Private Label Brands versus National Brands:

Some Implications for the Construction of the CPI

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AGENDA

- Overview of the paper
- Background
- Data and Identifying PLBs
- Aspect of PLB
- Substitution effect
- Quality Adjustment for PLBs
- Conclusion

Overview of the paper

- Compare private label brands (PLB) and national brands (NB) using Japanese scanner data.
- Compare these two in terms of the following:
  (1) the length of product life;
  (2) the price change over the entire life;
  (3) the frequency of price adjustment;
  (4) the average size of price changes;
  (5) the frequency of temporary sales;
  (6) the size of sale discounts;

Overview of the paper –continued

- Examine to what extent different sampling methodologies regarding the treatment of PLBs would affect the CPI.
- Specifically, we construct the CPI using three different product sampling methodologies:
  (1) sampling only from NBs;
  (2) sampling only from PLBs;
  (3) sampling both from NBs and PLBs.

Overview of the paper –continued

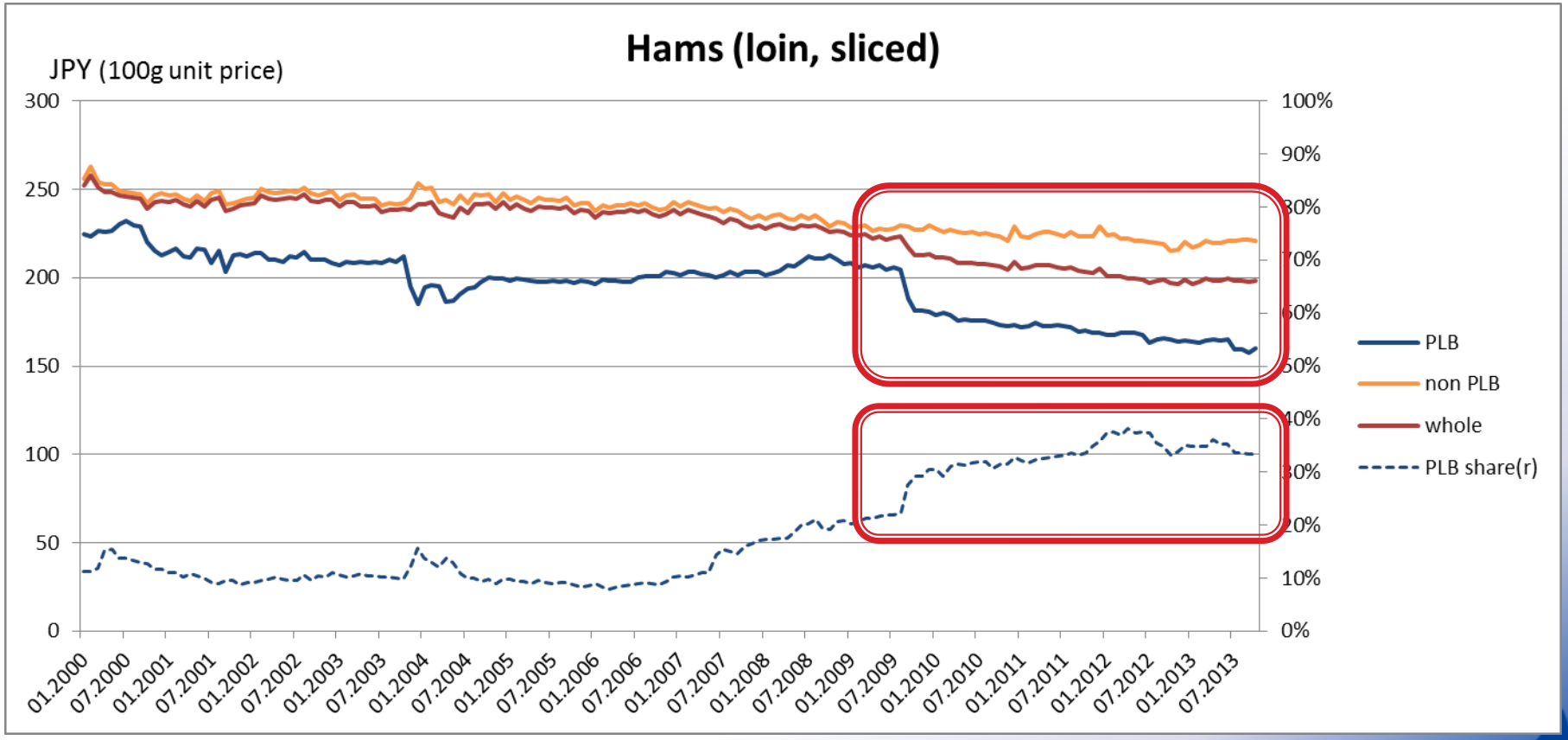
- We then compare 11 different quality adjustment methods to evaluate some lessons about the current practice employed by the Statistic Bureau of Japan regarding the PLBs
  (1) unit price method
  (2) subcategorized unit price
  (3) chained Jevons
  (4) existing products mean adjustment (4 branches)
  (5) existing products group adjustment (4 branches)

Overview of the paper –continued

- Main findings of the paper:
  - **Have PLBs any typical aspects?**
    - Life cycle and life cycle price change are not so different
    - Band of price change is tighter..
    - Frequency of price change is higher..
  - **Have PLBs impacts to Japanese CPI?**
    - Yes. Especially substitution effect should be carefully evaluated
  - **What kind of quality adjustment is reasonable?**
    - NB and PLBs should be treat as subcategory
    - We suggest “Quality adjustment by unit group”

Background

- Hams (loin, sliced)



Background

- Index in 2008 indicate the peak due to cost increase and downsizing

(Imai, Watanabe, 2014)

- **Have PLBs any typical aspects?**
- **Have PLBs impacts to Japanese CPI?**
- **What kind of quality adjustment is reasonable?**

  - It seems PLB is going to hold an important place in Japanese market
  - Can we treat PLBs as same as NBs?

