Price Deflators for
Personal Consumption Expenditures for Food

Ana Aizcorbe
Bureau of Economic Analysis
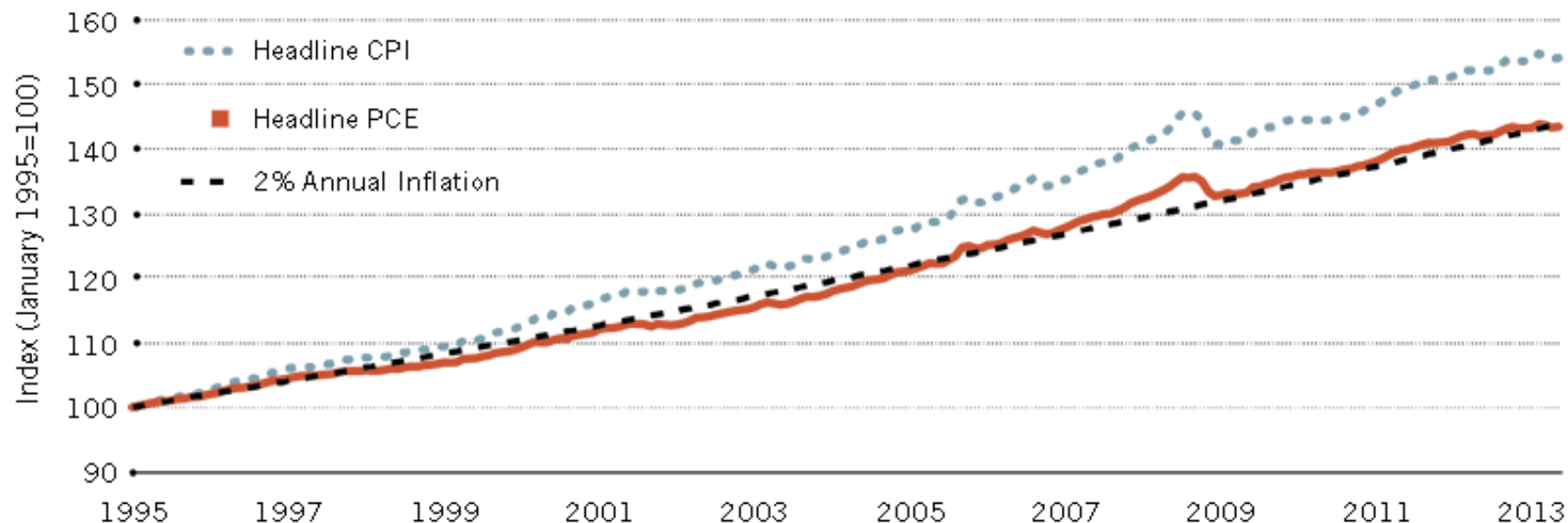
BEA publishes a Price deflator for Personal Consumption Expenditures (PCE)

Comparing Price Indexes: CPI vs. PCE

- Headline CPI
- Headline PCE
- 2% Annual Inflation

Outline

- How are deflators for Personal Consumption Expenditures (PCE) calculated and what do they tell us?

- Are those deflators very different from published CPIs for similar categories?

PCE "Food and nonalcoholic beverages purchased for off-premises consumption"

vs

BLS "Food at Home CPI"

PCE deflators are Chained Fisher Indexes

- Fisher index is a geometric average of the Laspeyres and Paasche indexes:

$$F_{t,\ t+1} = (L_{t,\ t+1} \cdot\ P_{t,\ t+1})^{1/2}.$$

- Laspeyres

$$L_{t,\ t+1} = \Sigma_i (p^i_{t+1} q^i_t) / \Sigma_i (p^i_t q^i_t),$$

- Paasche

$$P_{t,\ t+1} = \Sigma_i (p^i_{t+1} q^i_{t+1}) / \Sigma_i (p^i_t q^i_{t+1}).$$

- Cumulate growth through chaining:

