Cheapflation Cycles

Kunal Sangani

July 2026

Disclaimer

This presentation contains my own analyses calculated (or derived) based in part on data from Nielsen Consumer LLC and marketing databases provided through the NielsenIQ Datasets at the Kilts Center for Marketing Data Center at The University of Chicago Booth School of Business. The conclusions drawn from the NielsenIQ data are those of the author and do not reflect the views of NielsenIQ. NielsenIQ is not responsible for, had no role in, and was not involved in analyzing and preparing the results reported herein.

Post-Pandemic "Cheapflation"

Jack Monroe
@BootstrapCook

Woke up this morning to the radio talking about the cost of living rising a further 5%. It infuriates me the index that they use for this calculation, which grossly underestimates the real cost of inflation as it happens to people with the least. Allow me to briefly explain.

7:30 AM · Jan 19, 2022

37.1K Retweets **9,873** Quote Tweets **82.7K** Likes

Jack Monroe @BootstrapCook · Jan 19, 2022
Replying to @BootstrapCook
This time last year, the cheapest pasta in my local supermarket (one of the Big Four), was 29p for 500g. Today it's 70p. That's a 141% price increase as it hits the poorest and most vulnerable households.
171 3,532 16.5K

Jack Monroe @BootstrapCook · Jan 19, 2022
This time last year, the cheapest rice at the same supermarket was 45p for a kilogram bag. Today it's £1 for 500g. That's a 344% price increase as it hits the poorest and most vulnerable households.
119 2,785 13.5K

Jack Monroe @BootstrapCook · Jan 19, 2022
Baked beans: were 22p, now 32p. A 45% price increase year on year.
46 1,164 9,532

Office for National Statistics

Article

Tracking the price of the lowest-cost grocery items, UK, experimental analysis: April 2021 to September 2022

How the prices of the lowest-cost products for 30 everyday items have changed since April 2021.

Contact: Emily Hopson cpi@ons.gov.uk +44 1633 455 592

Release date: 25 October 2022

Next release: To be announced

- Discussion: "supermarkets are recouping their margins on value/budget products" or "targeted fiscal stimulus increased demand at low-end."

This Paper

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- Due to special circumstances of 2021–23 (e.g., pandemic stimulus, greedflation)?
  - No. The same pattern accompanies other periods in the data when input costs rose.
- Why do we see these cycles in cheapflation / inflation inequality?
  - Simple explanation.
    1. Complete pass-through in levels of input cost increases to prices.
    2. Same absolute price increase $\Rightarrow$ higher inflation for low-priced varieties.
    3. Low-income households buy lower-price varieties.
  - Explains 70% of variation in inflation inequality over time, fully accounts for heightened inflation inequality during Great Recession ('08–'11) and '21–'23.

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  - Aggregation. Many study inflation differences due to spending shares across categories.
    See e.g., Hobijn and Lagakos (2005), Jaravel (2024), Orchard (2025).
  - But BLS statistics miss differences in inflation across varieties within categories.
  - Differential volatility, pass-through for low-income hh's understated by $>$50%.

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  - But BLS statistics miss differences in inflation across varieties within categories.
  - Differential volatility, pass-through for low-income hh's understated by $>$50%.
- [In paper]: Welfare implications accounting for substitution, nonhomotheticity.
- Evidence that mechanism extends beyond food at home.
- Same mechanism: Cities/countries have different exposure to common cost shocks.

Selected Related Literature

- **Inflation inequality**:
  - *Due to diff spending shares across categories*: Michael (1979), Hagemann (1982), Garner et al. (1996), Hobijn and Lagakos (2005), Hobijn et al. (2009), Klick and Stockburger (2021, 2024), Orchard (2025), Hochmuth et al. (2022), Pallotti et al. (2023), Cavallo (2024), Jaravel (2024), Lan et al. (2024), Olivi et al. (2024), Lokshin et al. (2025).
  - *Scanner data, secular trend*: Kaplan and Schulhofer-Wohl (2017), Jaravel (2019).
    - Del Canto et al. (2025): "Prior work has found that households at different income levels experience different trend inflation in consumption prices, and that this difference is driven by differences within fine product groups. [...However,] there is no a priori reason to think inflation rates of finer product categories should be differentially responsive to short-run shocks. We therefore limit attention to the 25 CPI groups."
  - *Specific episodes*: *Great Recession*: Argente and Lee (2021), Li (2019), Becker (2026). *Post-Pandemic*: Weber et al. (2023), Cavallo and Kryvtsov (2024), Chen et al. (2024).
- **Pass-through**:
  - Bulow and Pfleiderer (1983), Nakamura and Zerom (2010), Weyl and Fabinger (2013), Mrázová and Neary (2017), Amiti et al. (2019), Butters et al. (2022), Sangani (2026).

