A Comparison of Weighted Time Dummy Hedonic and Time-Product Dummy Indexes

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Background

- Aizcorbe, Corrado and Doms (2003)
  - "When Do Matched-Model and Hedonic Techniques Yield Similar Price Measures?"
- Aizcorbe and Pho (2005)
  - "Differences in Hedonic and Matched-Model Price Indexes: Do the Weights Matter?"
- Silver and Heravi (2005)
  - "A Failure in the Measurement of Inflation: Results from a Hedonic and Matched Experiment Using Scanner Data"
- Krsinich (2016)
  - "The FEWS Index: Fixed Effects with a Window Splice"

The TDH and TPD models

- The Time Dummy Hedonic model:

$$\ln p_i^t = \delta^0 + \sum_{t=1}^{T} \delta^t D_i^t + \sum_{k=1}^{K} \beta_k z_{ik} + \varepsilon_i^t$$

- The Time Product Dummy model:

$$\ln p_i^t = \alpha + \sum_{t=1}^{T} \delta^t D_i^t + \sum_{i=1}^{N-1} \gamma_i D_i + \varepsilon_i^t$$

Weighted TDH and TPD Indexes

$$P^{0t} = \exp(\hat{\delta}^t)$$

$$P_{TDH}^{0t} = \frac{\prod_{i \in S^t} (p_i^t)^{s_i^t}}{\prod_{i \in S^0} (p_i^0)^{s_i^0}} \exp\left[\sum_{k=1}^{K} \hat{\beta}_k \left(\bar{z}_k^0 - \bar{z}_k^t\right)\right]$$

$$P_{TPD}^{0t} = \frac{\prod_{i \in S^t} (p_i^t)^{s_i^t}}{\prod_{i \in S^0} (p_i^0)^{s_i^0}} \exp\left(\bar{\hat{\gamma}}^0 - \bar{\hat{\gamma}}^t\right)$$

Decomposition in regression residuals (1)

- Weighted TDH and TPD sum to zero in each period.

$$\prod_{i \in S^0} \left(\frac{\hat{p}_i^0}{p_i^0} \right)^{s_i^0} = \prod_{i \in S^t} \left(\frac{\hat{p}_i^t}{p_i^t} \right)^{s_i^t} = 1$$

- The TDH and TPD indices can be written as:

$$P^{0t} = \prod_{i \in S^0} \left(\frac{\hat{p}_i^t}{p_i^0} \right)^{s_i^0} = \prod_{i \in S^t} \left(\frac{p_i^t}{\hat{p}_i^0} \right)^{s_i^t} = \prod_{i \in S^0} \left(\frac{\hat{p}_i^t}{p_i^0} \right)^{\frac{s_i^0}{2}} \prod_{i \in S^t} \left(\frac{p_i^t}{\hat{p}_i^0} \right)^{\frac{s_i^t}{2}}$$

