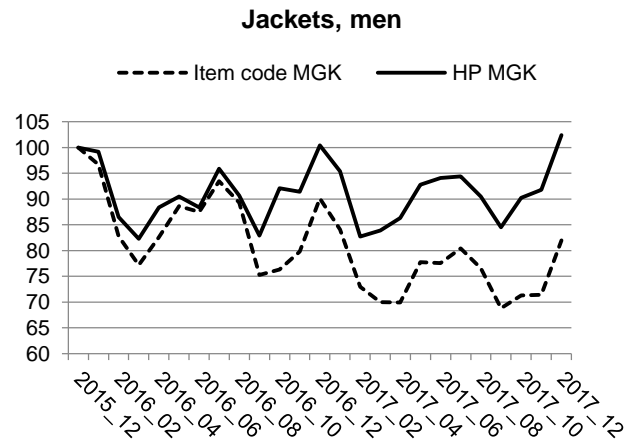
TEF – Total Effect Framework

- A systematic approach in order to empirically evaluate different choices
- Measure effects by defining a set of generic diagnostics
- **Not just a question of formula** - three necessary choices: 1) Homogenous products
2) Reference universe 3) Index base
- The choices dependent on the dynamism of item universe
- Dynamic items: 1) Replacement items 2) Regeneration items 3) Strongly seasonal items



Homogenous products (HPs)

- How to define the product?
 - Defining the product at item code (GTIN) level may be too detailed
- Creation of HPs mostly motivated by replacement items
- For markets with high item churn the effects of **missing replacements** can be large and systematic



- In general, HP-based indices are not more volatile than the item-based, hence no strong indication of classification bias

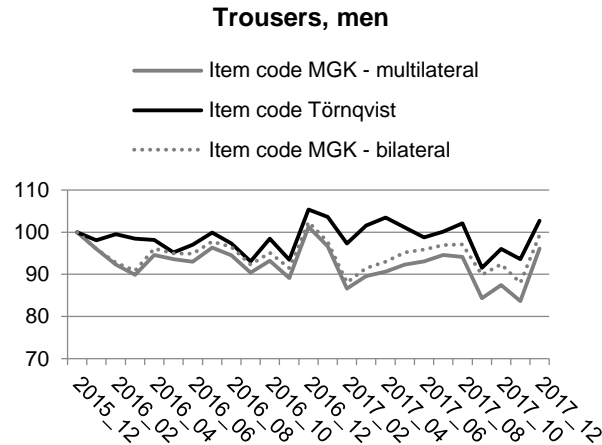
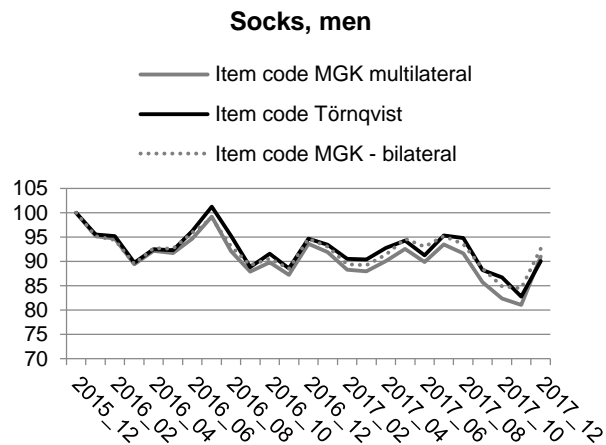
Homogenous products (HPs) II

- How item codes are classified key choice in HP formation
- HP formation depends on available metadata – often limited
- Approach implemented by Statistics Norway for price indices related to sport clothing and equipment
 - Scanner data from one major sport clothing and equipment retailer
 - HPs defined by **brand blocking** – *Store concept/Raincoat men/Helly Hansen (brand)*
 - In cases with too high heterogeneity only using metadata – “normal price” as additional classification criteria
 - The majority of the HPs entirely based on metadata
 - Fixed HPs within the short-term link