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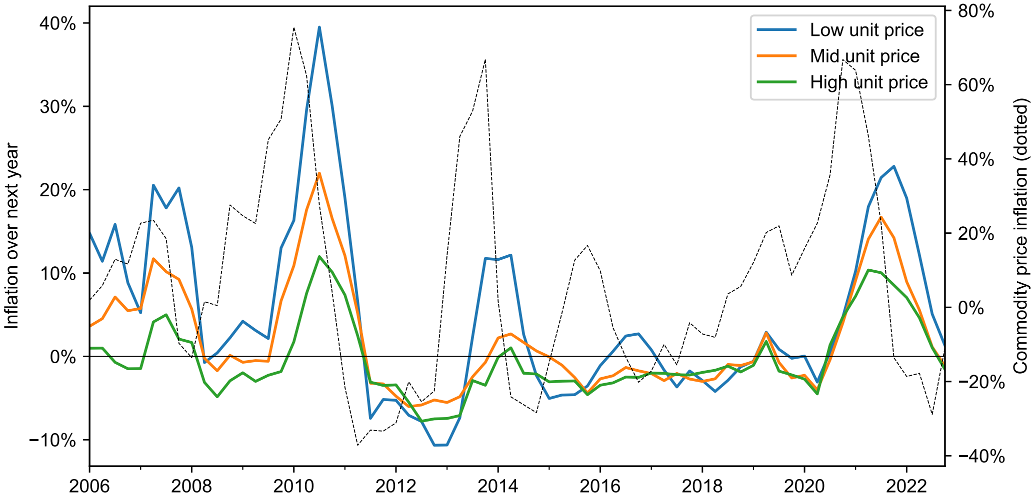
Coffee: A case study

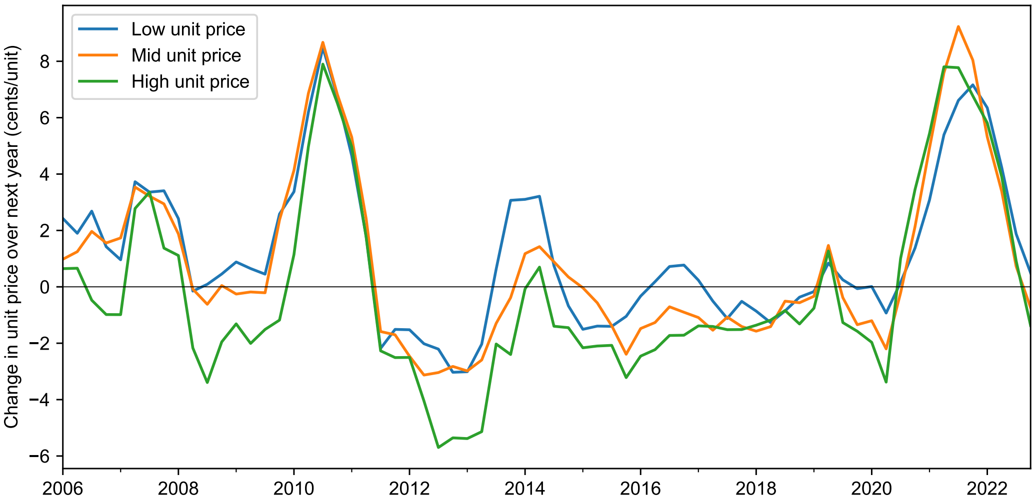
- Roasted coffee as a laboratory. Nakamura and Zerom (2010), Sangani (2026).
- Costs: Primary input—green coffee beans—traded on global commodity markets.
- Retail prices: NielsenIQ Retail Scanner data ($>$30,000 participating U.S. stores).

1. Pass-through in levels of commodity cost changes to prices.
2. Same absolute price increase $\Rightarrow$ higher inflation for low-priced varieties.
3. Low-income households buy lower-price varieties, and thus face higher inflation.

Low-priced varieties exhibit greater sensitivity of inflation to costs



Differences disappear when measuring price changes in levels



Canonical approach to measure pass-through of commodity cost changes

- Specification à la Campa and Goldberg (2005), Nakamura and Zerom (2010), etc.

- Long-run pass-through in levels $\sum_{k=1}^{K} b_k$ using:

$$\Delta p_{irt} = a_{ir} + \sum_{k=0}^{K} b_k \Delta c_{t-k} + \sum_{k=1}^{4} d_k q_t + \varepsilon_{irt}.$$

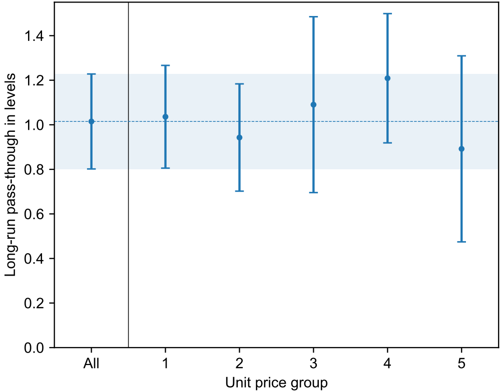
  - Absorb product-retailer trends a_{ir} and seasonal effects with quarter-of-year dummies q_t.
  - Horizon of $K = 6$ quarters, following Nakamura and Zerom (2010).

- Long-run pass-through in logs $\sum_{k=1}^{K} \beta_k$ from analogous specification,

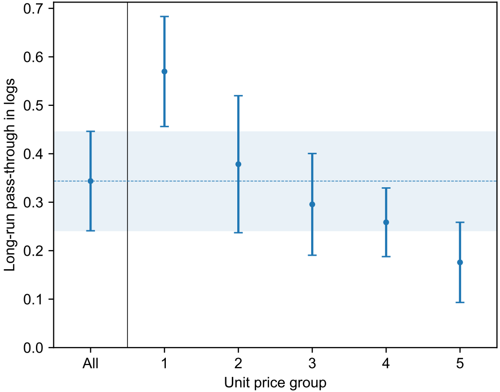
$$\Delta \log p_{irt} = \alpha_{ir} + \sum_{k=0}^{K} \beta_k \Delta \log c_{t-k} + \sum_{k=1}^{4} \delta_k q_t + \varepsilon_{irt}.$$

Complete pass-through in levels → heterogeneous log pass-through

- Pass-through in levels is 1.01 (se: 0.11) and uniform across unit price groups.
- Pass-through in logs is incomplete (0.34; se: 0.05) and decreasing with unit price.