$$Chained\ F_{t+1} = (Chained\ F_t) \cdot\ (F_{t,\ t+1}).$$

- For example, the Laspeyres index can be written:

$$L_{t,0} = \sum_i w_0^i \left(p_t^i / p_0^i \right)$$

where the **weights**, w_t^i, are expenditure shares

$$w_t^i = p_t^i q_t^i / \sum_i p_t^i q_t^i$$

and the p_t^i / p_0^i are called **price relatives**

Virtually all price relatives are based on BLS CPIs

PCE Food and nonalcoholic beverages purchased for off-premises consumption	Source data for price relatives
Cereals	CPI Cereals and Cereal Products
Bakery products	CPI Bakery Products
Beef and veal	CPI Beef and veal
Pork	CPI Pork
Other meats	CPI Other meats
Poultry	CPI Poultry
Fish and seafood	CPI Fish and seafood
Fresh milk	CPI Milk
Eggs	CPI Eggs
Processed dairy products	BEA composite of CPIs
Fats and oils	CPI Fats and oils
Fruit (fresh)	CPI Fresh fruits
Vegetables (fresh)	CPI Fresh vegetables
Processed fruits and vegetables	CPI Processed fruits and vegetables
Sugar and sweets	CPI Sugar and sweets
Food products, not elsewhere classified	BEA composite of CPIs
Coffee, tea, and other beverage materials	CPI Beverage materials including coffee and tea
Mineral waters, soft drinks, and vegetable juices	CPI Juices and nonalcoholic drinks
Food produced and consumed on farms	BEA composite of USDA prices

Source: https://www.bea.gov/sites/default/files/faq/faq521.xlsx

6

7/29/2024

Weights: source data

- PCE weights are calculated using PCE estimates for nominal spending.

- Those data are based on:
  - Monthly Census retail trade surveys of receipts by type of retailer (grocery, convenience store, etc.)
    - Benchmarked annually to the Annual Retail Trade Survey
  - Those receipts are split into product lines using estimates from:
    - Economic Census data on retail sales by product line,
    - Updated annually using retail point-of-sale scanner data from Circana and data from Fresh Look Marketing Group.
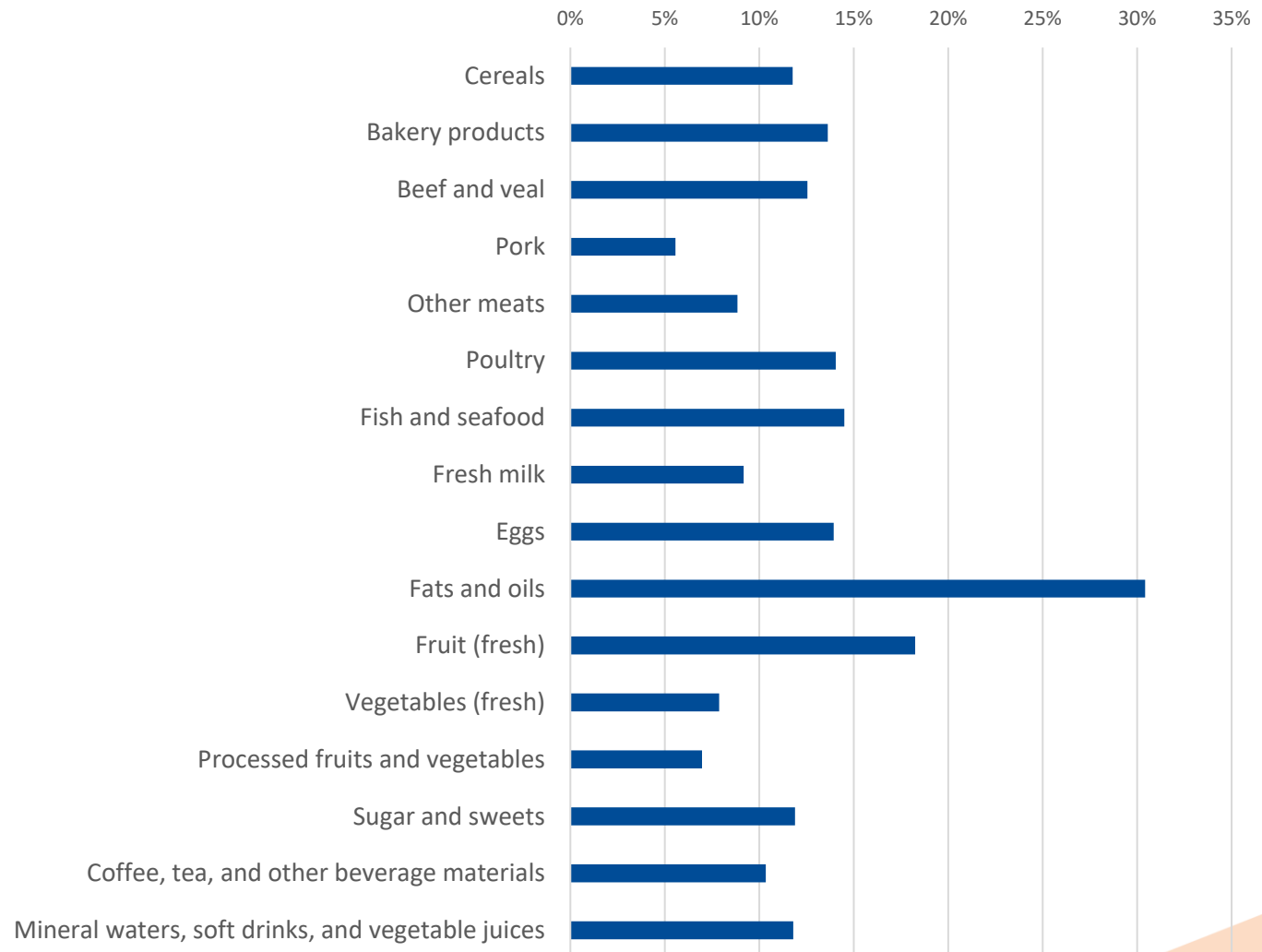
The resulting weights do differ