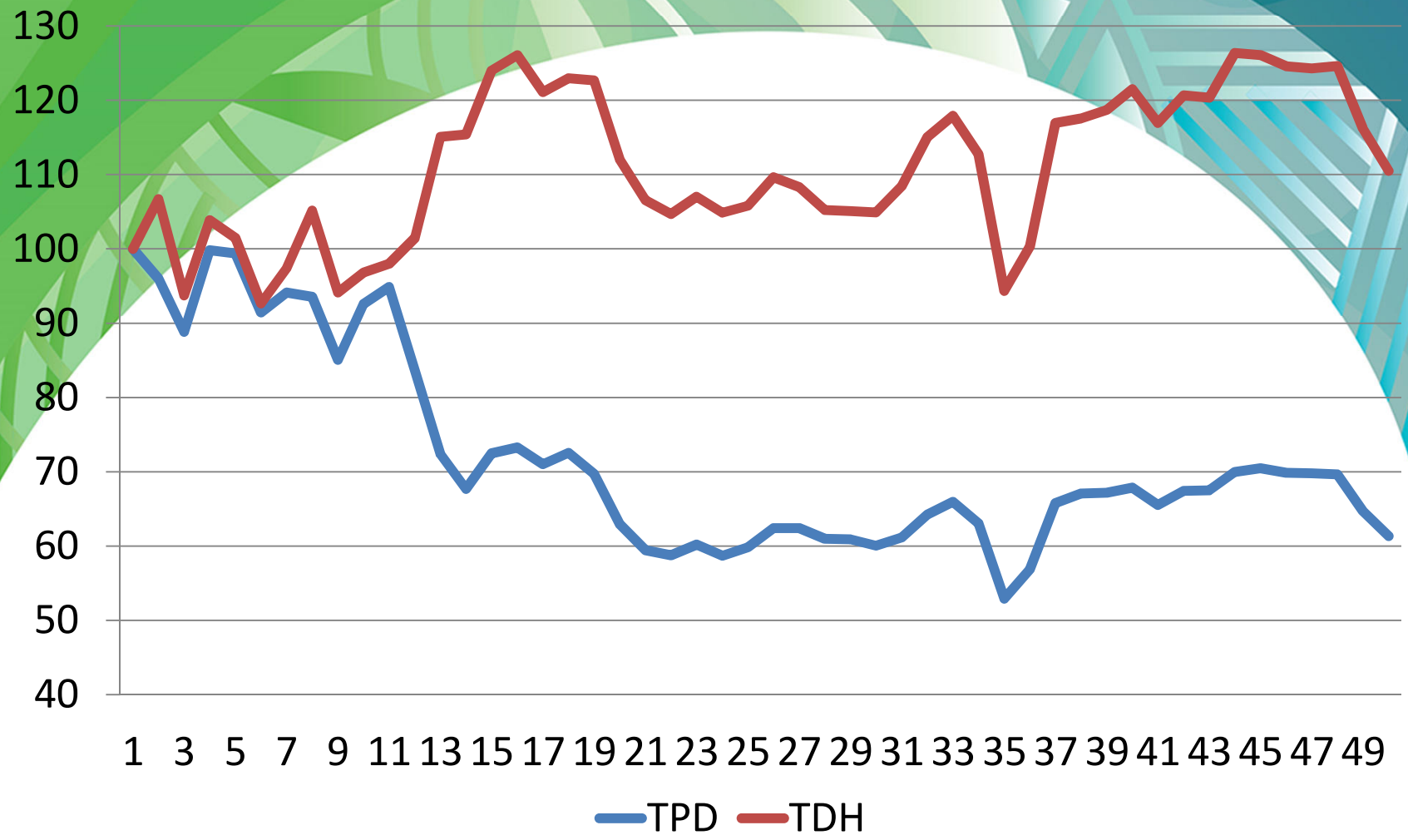
Decomposition in regression residuals (2)

$$\frac{P_{TPD}^{0t}}{P_{TDH}^{0t}} = \exp\left[\frac{s_D^0}{s_M^0}\left(\bar{u}_{D(TPD)}^0 - \bar{u}_{D(TDH)}^0\right)\right] \bullet$$