(a) Pass-through in levels.



(b) Pass-through in logs.

Robustness

Unit price group	Panel A. Pass-through in levels					
	Baseline	IV: Exchange rates	IV: Weather shocks	Product-quarter FEs	$K = 4$	$K = 8$
1	0.13	0.10	0.25	0.22	0.23	–0.38
2	–0.44	–0.42	–0.17	–0.64	–0.40	0.18
3	0.33	0.52	0.24	–0.02	–0.15	0.06
4	1.06	0.85	–0.32	1.42	1.13	1.30
5	–0.51	–0.36	–0.30	–0.36	–0.52	–0.18
Unit price group	***Panel B. Pass-through in logs***					
	Baseline	**IV: Exchange rates**	**IV: Weather shocks**	**Product-quarter FEs**	**$K = 4$**	**$K = 8$**
1	2.90**	2.21**	1.70*	2.81**	2.57**	2.30**
2	0.39	0.35	0.13	0.25	0.14	1.05
3	–0.64	–0.35	–0.53	–0.88	–0.88	–0.76
4	–1.34	–1.14	–2.04**	–1.02	–0.76	–0.89
5	–2.50**	–2.33**	–2.05**	–2.28**	–2.22**	–2.32**

- Difference in pass-through relative to all products: $(\rho_i - \rho_{\text{all}})/(\text{SE}_i^2 + \text{SE}_{\text{all}}^2)^{1/2}$.
- Result: Uniform pass-through in levels, higher log pass-through for low-price varieties.

From cheapflation to inflation inequality

- Inflation by income group: NielsenIQ Homescan panelist data.
- Sort Homescan panelists into income quintiles.
  - Order by income bin and equivalized expenditures within bin.
  - Split into five groups using NielsenIQ-provided projection weights.
- For each group g, let $\omega_{it}^{g} =$ expenditure share on product i by group g in quarter t.
- Year-over-year Laspeyres inflation rates for each group g:

$$\pi_t^g = \sum_i \omega_{it-4}^{g} \pi_{it}, \qquad \text{where} \qquad \pi_{it} = p_{it}/p_{it-4} - 1.$$

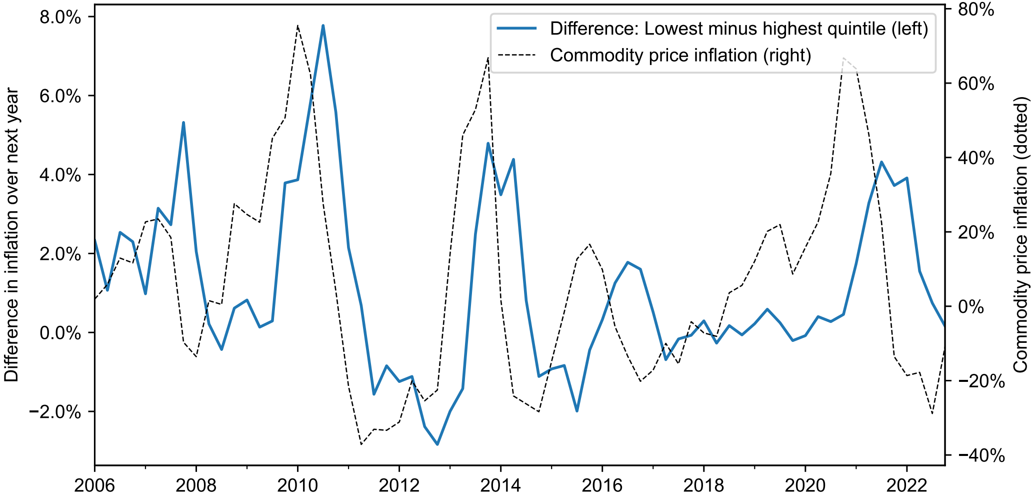
  Inflation rates for each UPC i from Retail Scanner data (match 62% of expenditures).

From cheapflation to inflation inequality

- Low-income buy cheaper varieties $\Rightarrow$ more sensitive to inflation.

Panel A. Prices paid		*Panel B. Inflation sensitivity*		
	Log unit price		*Coffee inflation for income group*	
	(1)		(OLS)	(IV)
Income quintile 2	0.036**	Coffee inflation $\times$ Income quintile 2	-0.039**	-0.055**
	(0.000)		(0.002)	(0.018)
Income quintile 3	0.093**	Coffee inflation $\times$ Income quintile 3	-0.096**	-0.119**
	(0.001)		(0.004)	(0.030)
Income quintile 4	0.157**	Coffee inflation $\times$ Income quintile 4	-0.155**	-0.201**
	(0.005)		(0.008)	(0.050)
Income quintile 5	0.236**	Coffee inflation $\times$ Income quintile 5	-0.270**	-0.322**
	(0.006)		(0.017)	(0.024)
Time FEs	Yes	Time FEs	Yes	Yes
N	360	N	340	340
R^2	0.99	R^2	1.00	0.99
Within R^2	0.93	Within R^2	0.80	0.19

Fluctuations in within-category inflation inequality



- BLS has one ELI for "roasted and instant coffee." Misses all variation within coffee!

