

Twenty-one years of adjustments for quality change in the U.S. Consumer Price Index

Brendan Williams

Senior Economist

Consumer Price Index Division

Bureau of Labor Statistics

Prepared for FCSM
October 25, 2022



Overview

- Quality adjustments had a -0.04% impact annually
- External previous estimates suggest a larger amount of quality bias
- Item replacements have strong, positive effects
 - ▶ Broader understanding of the item replacement process helps explain this discrepancy

Summary of major findings

Effect	Annual impact (Dec 1998 – Dec 2019)
Quality adjustment	-0.04%
Item replacement	0.63%
Class-mean imputation	0.17%

Item replacement

- Leads to the need for quality adjustment
- Discontinued good replaced with new replacement
- Item replacements can be compared, adjusted, or imputed
 - ▶ Class-mean imputation: Imputation by other item replacements
 - ▶ Cell-relative imputation: Imputation by other items in basic index (deletion method)

Item replacement objectives

- Price change associated with product updates
 - ▶ Usual justification for item replacement
- Quality change
 - ▶ Aspects not captured by match model
- Product cycle effects
- Change in consumer surplus from product entry/exit

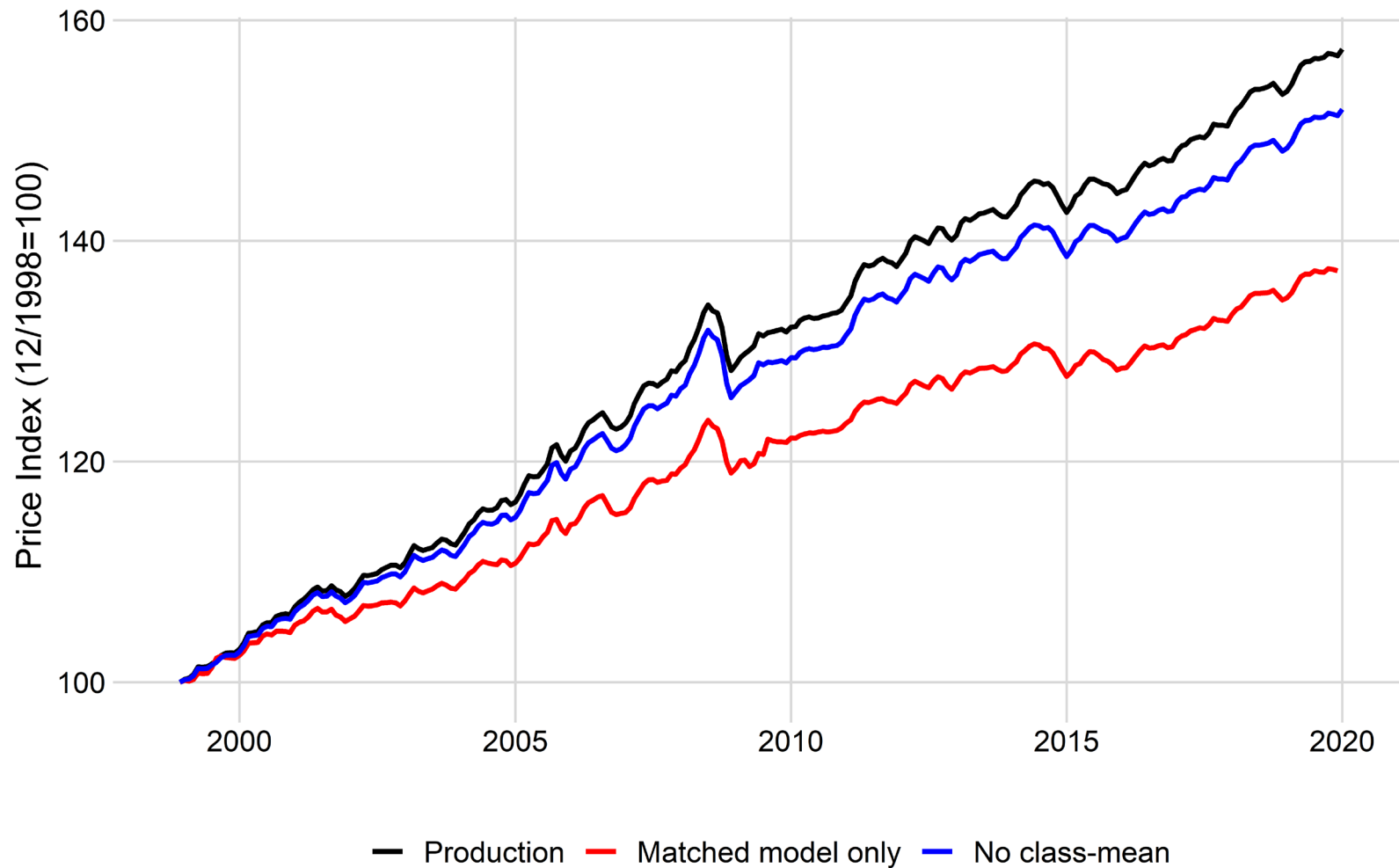
Hedonic adjustments

- Hedonic indexes expected to approximate matched-model behavior
- Selection bias correction
 - ▶ BLS has lacked detailed, timely weights
- Certain forms of hedonics do not capture staggered price change/product cycle effects