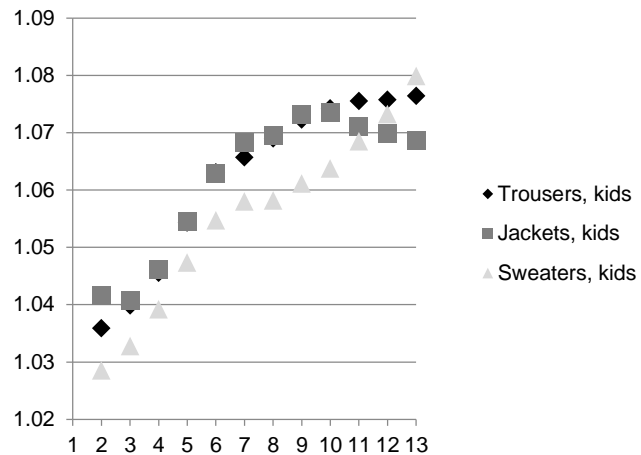
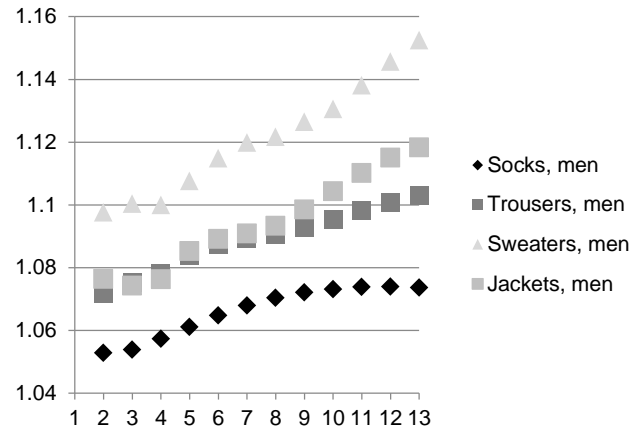
Reference universe

- Multilateral index formula does not dictate the choice of reference universe
- Multilateral reference universe **responsive to regeneration items**
 - Given bilateral fixed index base a new item/HP will not be captured until next time the base month is updated
- Diagnostic: Testing the sensitivity to the choice of reference universe
 - Compare bilateral index to multilateral index (Fixed base monthly expanding window) with **fixed item universe 0 to T**



Reference universe II

- Diagnostic: Testing the sensitivity of different window lengths



- Sensitivity of the GEKS index varies across the commodity groups
- The GEKS increases with window length

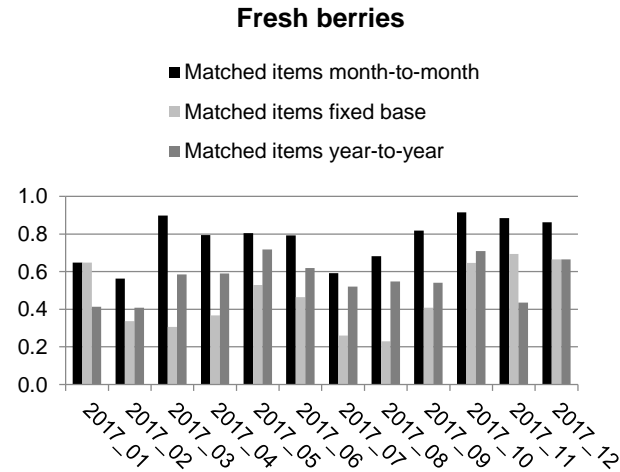
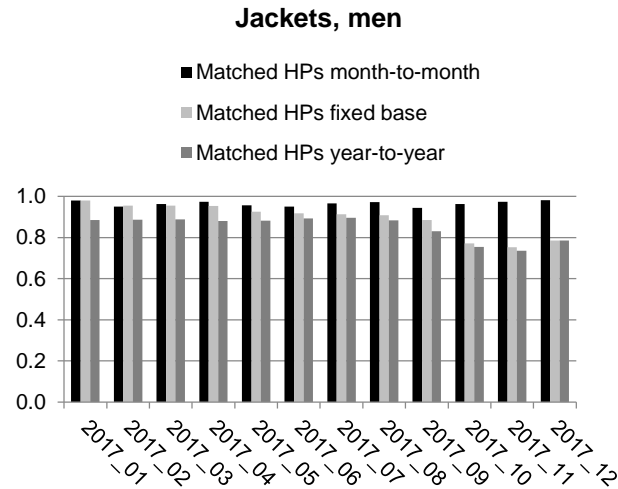
Index base

- Given that HPs capture replacement items, the choice of index base is most affected by **strongly seasonal** and **regeneration items**
 - **Fixed base month index** – to capture strongly seasonal items will normally require imputation of both price and quantity
 - Generally, **moving base month t-1**, cannot eliminate chain drift completely
 - May lead to heavy drift in chained *bilateral* indices, and may create bias in case of strongly seasonal items if first-appearance prices are not appropriately accounted for
 - **12 month base** - may be the best option for covering strongly seasonal items, but not necessarily for the inclusion of regeneration items



Index base II

- Diagnostic: Check the actual dynamics in given markets (expenditure shares)