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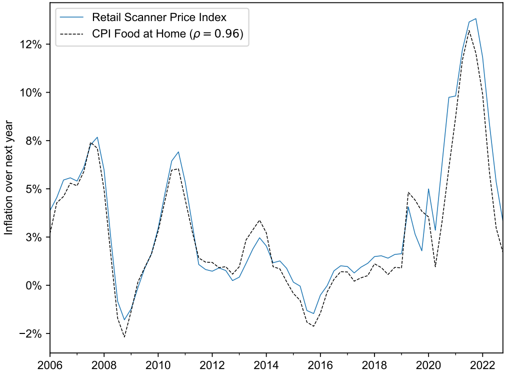
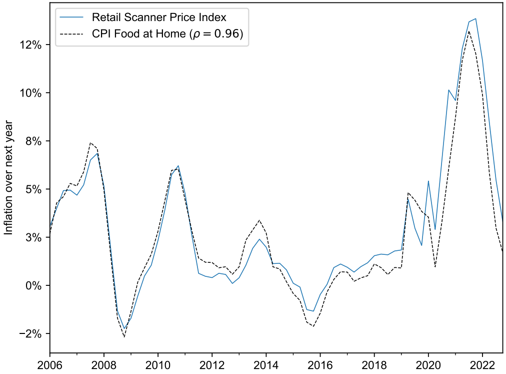
Does mechanism extend to rest of food at home?

- Replicate BLS food-at-home inflation using UPCs from all NielsenIQ food departments.



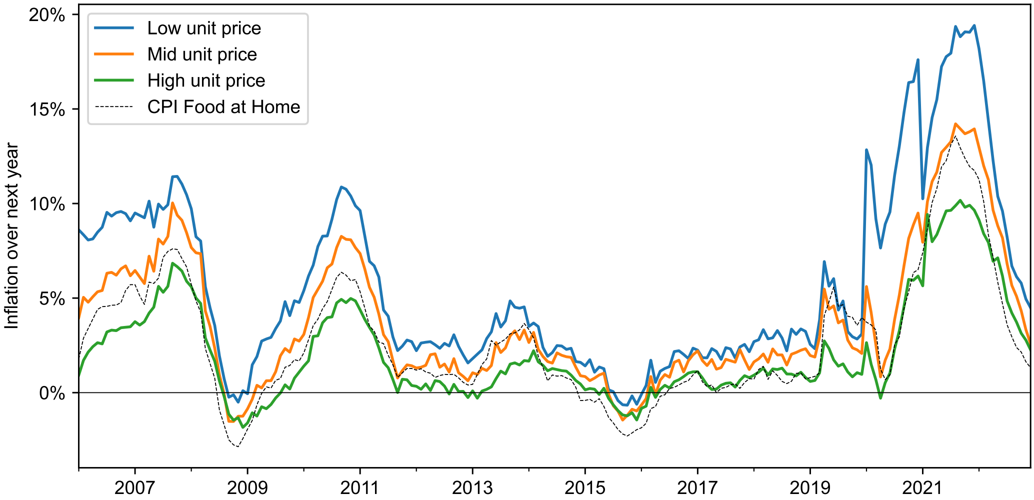
(a) Level of aggregation: Retailer-UPC



(b) Level of aggregation: UPC

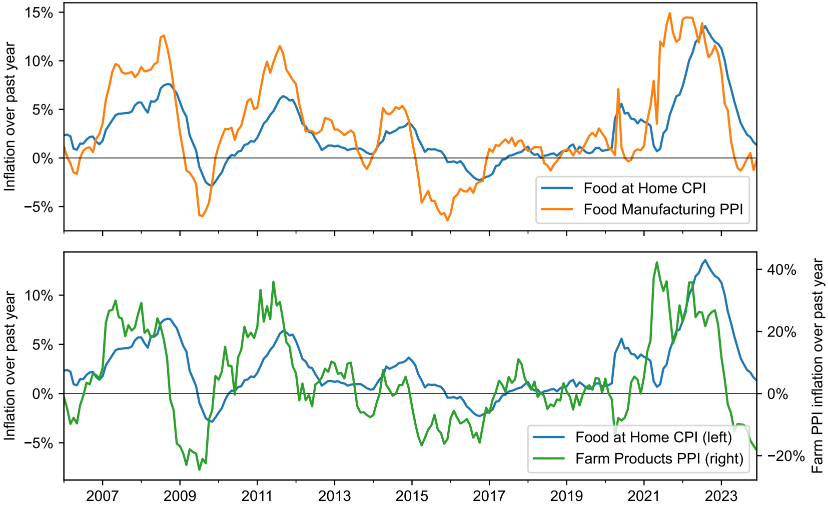
Cycles in food-at-home cheapflation

- Inflation for lower-priced varieties more sensitive to aggregate inflation rate.



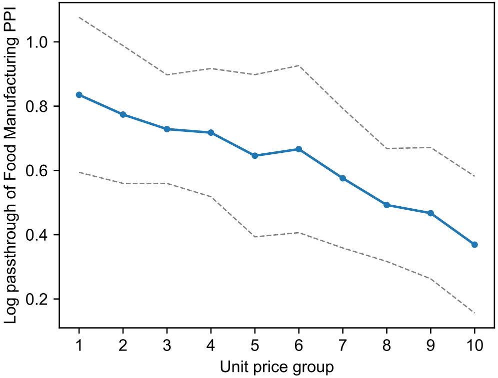
Are cheapflation cycles due to pass-through?

- Log pass-through of Food Mfg. & Farm Products PPI to inflation by unit price group.