Background

Some Private brand (PB) commodities
that conform to the prescribed basic specifications
established by considering their representativeness, marketability, continuity and other factors are surveyed.
（Q&A about the Retail Price Survey, SBJ）

- PLBs possibly are surveyed
  - 66 items (foods and drinks)
  - 9 items (daily needs)
- NBs definitely are specified
  - 36 items (food (not flesh) and drinks)
  - 25 items (daily needs)

※ Evaluable in scanner data, mainly in food (not flesh), drinks (not alcohol) and daily needs

Background

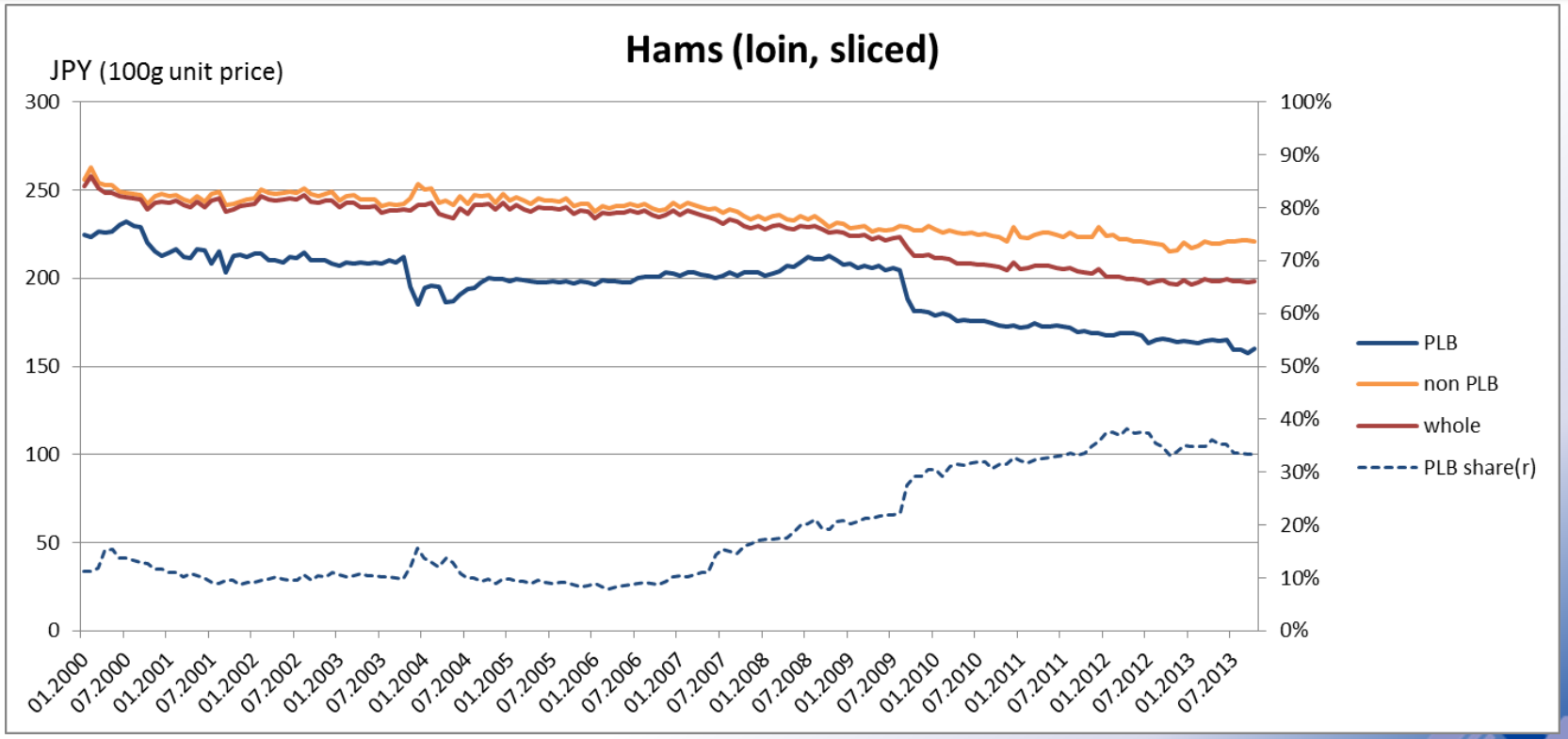
Some Private brand (PB) commodities
that conform to the prescribed basic specifications
established by considering their representativeness, marketability, continuity and other factors are surveyed.
（Q&A about the Retail Price Survey, SBJ）

- If some PLBs comply with basic specifications,
  - SBJ consider those have “same quality”
  - It means those prices are put into the functions directly
    (except for unit price adjustment)

Background

Ham:

Ham (loin), not Japanese Agricultural Standard (JAS) certified, ordinary quality



Data and Identifying PLBs

- Scanner data
  - Jan. 2000 – Oct. 2013

Number of Outlets, Products and Observations

	No. of outlets	Entries	Exits	No. of products	No. of observations
2000	189	21	4	251,053	242,357,320
2001	187	2	4	265,628	274,319,003
2002	198	13	2	276,503	283,432,923
2003	189	3	12	274,479	257,525,219
2004	202	17	4	279,753	282,074,675
2005	187	15	30	288,634	309,888,190
2006	189	7	5	306,166	323,722,317
2007	274	93	8	348,134	379,329,705
2008	261	4	17	367,079	412,843,270
2009	264	7	4	357,950	416,297,894
2010	259	0	5	358,305	415,354,684
2011	249	0	10	358,837	403,651,608
2012	261	21	9	358,250	445,600,351
2013	334	78	5	366,233	401,856,201

2003: 11.2003 and 12.2003 weekly observation only
2013: 1.2013 to 10.2013 only

Data and Identifying PLBs

- Identifying PLBs

Ex)