- For commodity groups with seasonal patterns there can be large difference (bicycles, pork, fresh berries etc)
- Greater sensitivity of fixed base month than 12 month base
- No ideal choice of index base to all commodity groups

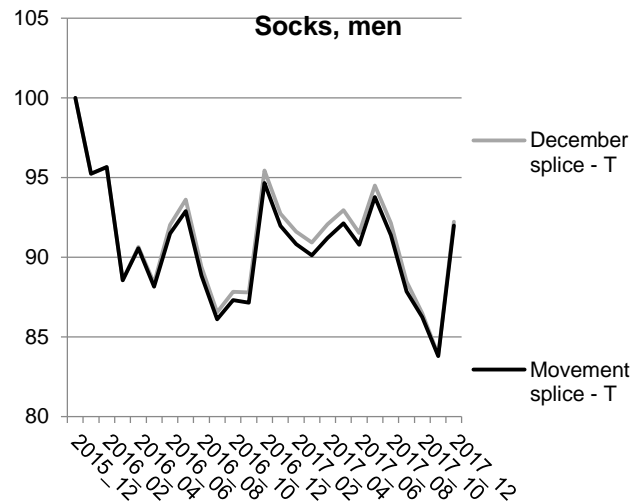
Splicing options

- Tested different splicing options;
 - “***Movement splice***”
 - Rolling window of 13 months
 - Month-to-month movement spliced on to existing time series
 - “***Fixed base moving window (FBMW) - December splice***”
 - Combine rolling window with December linking



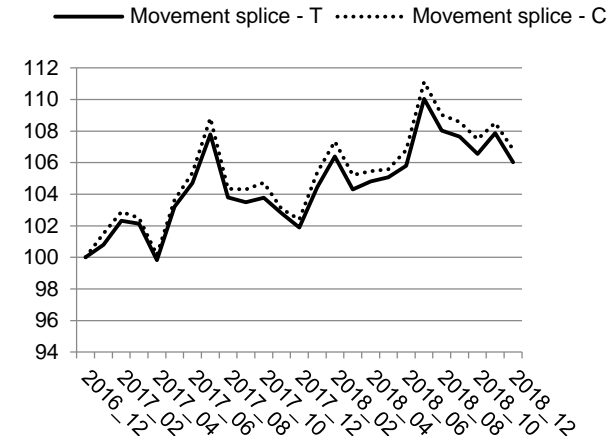
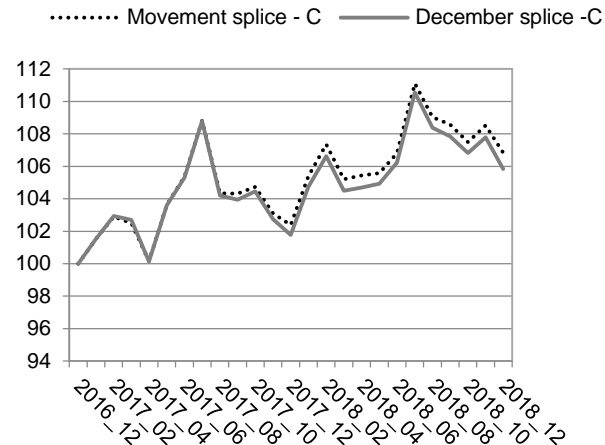
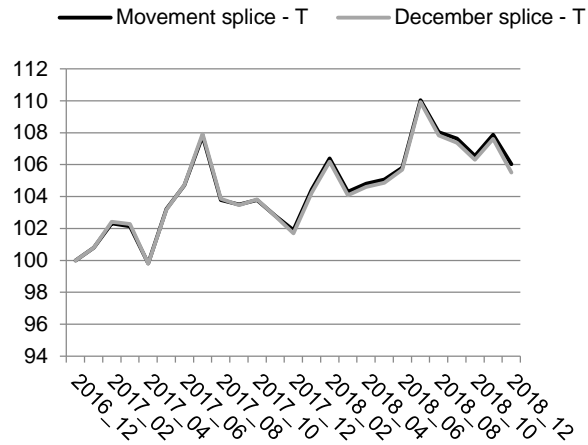
Splicing options II

- “*Movement splice*” captures the **long-term effects** of strongly seasonal items
 - Ex. strawberries only available in June and July
 - More drift in “*movement splice*” compared to “*FBMW with December splice*”?
- “*FBMW December splice*” does not capture the long-term effects of strongly seasonal items not present in base month
- Trade off between drift and capturing permanent effects of strongly seasonal items?