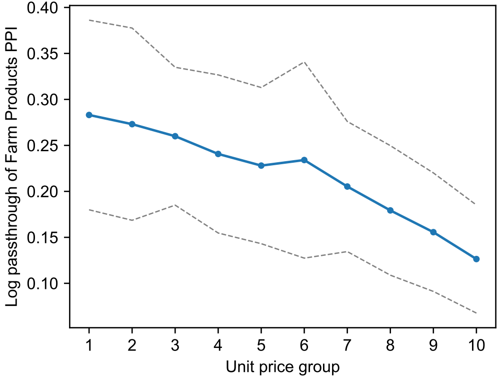


Driven by differential log pass-through of upstream costs

$$\Delta \log p_{it} = \alpha_i + \sum_{k=0}^{K} \beta_k \Delta \log \mathrm{PPI}_{t-k} + \sum_{k=1}^{4} \delta_k q_k + \varepsilon_{it}.$$



(a) Food Manufacturing PPI.



(b) Farm Products PPI.

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Testing for pass-through in levels

- How do we know declining log pass-through is due to pass-through in levels?
- Approach: Posit simple pricing rule, see if it quantitatively explains patterns.

Testing for pass-through in levels

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- Approach: Posit simple pricing rule, see if it quantitatively explains patterns.
- Suppose each module consists of varieties indexed by i, with unit prices

$$p_i = m + b_i w.$$

  - Assumption 1: A unit of each variety contains the same quantity of material input.
  - Assumption 2: Additive markup priced relative to labor w. Obtains with generalized logit:

$$q_i = \frac{\exp\left(\delta_i - b_i p_i / w\right)}{\int_j \exp\left(\delta_j - b_i p_j / w\right) dj}.$$

  (Can also obtain with perfect competition & Leontief production, or with limit pricing.)

Testing for pass-through in levels

- Variety i has price,

$$p_i = m + b_i w.$$

- To a first order, gap between inflation rates for L and H from t to $t+4$ is

$$\underbrace{\pi^L_{t+4} - \pi^H_{t+4}}_{\text{Cheapflation}} = \underbrace{\left(\frac{p_t}{p^L_t} - \frac{p_t}{p^H_t}\right)}_{\text{Price gap}} \times \underbrace{\left(\pi^{\text{all}}_{t+4} - \pi^{w}_{t+4}\right)}_{\text{Excess inflation}},$$

  - p_t is the average module unit price, and p^L_t, p^H_t are the avg unit prices for L and H.
  - $\pi^{\text{all}}_{t+4} - \pi^{w}_{t+4}$ is difference between module and wage inflation from t to $t+4$.

- Empirical specification: Across modules m and quarters t, we predict $\beta \approx 1$:

$$\text{Cheapflation}_{mt+4} = \beta \left(\text{PriceGap}_{mt} \times \text{ExcessModuleInflation}_{mt+4}\right) + \varepsilon_{mt}.$$

Testing for pass-through in levels

- We find $\beta \approx 1$.

	Inflation of lowest-price decile − highest-price decile					
	(1)	(2)	(3)	(4)	(5)	(6)
Excess module inflation $\times$ Price gap	1.183**		1.188**		1.194**	
	(0.027)		(0.025)		(0.019)	
Module inflation $\times$ Price gap		1.186**		1.188**		1.194**
		(0.025)		(0.025)		(0.019)
Wage inflation $\times$ Price gap		-1.657**		-1.047**		-1.540**
		(0.335)		(0.299)		(0.453)
Post-2020			-0.067**	-0.073**		
			(0.018)	(0.024)		
Time FEs					Yes	Yes
Product Module FEs					Yes	Yes
N	42137	42137	42137	42137	42137	42137
R^2	0.92	0.92	0.92	0.92	0.93	0.93

Testing for pass-through in levels

- We find $\beta \approx 1$. Predictions also hold if we split module vs. wage inflation.

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Testing for pass-through in levels

- We find $\beta \approx 1$. Predictions also hold if we split module vs. wage inflation.
- No excess cheapflation from 2021–2023. Little add'l time variation in cheapflation.

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	(1)	(2)	(3)	(4)	(5)	(6)
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Testing for pass-through in levels: Comparison to alternative models

1. Fixed percentage markups: If $p_i = \mu_i(m + \beta_i w)$, then cheapflation would instead be

$$\pi^L - \pi^H = \left(\frac{\mu_L}{\mu}\frac{p}{p_L} - \frac{\mu_H}{\mu}\frac{p}{p_H}\right) \times \left(\pi^{\text{all}} - \pi^w\right).$$

Then, for any $\mu_H > \mu > \mu_L$, we would generically estimate $\beta < 1$ in regression:

$$\pi^L - \pi^H = \beta \underbrace{\left(\frac{p}{p^L} - \frac{p}{p^H}\right)}_{\text{Price gap}} \times \underbrace{\left(\pi^{\text{all}} - \pi^w\right)}_{\text{Excess inflation}}.$$

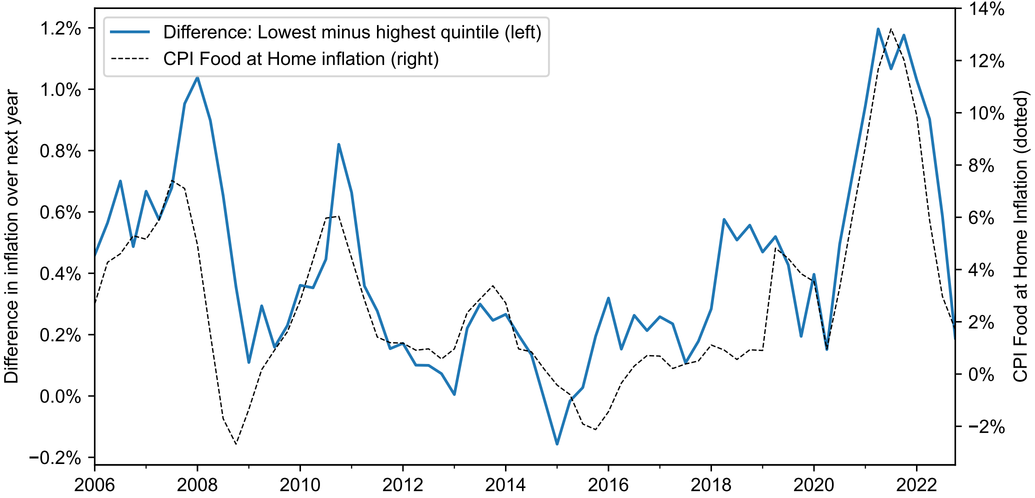
2. Consequence of general inflation: $\beta^{\text{all}} > -\beta^w$.
   - We cannot reject $\beta^{\text{all}} = -\beta^w$ in any specification ($p = 0.16, 0.65, 0.45$).