"Snow Brand Hokkaido

Country Maker Proc

49 03050 155

"AEON TopValu Hokkaido Butter 200g

49 01810 39395 4 (JAN)

Products having **retailer maker code** are PLBs

- 570 six digit categories evaluable (1,797 six digit categories in data)

Data and Identifying PLBs

- PLB related basic information

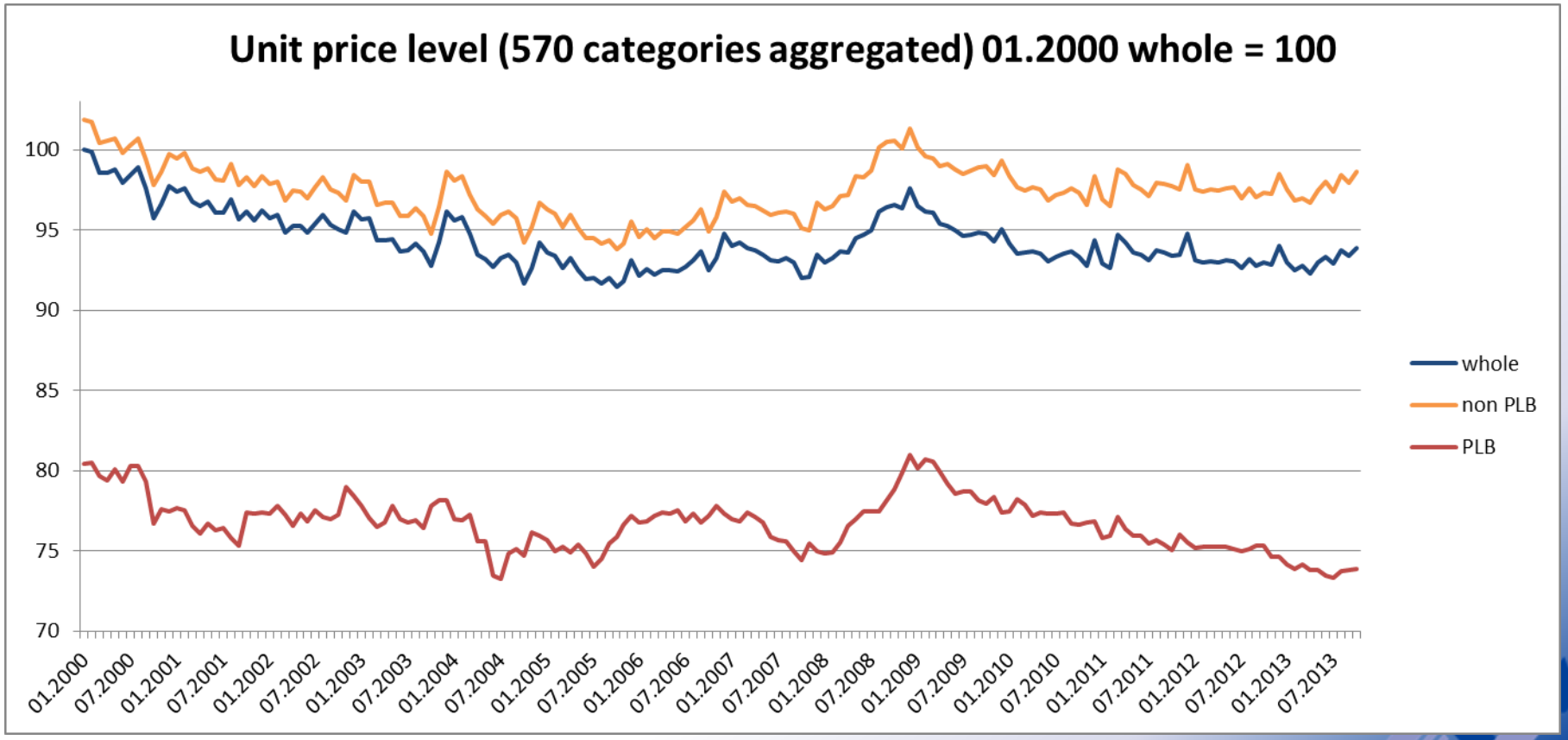
[PBbase] Number of Outlets, Products and Turnover of Products

	No. of outlets	Entries	Exits	No. of products	Entries	Exits	Entry rate	Exit rate
2000	175	–	–	118,046	–	–	–	–
2001	174	2	3	121,134	30,483	27,395	0.252	0.226
2002	183	11	2	119,348	28,435	30,221	0.238	0.253
2003 *	174	2	11	121,454	30,393	28,287	0.250	0.233
2004	178	8	4	119,771	28,573	30,256	0.239	0.253
2005	153	4	29	126,039	35,032	28,764	0.278	0.228
2006	154	5	4	141,629	44,733	29,143	0.316	0.206
2007	219	73	8	150,722	42,405	33,312	0.281	0.221
2008	216	3	6	142,610	34,210	42,322	0.240	0.297
2009	215	1	2	139,580	34,567	37,597	0.248	0.269
2010	211	0	4	139,248	33,341	33,673	0.239	0.242
2011	202	0	9	138,147	33,342	34,443	0.241	0.249
2012	208	15	9	133,451	26,854	31,550	0.201	0.236
2013 *	218	14	4	183,674	47,062	58,749	0.256	0.320

!! Only outles providing one PLB product at least
2003: 11.2003 and 12.2003 are weekly data
2013: 1.2013 to 10.2013 Only

Data and Identifying PLBs

- Aggregated geometric mean of unit price (lower weight: quantity)