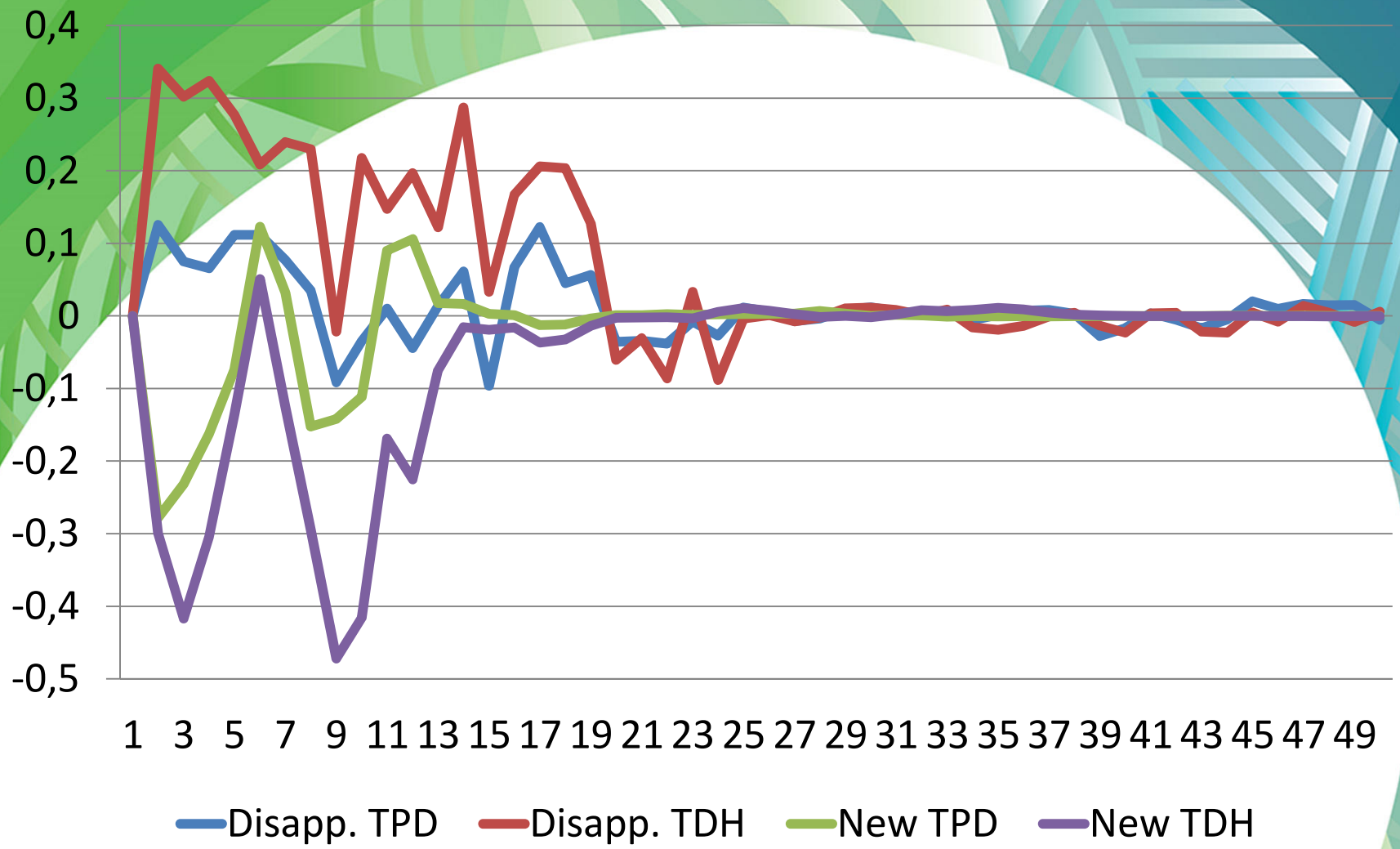
$$\bullet \exp\left[\frac{s_N^t}{s_M^t}\left(\bar{u}_{N(TDH)}^t - \bar{u}_{N(TPD)}^t\right)\right] \bullet$$

$$\bullet \exp\left[\left(\bar{u}_{M(TPD)}^0 - \bar{u}_{M(TPD)}^{0(t)}\right) - \left(\bar{u}_{M(TDH)}^0 - \bar{u}_{M(TDH)}^{0(t)}\right)\right]$$