From cheapflation to inflation inequality

- Low-income buy cheaper varieties across food-at-home. Handbury (2021), Sangani (2022).
- $\Rightarrow$ Low-income inflation rates more sensitive to category-level inflation.

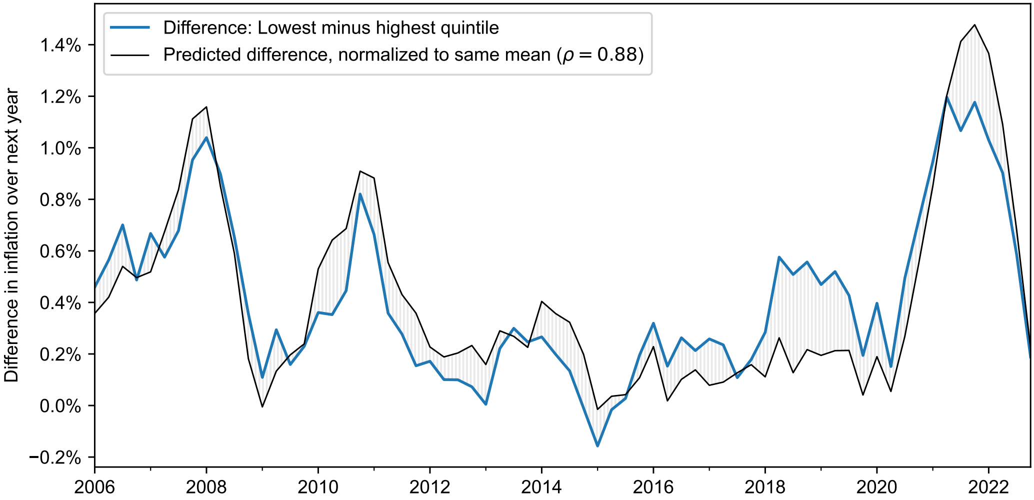
Panel A. Prices paid		*Panel B. Inflation sensitivity*	
	Log unit price (1)		*Module inflation for income group* (2)
Income quintile 2	0.012**	Avg. module inflation $\times$ Income quintile 2	0.000
	(0.003)		(0.003)
Income quintile 3	0.027**	Avg. module inflation $\times$ Income quintile 3	-0.008*
	(0.004)		(0.004)
Income quintile 4	0.049**	Avg. module inflation $\times$ Income quintile 4	-0.025**
	(0.006)		(0.006)
Income quintile 5	0.082**	Avg. module inflation $\times$ Income quintile 5	-0.052**
	(0.008)		(0.010)
Module-Time FEs	Yes	Module-Time FEs	Yes
N	213971	N	201667
R^2	1.00	R^2	0.99
Within R^2	0.19	Within R^2	0.08

Cycles in inflation inequality over entire food-at-home bundle



Cycles in inflation inequality over entire food-at-home bundle

- Predicted gap = diff within-module infl (pass-through in levels) + diff spending shares.



Explaining variation in inflation inequality over time

	Variance of inflation gap (pp^2)	*Excess inflation inequality relative to full sample average* (percentage points)	
	All Years	2008–2011	2021–2023
Actual	0.100	0.122	0.323
After accounting for pass-through in levels	0.043	0.002	0.117
After accounting for pass-through in levels and module expenditure shares	0.030	-0.041	-0.043

- Predicted gap explains 70% of variation in inflation inequality over time.
- Accounts for excess inflation inequality during Great Recession ('08–11) and Post-Pandemic Inflation ('21–23).

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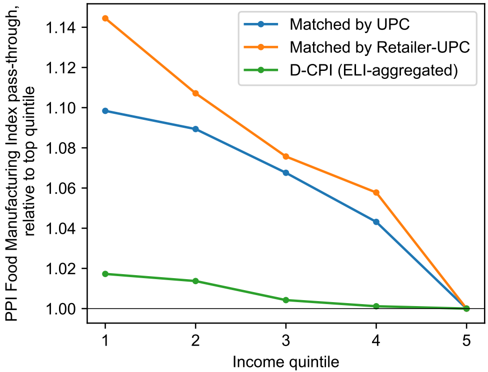
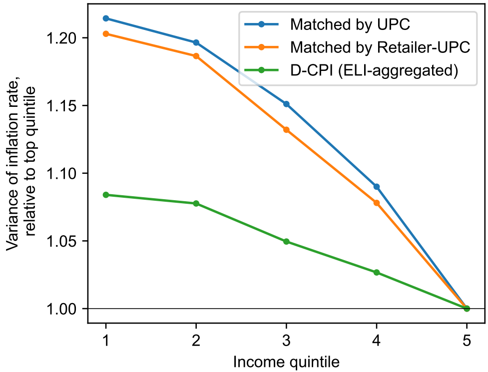
Official price indices do not capture ↑ volatility, sensitivity for low-income

- Food-at-home inflation for low-income more sensitive to upstream costs, more volatile.
- Inflation measures built on BLS ELI data (e.g., D-CPI) do not capture these effects.