Aspect of PLB

- 570 categories aggregated indicators

	Ratio (PLB / non PLB)		PLB	
	mean	stdev.	mean	stdev.
Variety	0.113	0.100	85.595	106.749
Life Cycle length (days)	1.237	0.383	1190.487	439.167
ΔP (entry − exit)	1.164	1.979	−0.087	0.059
ΔP (max − min)	1.021	0.328	−0.255	0.084
ΔP (entry − exit) / Life Cycle length	0.610	14.273	−0.006	0.026
Price change count (per 30 days)	2.477	1.561	2.593	2.132
Price decline count (per 30 days)	2.391	1.477	1.327	1.086
Price change interval (days)	0.788	0.497	41.786	30.582
Price decline interval (days)	0.827	0.476	65.652	44.628
Price change ratio	0.762	0.292	0.111	0.048
Price decline ratio	0.746	0.256	0.099	0.037

* This data calculated by only products which already exit from the market

Aspect of PLB

- Indicators

Variety	# of products
Life Cycle length (days)	Duration from the start date of sale to disappear date
ΔP (entry – exit)	(exit price – entry price) / entry price
ΔP (max – min)	(max price – min price) / max price
ΔP (entry – exit) / Life Cycle length	(exit price – entry price) / entry price / Life Cycle length
Price change count (per 30 days)	Price change count per 30 days
Price decline count (per 30 days)	Price decline count per 30 days
Price change interval (days)	Duration from last price change to next change
Price decline interval (days)	Duration from last price decline to next decline
Price change ratio	|(new price – last price) / last price| on price change
Price decline ratio	|(new price – last price) / last price| on price decline

Aspect of PLB

- Life cycle length and life cycle rate of price decline are not so different

- Price change is more frequent
  More than two times frequency for sale and price back

- Price change band is narrower
  PLB move within ±10%
  non PLB move within ±15%

Aspect of PLB

- CDF over 570 categories

Substitution Effect

- Price mean change is divided to three factors

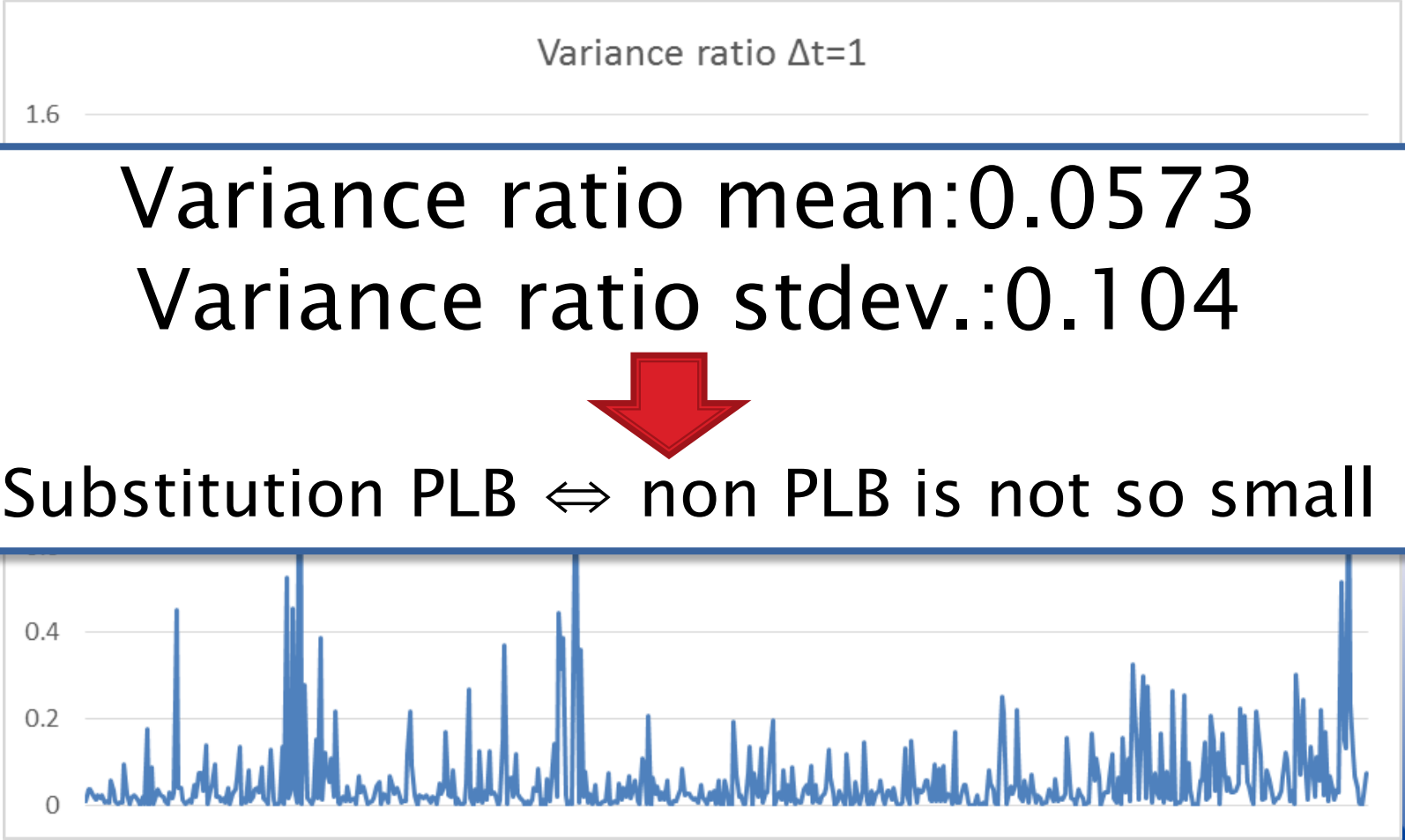
$$\Delta lnP = \underbrace{\alpha_{t-1} \cdot \Delta lnP_{PLB}}_{\text{PLB factor}} + \underbrace{(1-\alpha_{t-1}) \cdot \Delta lnP_{nonPLB}}_{\text{non PLB factor}}$$

$$\underbrace{+(\alpha_t - \alpha_{t-1}) \cdot lnP_{PLB\ t} + (\alpha_{t-1} - \alpha_t) \cdot \Delta lnP_{nonPLB\ t}}_{\text{substitution factor}}$$