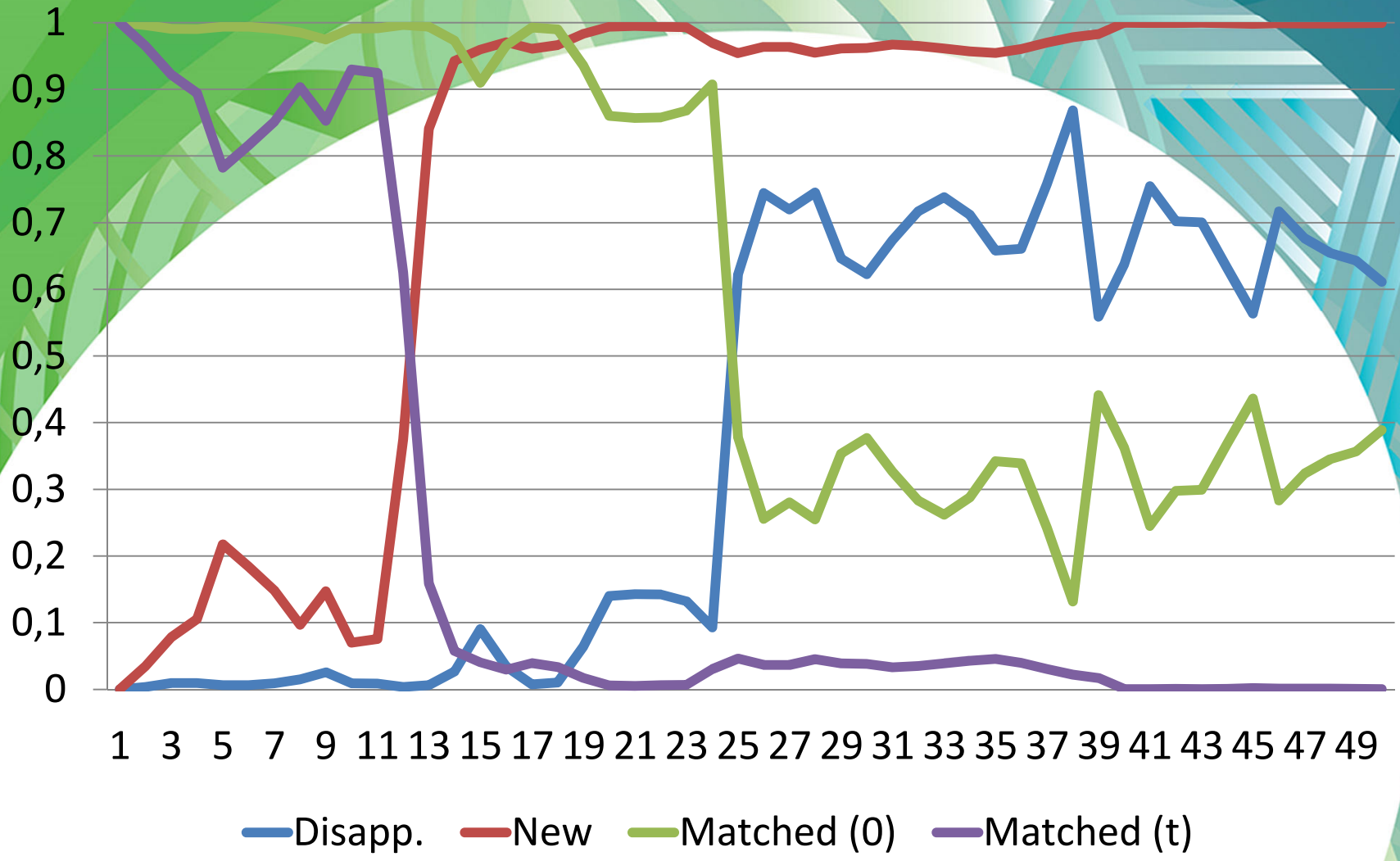
Empirical Illustration (1)
Weighted TPD & TDH Indexes