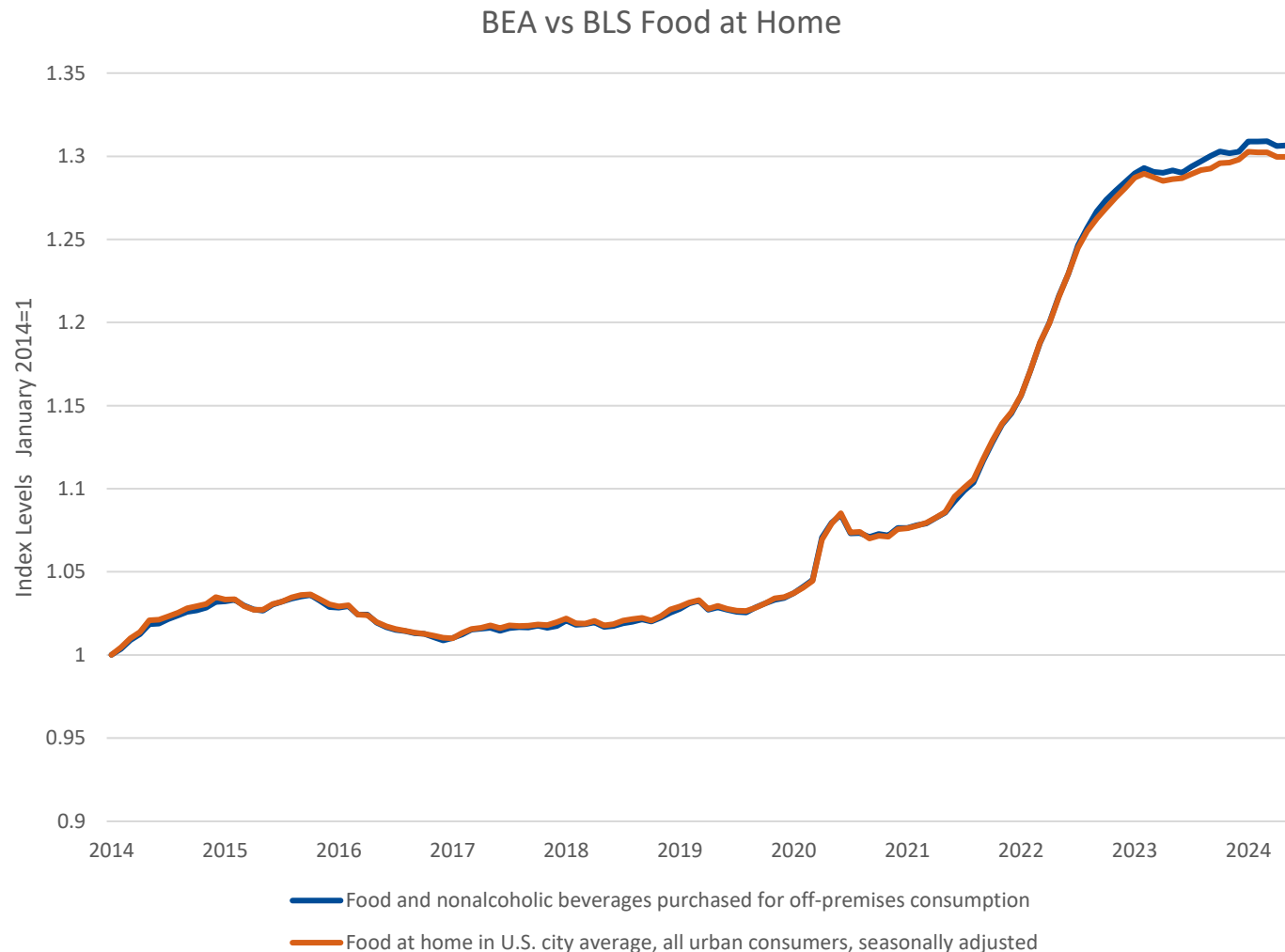Weights for Food at Home indexes, 2023