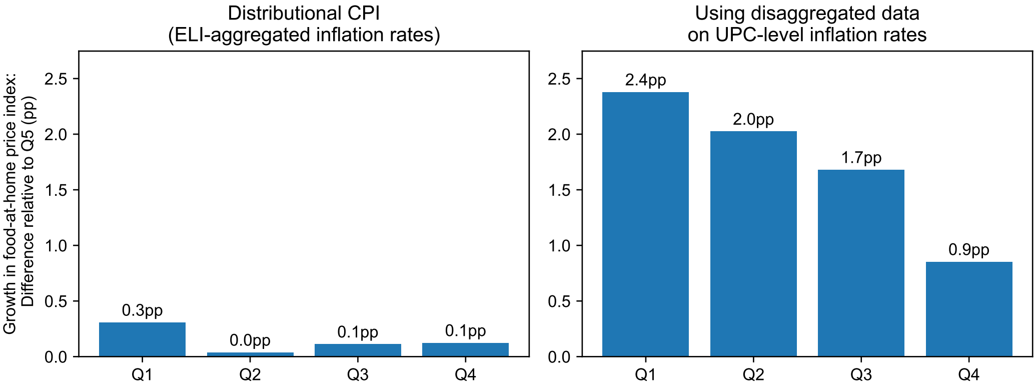
(a) Log pass-through of Food Manufacturing PPI.



(b) Variance of annual inflation rates.

BLS data misses 87% of differential food-at-home inflation over 2021–2023

- Differences in food-at-home price growth by income quintile, 2020Q4 to 2023Q4.
- Average growth was 21pp over this period $\Rightarrow$ $\approx$10% higher for low-income.



Official price indices understate gaps

- “BLS data” column uses most disaggregated official price indices available. Jaravel (2024).
- Differences in cost sensitivity, volatility understated due to aggregation.

Measure	Scanner data	BLS data	Understatement in BLS data
	Difference: 1st vs. 5th income quintile		
Pass-through of Food Manufacturing PPI, 2006–2020	9.8%	1.7%	83%
Pass-through of Farm Products PPI, 2006–2020	5.8%	2.8%	52%
Variance of food-at-home inflation rates, 2006–2020	21.4%	8.4%	61%
Growth in food-at-home price index, 2020Q4–2023Q4	2.4pp	0.3pp	87%

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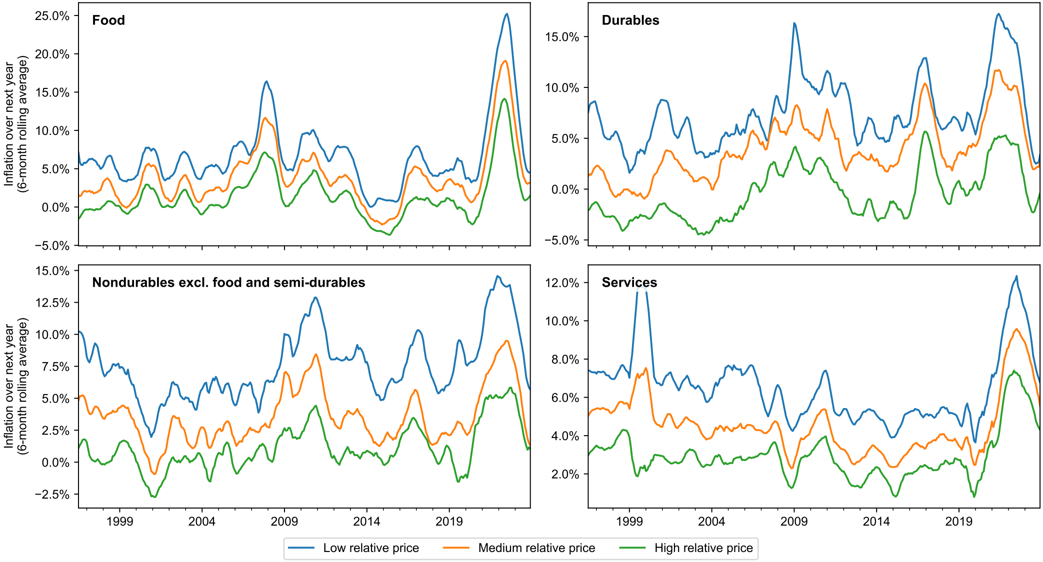
Cheapflation and inflation inequality beyond food at home

- Frequent challenge: External validity beyond food at home.
- Pass-through in levels should affect inflation inequality in other categories if...
  - Firms have other inputs besides labor.
  - Firms pass through these input cost changes in levels.
  - Consumers purchase differently-priced varieties.
- Two alternative data sources:
  1. Cheapflation: UK CPI microdata.
  2. Inflation inequality: Cross-city variation with BLS metro area data.
- [In paper]: Evidence from automobile purchases and model prices.