α: *share of PLB*

Substitution Effect

- Variance ratio for substitution effect

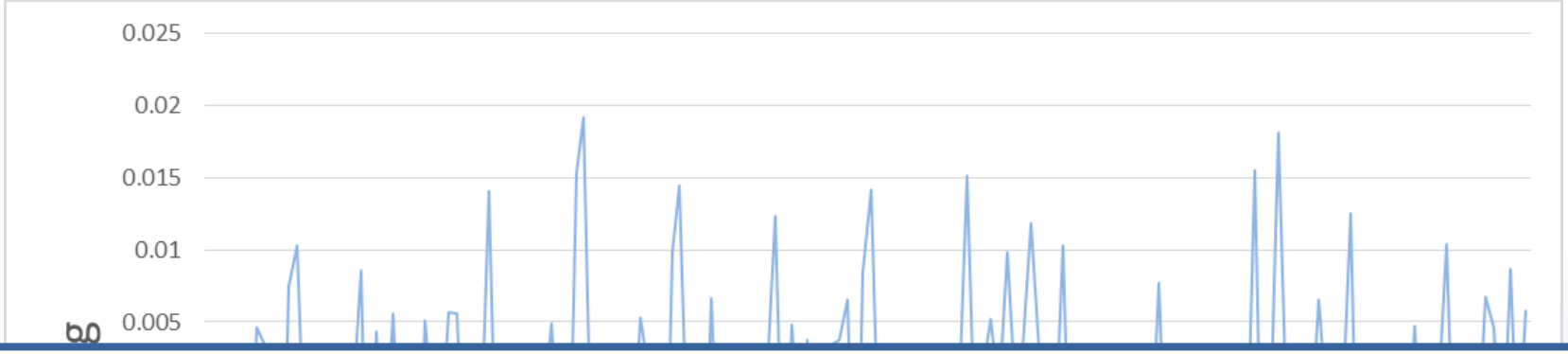


Variance ratio mean:0.0573
Variance ratio stdev.:0.104

Substitution PLB ⇔ non PLB is not so small

Substitution Effect

- Time line of substitution effect

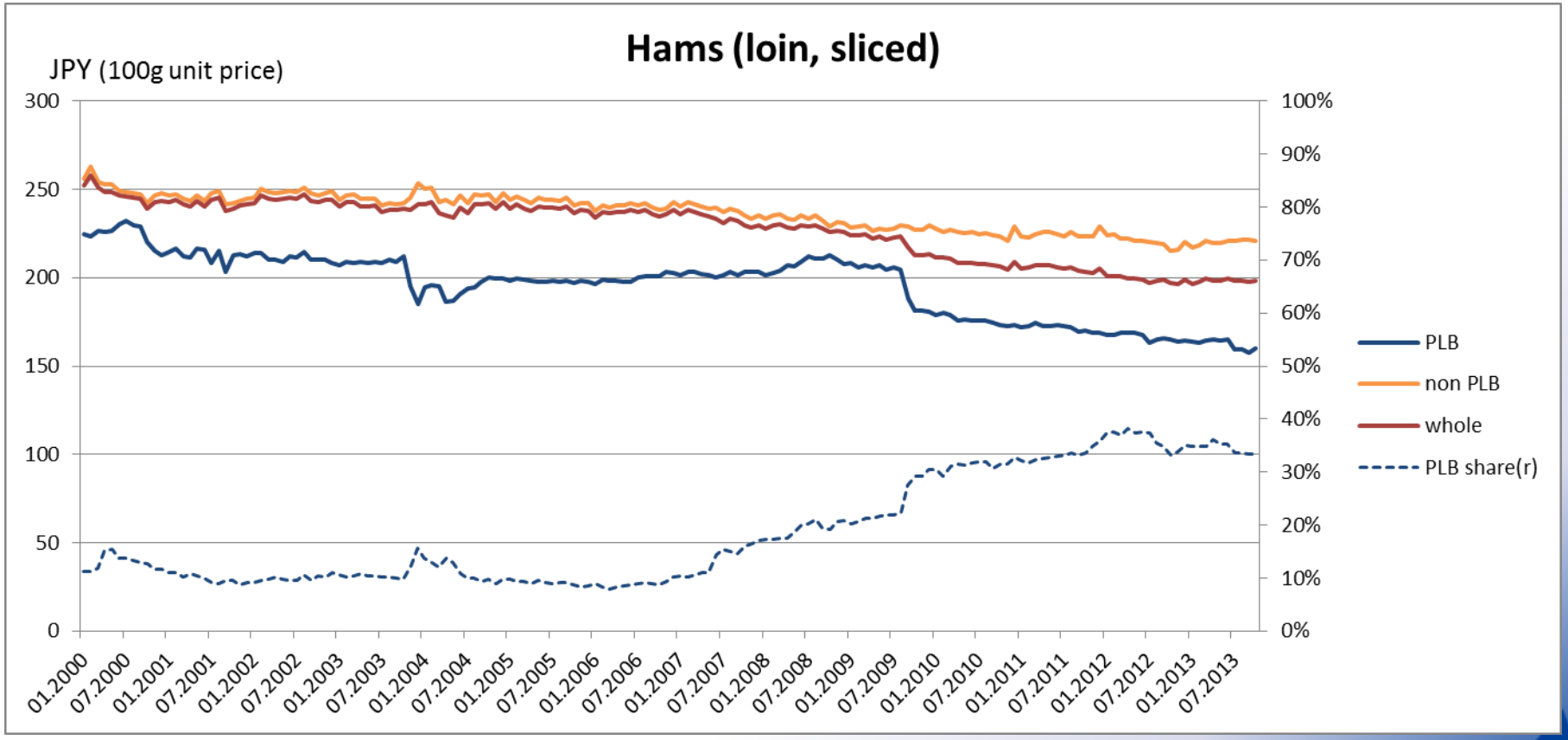


Substitution effect is important
as same as
Price change of PLBs

Consumers move to PLBs

Quality Adjustment for PLBs

- Hams (loin, sliced)