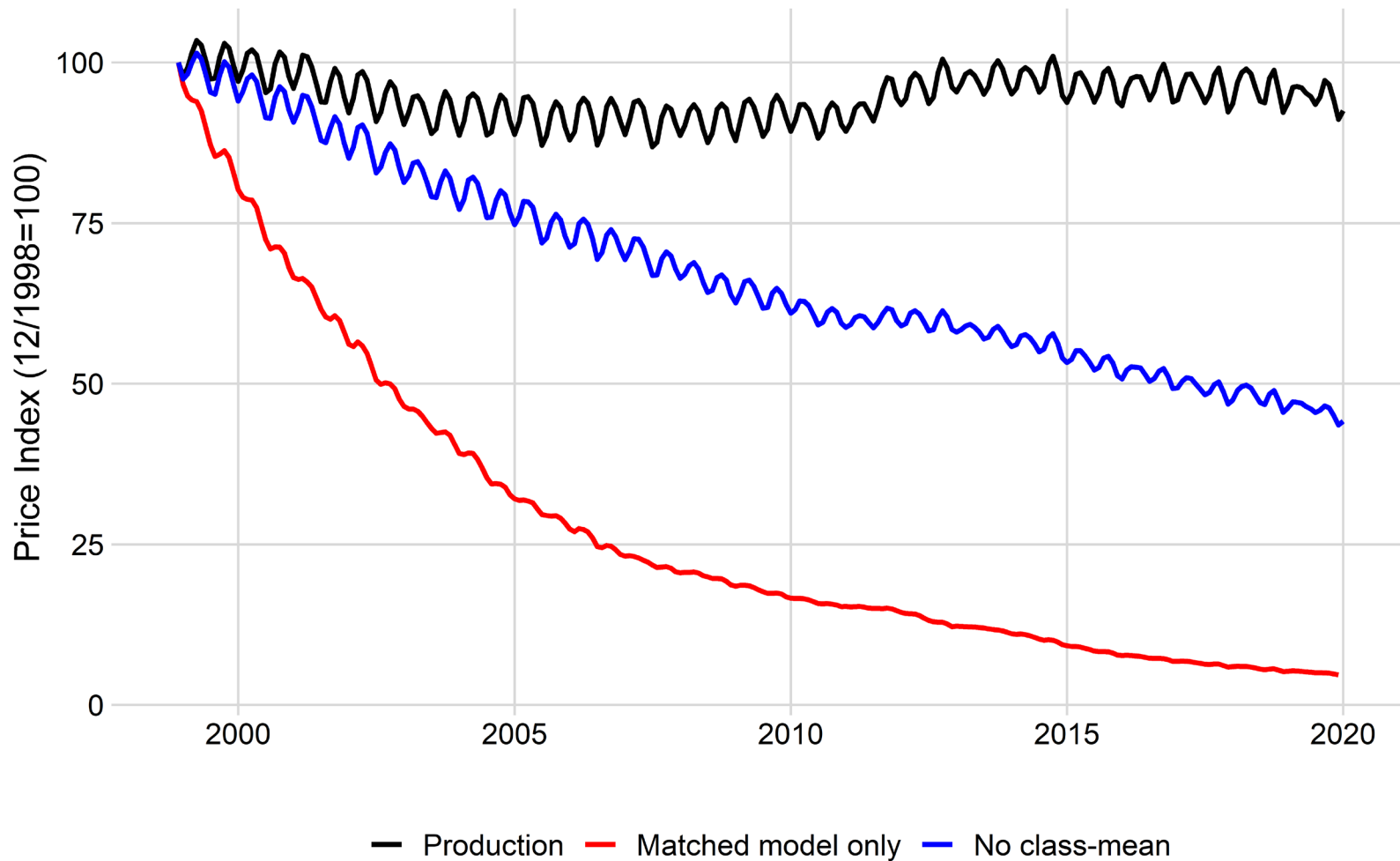
Counterfactual indexes

- Matched model only (no item replacement)
- No class-mean imputation
 - ▶ Use cell-relative for all imputations
- No quality adjustment