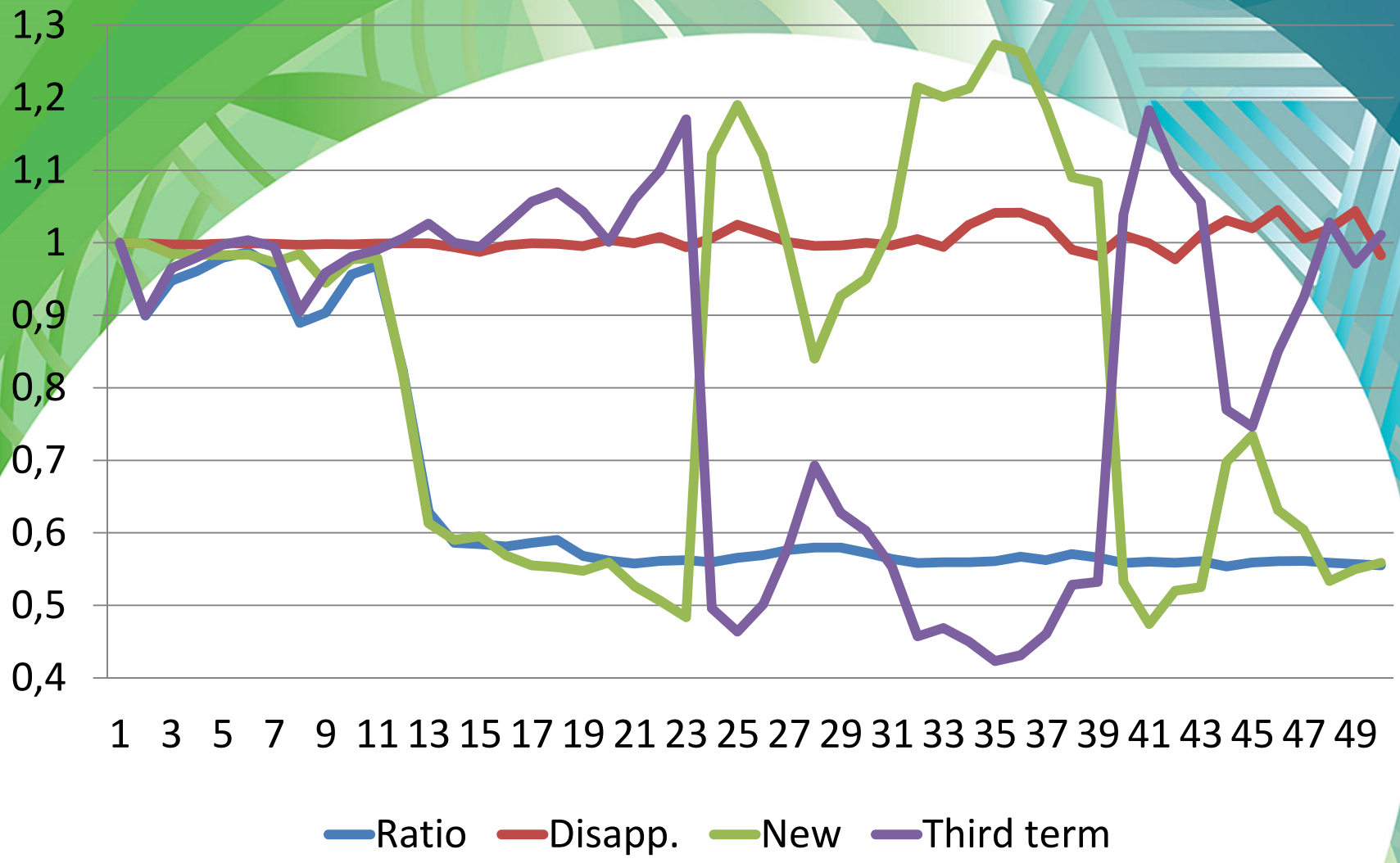
Empirical Illustration (2)
Weighted Average Residuals