Quality Adjustment for PLBs

- Points
  - PLBs' price level are generally quite different from non PLB's one

To consider COGI

PLBs needs proper adjustment

  - There is difference in quality between PLBs and non PLBs

Quality Adjustment for PLBs

- Points detail
  - There are two types of PLB
    - Same product without brand label

      ⇒ Its spec is considerable as same with non PLB
    - Proprietary planed product for Reasonability

      ⇒ Some spec is depressed to cut cost

Second PLBs needs adjustment

Quality Adjustment for PLBs

- Strategies
  - Impute mean price
    - Impute new PLB with PLB mean
    - Impute new PLB with non PLB mean
  - Impute grouped mean price
    - Impute with weight/size grouped mean
  - Intermediate index
    - Divide PLBs and non PLB to sub category index

Quality Adjustment for PLBs

- Strategies detail
  - Impute mean price
    - Impute mean price on existing PLB

$$P_{PLB,t}^{Adjusted} = P_{PLB,t} \cdot {mean_{i \epsilon PLB}(P_{ti})} \Big/ {P_{PLB,t}}$$

    - Impute mean price on existing non PLB

$$P_{PLB,t}^{Adjusted} = P_{PLB,t} \cdot {mean_{i \epsilon non\ PLB}(P_{ti})} \Big/ {P_{PLB,t}}$$

    - independently of way for PLB, non PLB products are imputed by own existing mean price

Quality Adjustment for PLBs

- Strategies detail
  - Impute grouped mean price
    - Impute types with PLB/non PLB are same
    - To calculate impute ratio, use same weight/size group's existing mean

If new PLB has 400g weight

$$P_{PLB,t}^{G.Adjusted} = P_{PLB,t} \cdot {mean_{i\epsilon PLB,Group400g}(P_{ti})}/{P_{PLB,t}}$$

Use mean price with same weight group

If no same group exists on t,

Liner adjusted mean price with group having most product variation

$$P_{PLB,t}^{Adjusted} = P_{PLB,t} \cdot {mean_{i\epsilon PLB,Group350g}(P_{ti}) \cdot {400}/{350}}/{P_{PLB,t}}$$

Quality Adjustment for PLBs

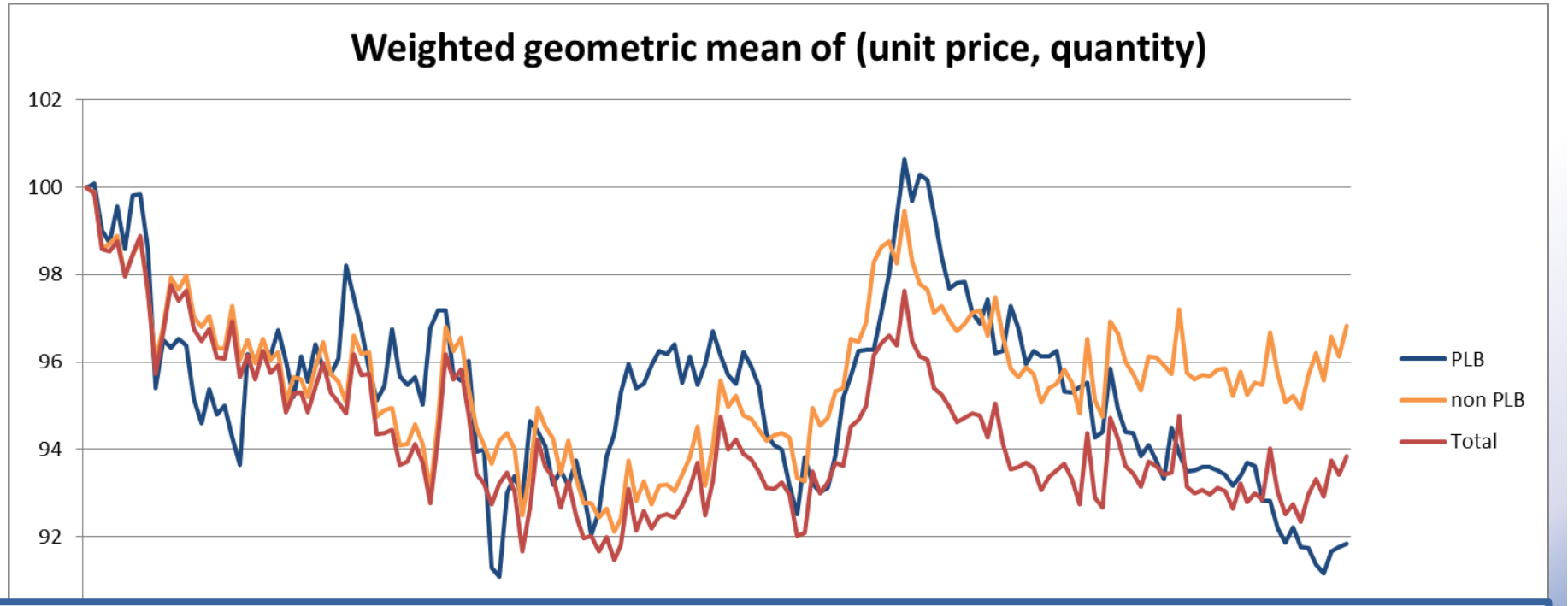
- Strategies detail
  - Intermediate index
    - PLB and non PLB as subcategory index
    - Aggregate PLB index and non PLB index to its category level index with amount of sale share