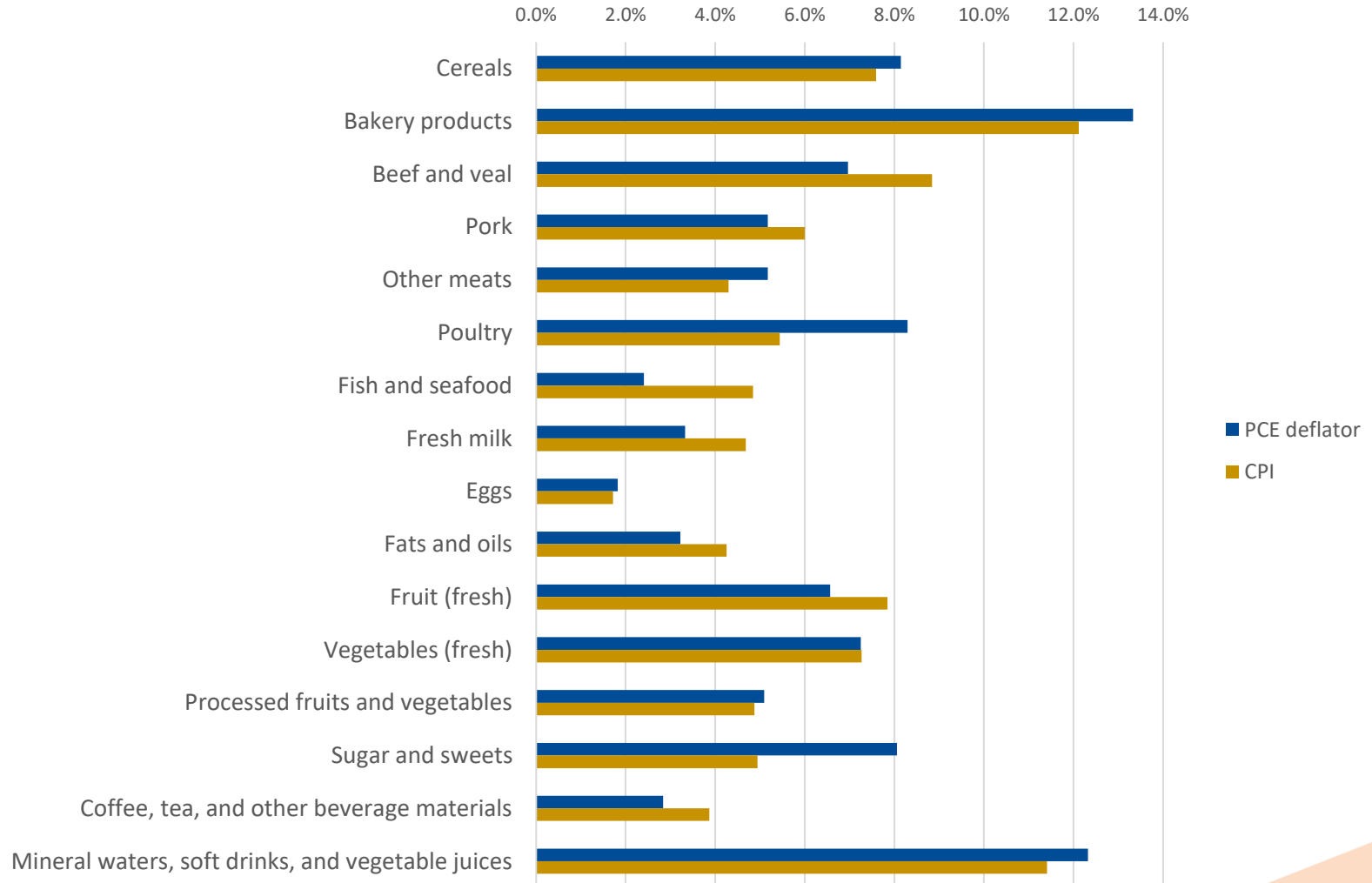
Price relatives vary across categories