 - ▶ Convert quality adjustments to comparable or non-comparable based on threshold
 - ▶ All quality adjustments converted to comparable

Item replacement counterfactuals (All)



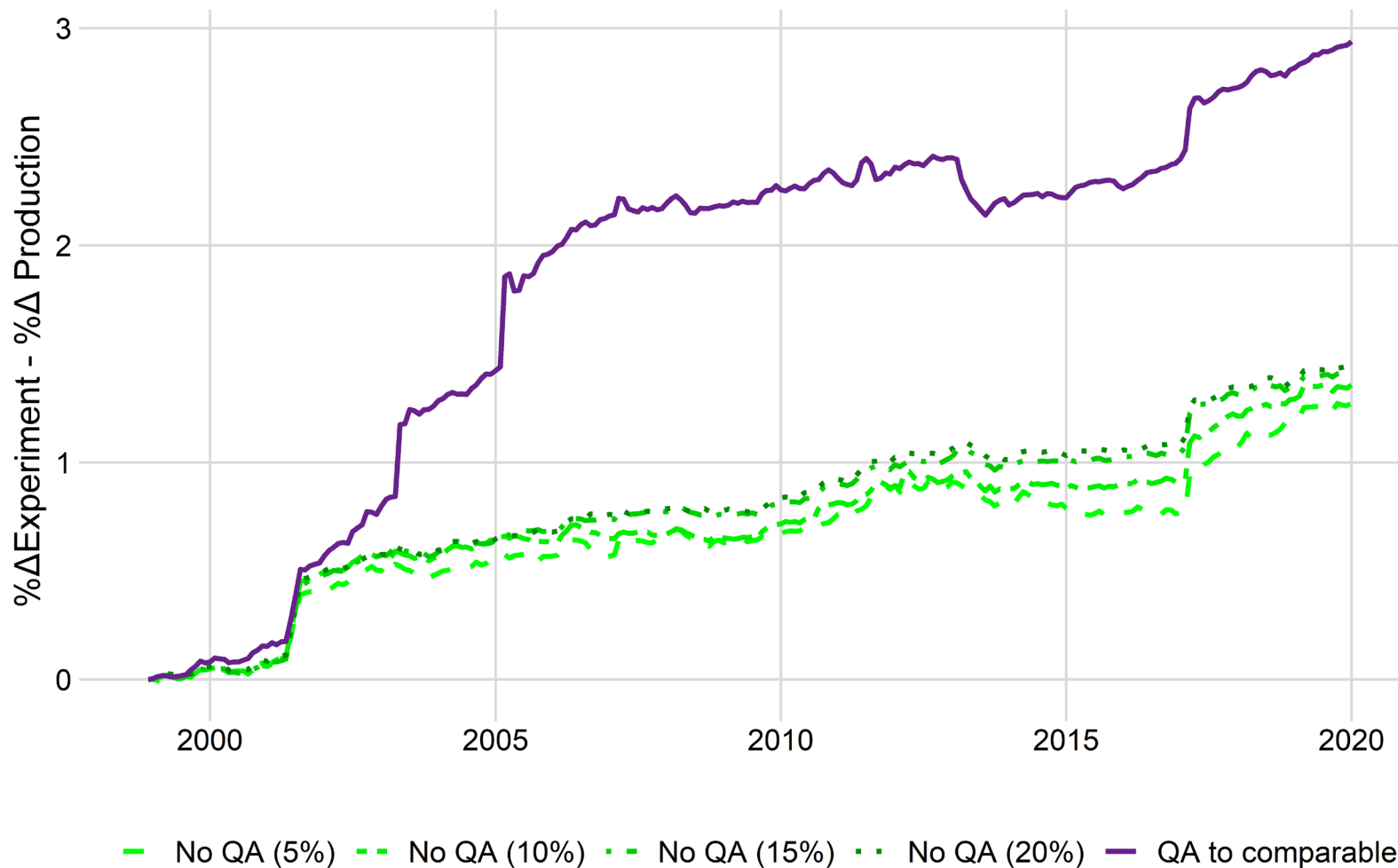
Item replacement counterfactuals (Apparel)