Empirical Illustration (3)
Aggregate Expenditure Shares

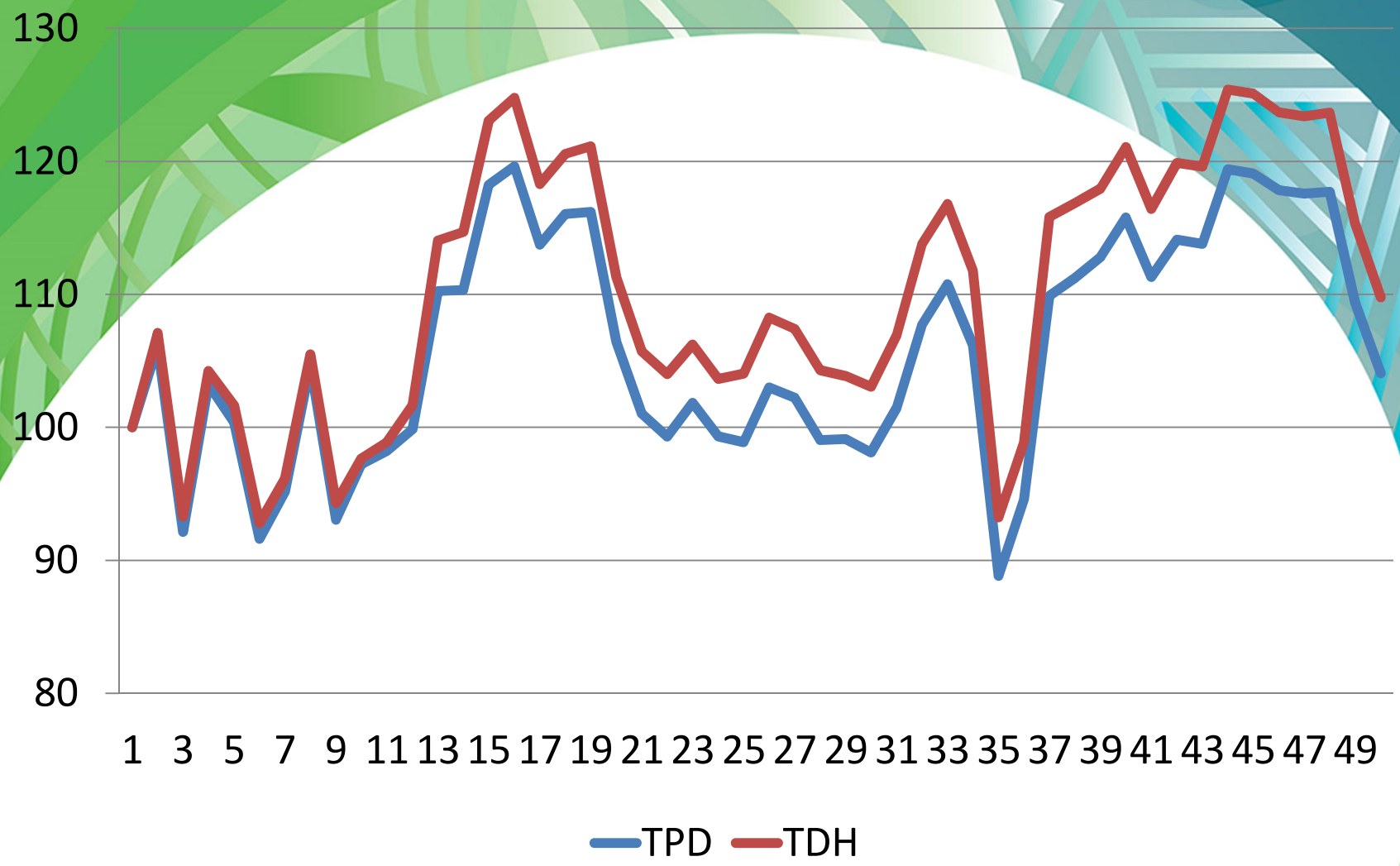


Empirical Illustration (4)
Decomposition of TPD-TDH Ratio