Quality Adjustment for PLBs

- 6 digits category index
  - Weighted geometric mean of (unit price, quantity)
  - Laspeyres index based on 01.2000
  - Chained Jevons index
  - Chained Tronqvist index
    - Element as PLB index and non PLB index with amount of sale share
- Upper level aggregate
  - Aggregate with annual amount of share weight in 2000

Quality Adjustment for PLBs

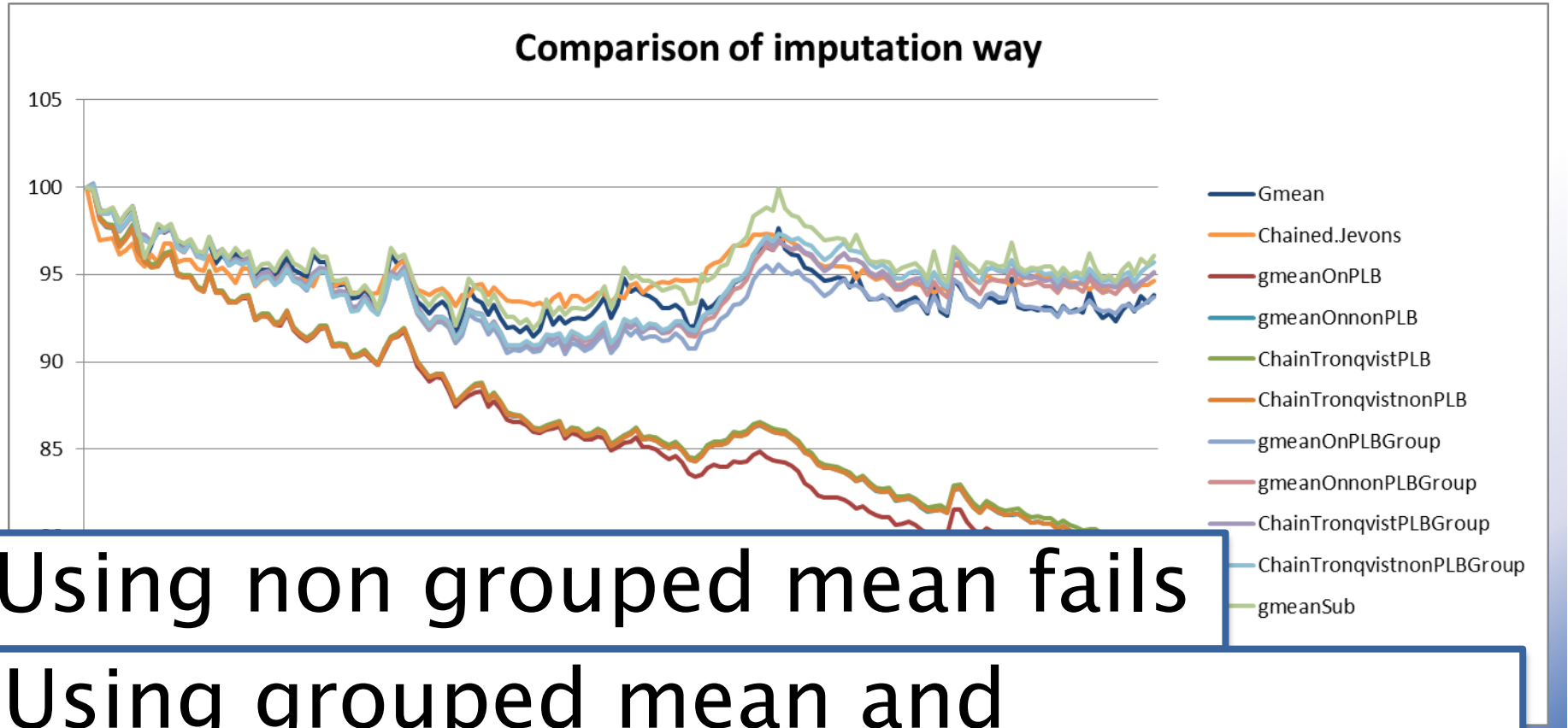
- Results with lower weight



These index contains
Substitution effect to cheep PLB prices

Quality Adjustment for PLBs

- Results with lower weight

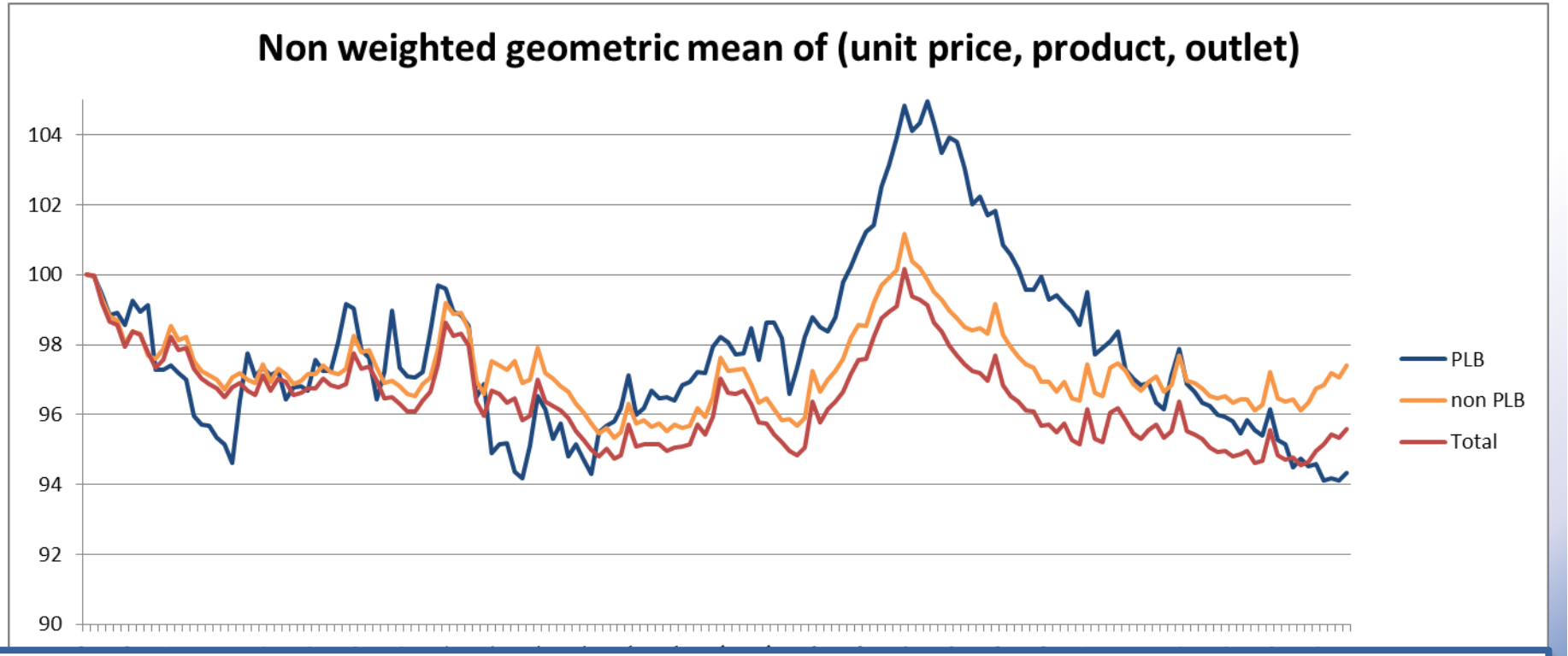


Using non grouped mean fails

Using grouped mean and intermediate follows chained Jevons

Quality Adjustment for PLBs

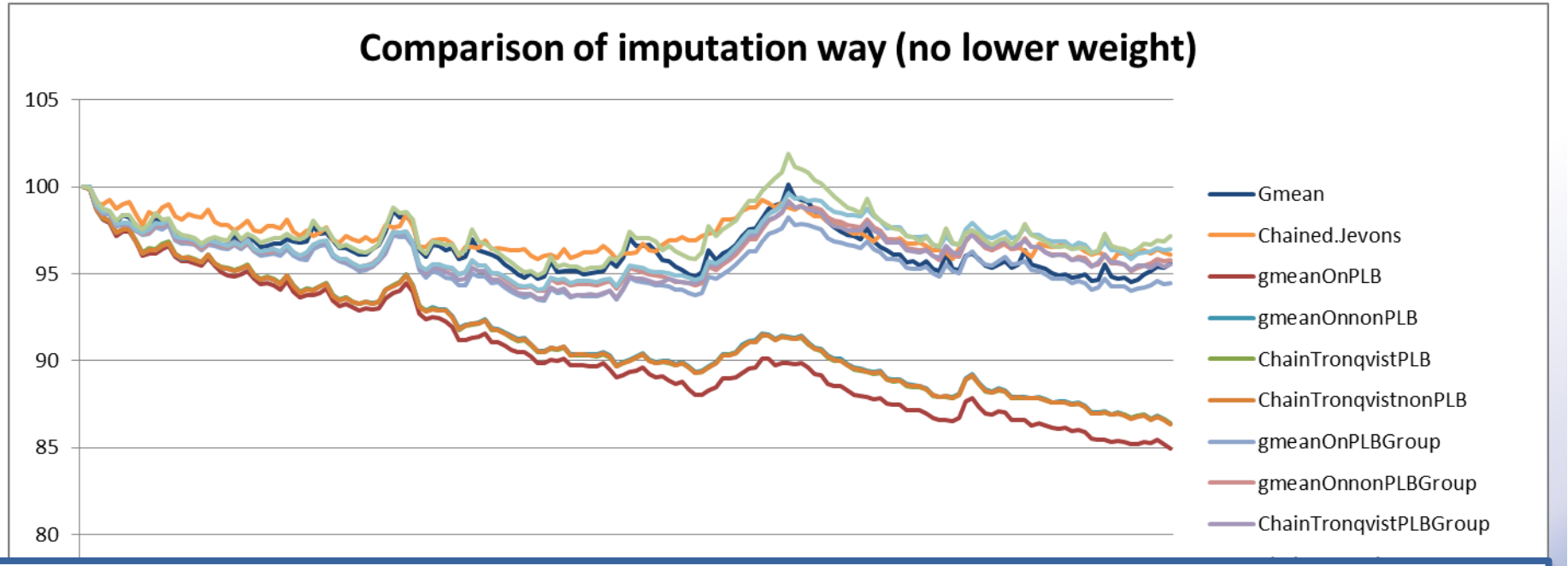
- Results without lower weight



Factual statistics faces to these index due to difficulty getting real-time weight

Quality Adjustment for PLBs

- Results



Both of lower weighted and non weighted has about 3.0 points difference at the max at final reach in our case

Conclusion

- Findings

  PLBs have tricky aspects

  - **Have PLBs any typical aspects?**
    - Life cycle and life cycle price change are not so different
    - Band of price change is tighter;
      PLB move within ±10% non PLB move within ±15%
    - Frequency of price change is higher;
      More than two times frequency for sale and price back
  - **Have PLBs impacts to Japanese CPI?**
    - Some consumers move to cheep PLBs. Especially substitution effect should be carefully evaluated
      Its means how PLBs get market share and how PLBs are different from non PLBs on quality are imprtant
  - **What kind of quality adjustment is reasonable?**
    - NB and PLBs should be treat as subcategory
    - We suggest “Quality adjustment by unit group”

Conclusion

- We face to needs getting real-time weight much more before
  - Except for grouped mean method, we need real-time weight
  - Without information how PLBs hold share in the market, we can get only imperfect price change
  - PLBs is going to be typical property which needs proper quality adjustment way

Thank you for all your attention.

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