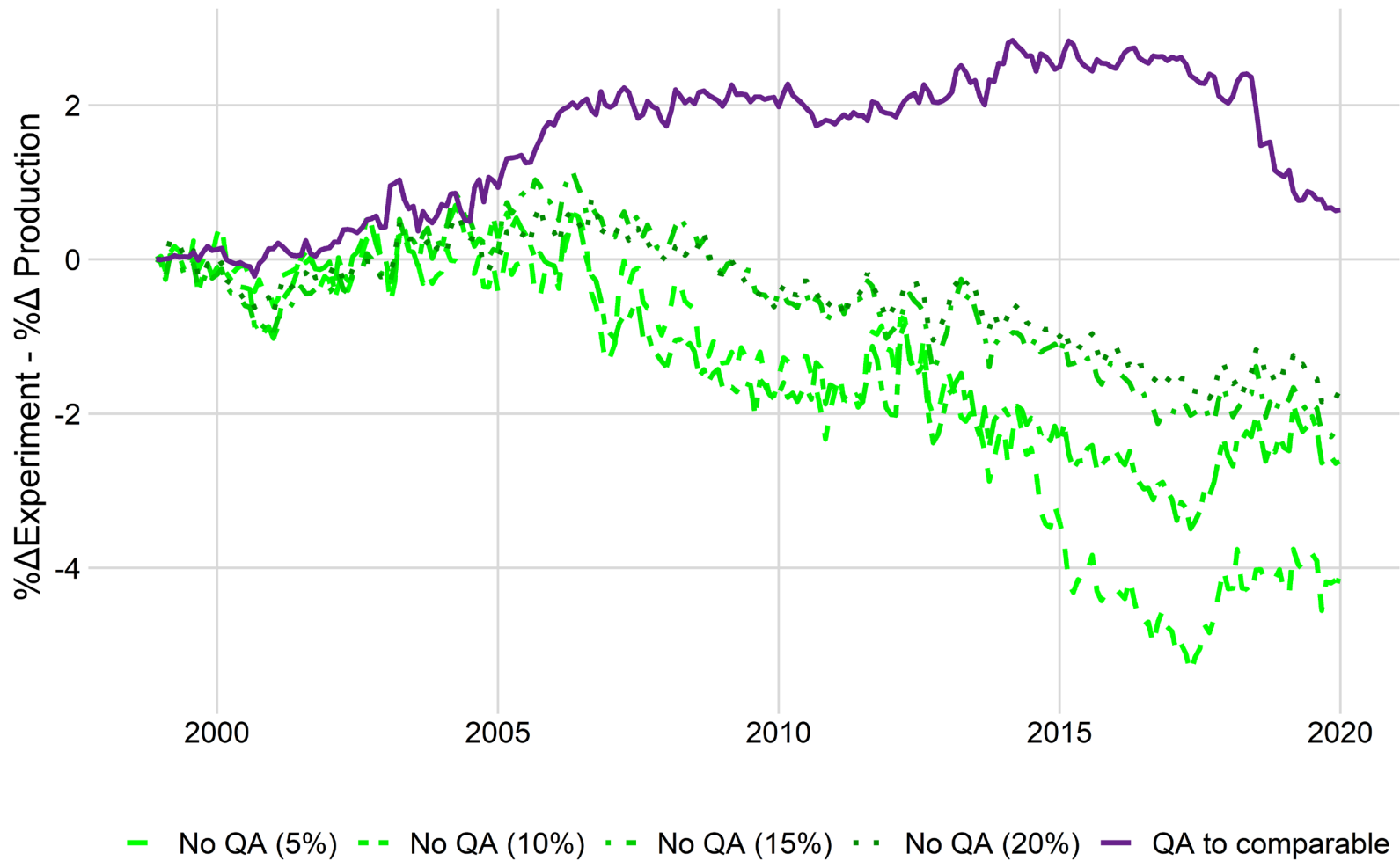
Class-mean imputation candidates

Rank	Title	Item Replacement Impact
1	Baby food	12.48%
2	Motor vehicle insurance	9.46%
3	Other miscellaneous foods	7.28%
4	Breakfast cereal	7.11%
5	College tuition and fees	6.92%
6	Candy and chewing gum	5.80%
7	Frozen noncarbonated juices	5.42%
8	Cakes, cupcakes, and cookies	5.32%
9	Water and sewerage maintenance	5.28%
10	Coffee	5.19%

QA counterfactuals (All)



QA counterfactuals (Apparel)



Counterfactuals without quality adjustment (Increases)

Rank	Title	No QA (5%)	QA Type
1	Used cars and trucks	22.21	Cost
2	Wireless telephone services	18.94	Hedonic
3	Cable and satellite television...	16.00	Hedonic
4	Men's shirts and sweaters	6.26	Hedonic
5	New vehicles	4.95	Cost
6	Leased cars and trucks	4.59	Cost
7	Major appliances	3.36	Hedonic
8	Internet services and...	1.80	Hedonic
9	Telephone hardware, calculators...	1.22	Hedonic
10	Televisions	0.97	Hedonic
11	Personal computers...	0.78	Cost

Counterfactuals without quality adjustment (Declines)

Rank	Title	No QA (5%)	QA Type
1	Women's footwear	-16.28	Hedonic
2	Boys' and girls' footwear	-7.51	Hedonic
3	Women's outerwear	-7.35	Hedonic
4	Men's footwear	-6.11	Hedonic
5	Women's suits and separates	-5.29	Hedonic
6	Men's suits, sport coats, and outerwear	-5.11	Hedonic
7	Boys' apparel	-4.41	Hedonic
8	Men's pants and shorts	-4.19	Hedonic
9	Women's dresses	-4.06	Hedonic
10	Girls' apparel	-2.19	Hedonic
11	Photographic equipment and supplies	-0.79	Hedonic
12	Other video equipment	-0.24	Hedonic

Summary

- BLS quality adjustments have a modest impact on the CPI
- Item replacement and class-mean imputations have a large impact
- Evidence for product cycles in addition to simultaneous product and price updates



Contact Information

Brendan Williams

Senior Economist

Consumer Prices Division

Office of Prices and Living Conditions

www.bls.gov/cpi

williams.brendan@bls.gov