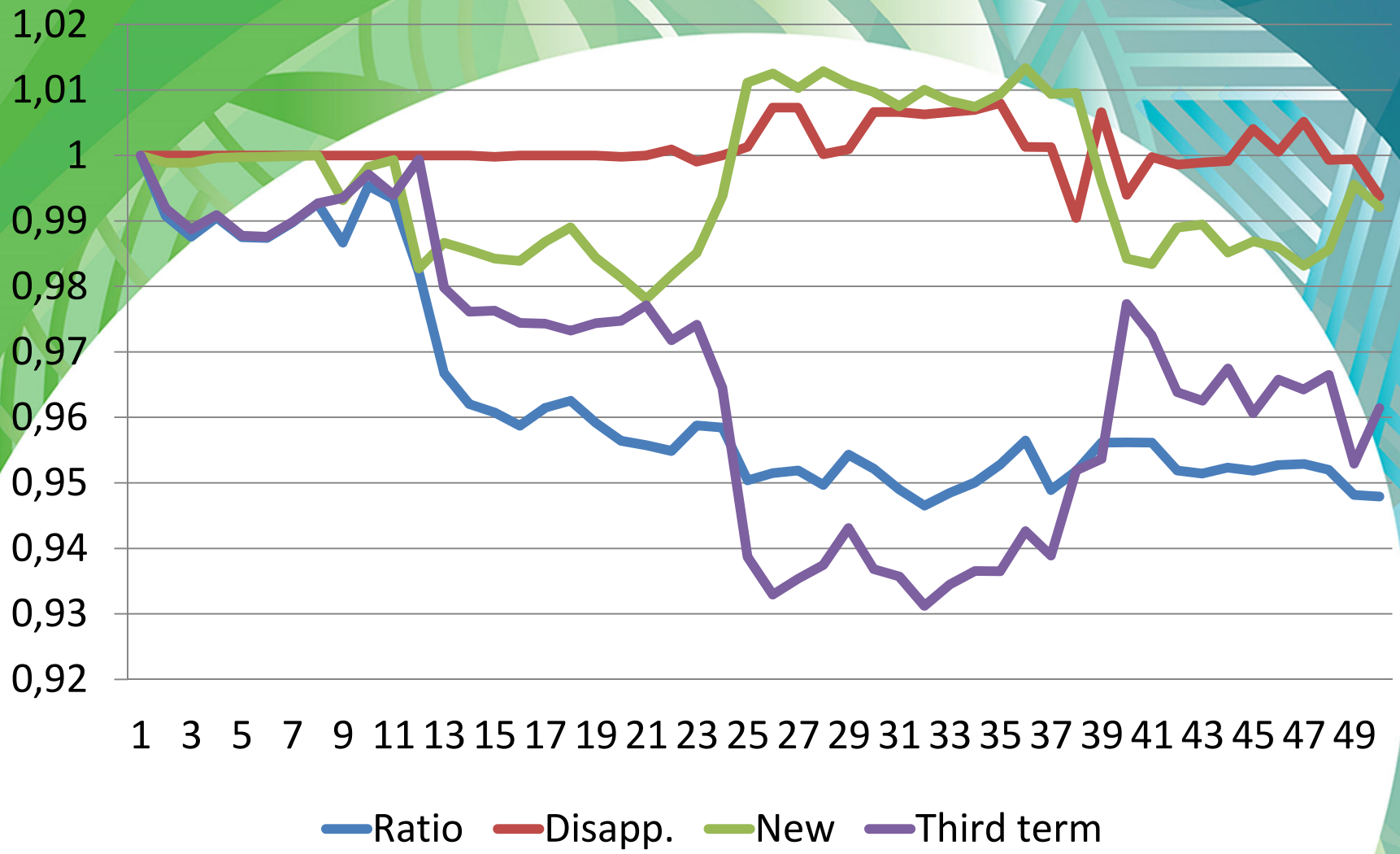


Empirical Illustration (5)

TPD-TDH Indexes – Group Level



Empirical Illustration (6)
Decomposition – Group Level



Questions?