Price relatives for Food at Home categories, 2010 - 2023

Still, the resulting PCE deflator is very similar to the CPI

Average annual growth rates are 2.72 vs 2.64 for BEA and BLS, respectively.

BEA vs BLS Food at Home

— Food and nonalcoholic beverages purchased for off-premises consumption
— Food at home in U.S. city average, all urban consumers, seasonally adjusted

Summary of differences in the PCE deflator vs CPI

- Both use same building blocks (CPIs for very granular categories), but aggregate them differently
  - Formula – CPI uses a modified Laspeyres formula; PCE deflator uses a chained Fisher Ideal formula
  - Weights – CPI uses data from the Consumer Expenditure Survey; PCE deflator uses data obtained from business surveys
- They also differ in
  - Scope – CPI focuses on out-of-pocket expenditures by urban consumers; BEA uses all spending by all consumers
  - Other issues – Many smaller differences, including seasonal adjustment

Source: Comparing the Consumer Price Index and the Personal Consumption Expenditures Price Index (bea.gov)

Year to year differences are not small but apparently mostly offset

BLS-BEA food at home
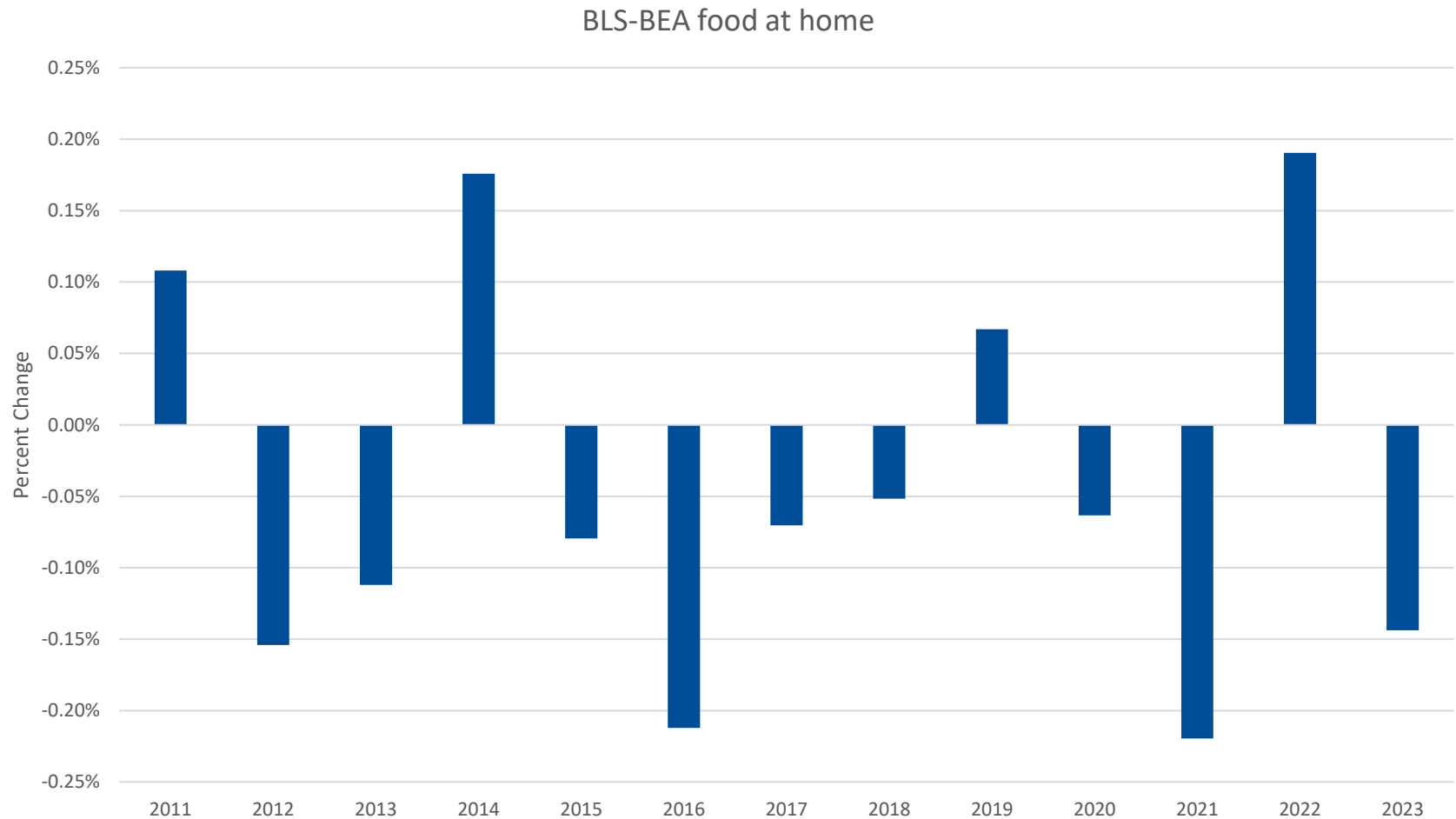
- Differences in how often the weights are updated
  - "a price index must track the goods and services that people actually buy and account for the relative amounts spent on them. In other words, the expenditure weights used in a price index should represent current reality as much as possible. .The timeliness of the Consumer Price Index (CPI) weights must be improved." CNSTAT, 2022

- The weights differ for other reasons
  - e.g. alcohol, underreporting cost in CE survey

Resources

- How are personal consumption expenditures (PCE) prices and quantities derived? | U.S. Bureau of Economic Analysis (BEA)

- Comparing the Consumer Price Index and the Personal Consumption Expenditures Price Index (bea.gov)

- Updated Summary of NIPA Methodologies (bea.gov)

- Chained-Dollar Indexes: Issues, Tips on Their Use, and Upcoming Changes | U.S. Bureau of Economic Analysis (BEA)

- Differences between the Consumer Price Index and the Personal Consumption Expenditures Price Index (bls.gov)

Thank you

Ana.Aizcorbe@bea.gov