Splicing options III

- Marginal total effects on COICOP 01

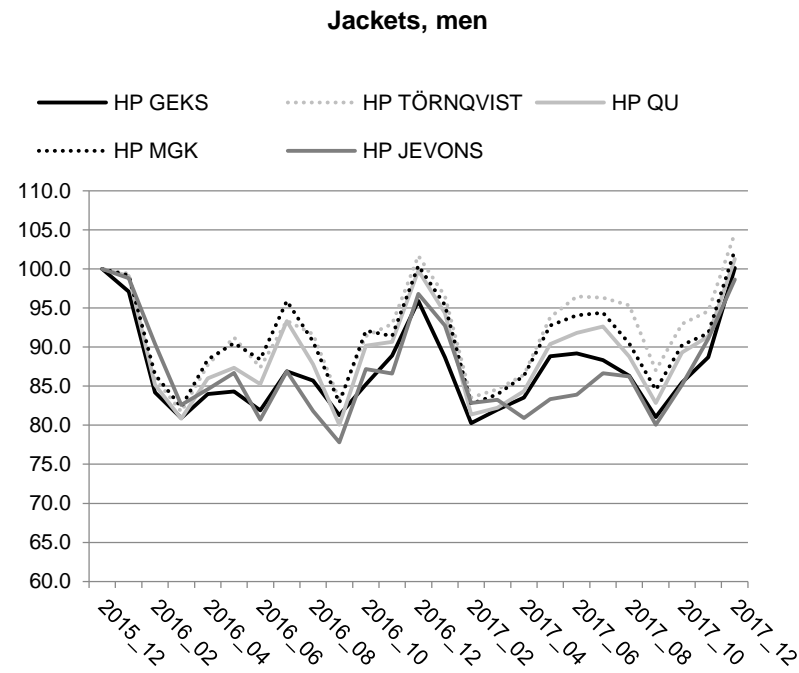
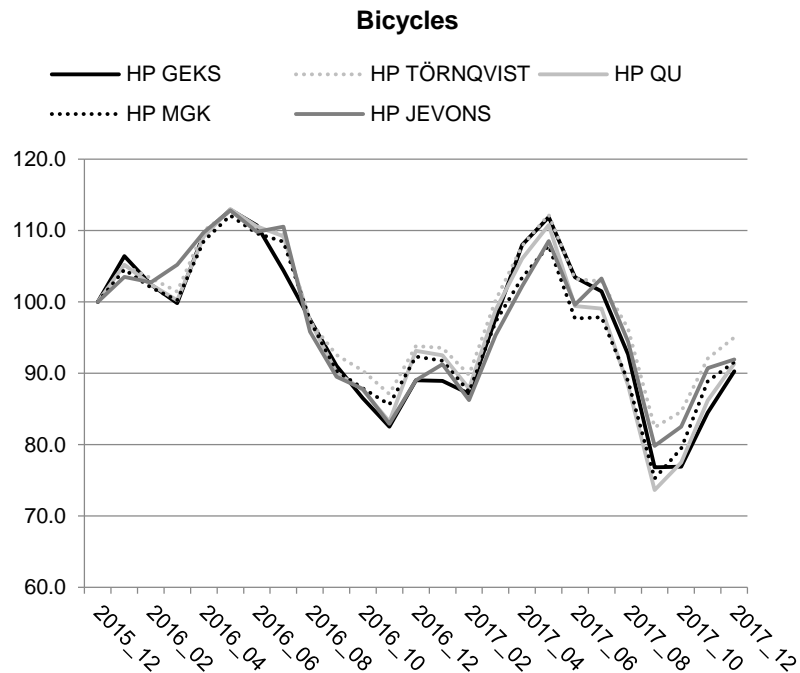


- “*Movement splice*” seems to pull the price growth marginally up, while the effects of seasonal items (and regeneration items) pull in opposite direction
- Empirically difficult to conclude – in general **small differences** between the options
- “*Mean splice*” - geometric mean of the indices by using every possible splicing alternative - suggested solution, but results in complex production routines



Index formula

- An additional separate choice - set of different index formulas tested and compared
 - GEKS, GUV (Generalized Unit value) indices, official Jevons index (dynamic method) and direct bilateral superlative index
- All necessary choices matters, but the effects of using HPs seem to outweigh the other choices (more systematic)



Conclusions

- Choices are many and answers are not obvious
- In favor of using HP in order to capture replacement items in dynamic universes
- Likely to implementing a multilateral price index formula in order to capture regenerations items in a timely manner
- A fixed length 13-months window seems to be a good choice
 - Splicing – a trade off?
- Own research as well as experiences and advises from NSIs and the statistical community very important for making final conclusion

Thank you!