Cheapflation cycles in UK CPI microdata



UK CPI microdata: Lower-priced varieties more sensitive to item inflation

	$Inflation_{kit+12}$		
	(1)	(2)	(3)
Relative $\text{Price}_{kit} \times$ Avg. Item Inflation_{it+12}	-0.307^{**}		
	(0.046)		
Relative $\text{Price}_{kit} \times$ Avg. Item $\text{Inflation}_{it+12} \times$ Food		-0.552^{**}	-0.548^{**}
		(0.047)	(0.056)
Relative $\text{Price}_{kit} \times$ Avg. Item $\text{Inflation}_{it+12} \times$ Other nondurables		-0.259^{**}	-0.251^{**}
		(0.115)	(0.118)
Relative $\text{Price}_{kit} \times$ Avg. Item $\text{Inflation}_{it+12} \times$ Semi-durables		-0.231^{**}	-0.229^{**}
		(0.038)	(0.047)
Relative $\text{Price}_{kit} \times$ Avg. Item $\text{Inflation}_{it+12} \times$ Durables		-0.191^{**}	-0.194^{**}
		(0.077)	(0.071)
Relative $\text{Price}_{kit} \times$ Avg. Item $\text{Inflation}_{it+12} \times$ Services		-0.177^{**}	-0.147^{**}
		(0.074)	(0.070)
Item-Time FEs	Yes	Yes	Yes
Relative $\text{Price}_{kit} \times$ Time FEs			Yes
N (millions)	21.6	21.6	21.6
R^2	0.12	0.12	0.12

- Strongest for food, but appears across categories. Not absorbed by time FEs.

Evidence on inflation inequality from BLS metro area data

- BLS collects price quotes and reports price indices for 32 metropolitan areas.
- Test for differences in inflation sensitivity, using inflation in MSA m at time t:

$$\text{Inflation}_{mt+1} = \beta\left(\text{USInflation}_{t+1} \times \text{LogIncome}_{mt}\right) + \gamma\text{LogIncome}_{mt} + \alpha_m + \delta_t + \varepsilon_{mt},$$

  - USInflation_{t+1} is nationwide inflation (U.S. city average) from year t to $t+1$.
  - LogIncome_{mt} is log of MSA income from BEA.

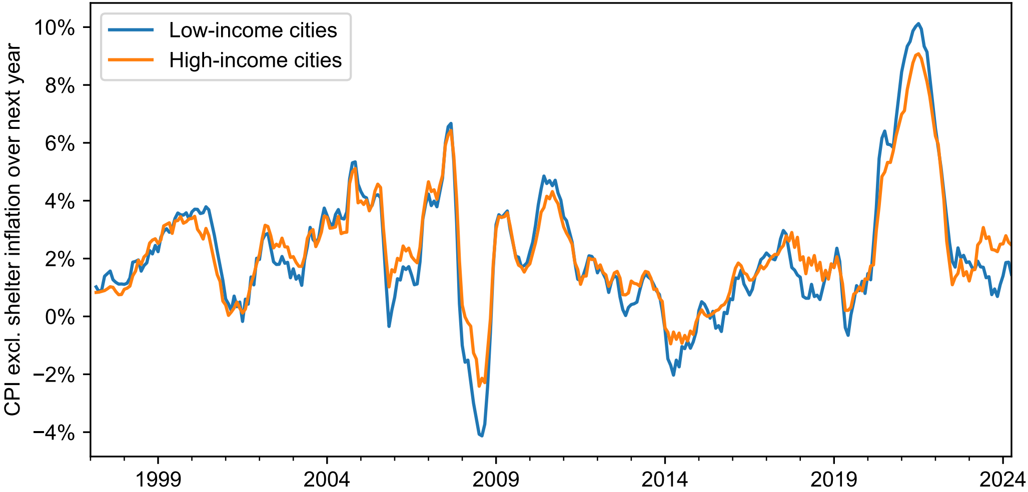
- $\beta < 0$ implies low-income cities more sensitive to nationwide inflation.

Inflation inequality across U.S. metros

	Inflation in Metropolitan Area					
Series	CPI	CPI Ex. Shelter	All Food	Food Away from Home	Goods Ex. Food	Services Ex. Shelter
BLS Code	`SA0`	`SA0L2`	`SAF1`	`SEFV`	`SACL1`	`SASL2RS`
	(1)	(2)	(3)	(4)	(5)	(6)
U.S. Avg. Inflation × Log Income	−0.970**	−0.452**	−0.258**	−0.589**	−0.227**	−0.271*
	(0.085)	(0.066)	(0.084)	(0.242)	(0.041)	(0.161)
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes
Metropolitan Area FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	3540	3534	3528	3515	3534	3534
R^2	0.85	0.89	0.75	0.42	0.92	0.57

- Higher sensitivity of inflation in lower-income cities.
- Beyond food-at-home, appears in food away from home, other goods, and services.

Inflation of CPI excluding shelter in high- and low-income cities



Differences in expenditure weights across categories explains only half

- BLS publishes expenditure weights across categories for metro areas.
- Construct MSA inflation rates w/ area weights $\times$ national category inflation.
- $\Rightarrow$ Sensitivity of actual MSA inflation rates varies 2x more with income, suggesting differences in within-category product mix and product-level inflation matter.

	Inflation in Metropolitan Area			
	CPI Data		Constructed with Area Weights	
	CPI	CPI Ex. Shelter	CPI	CPI Ex. Shelter
	(1)	(2)	(3)	(4)
U.S. Avg. Inflation $\times$ Log Income	-0.970**	-0.452**	-0.208**	-0.224**
	(0.085)	(0.066)	(0.035)	(0.030)
Time FEs	Yes	Yes	Yes	Yes
Metropolitan Area FEs	Yes	Yes	Yes	Yes
N	3540	3534	7452	7452
R^2	0.85	0.89	0.99	0.99

Conclusion

- A new source of fluctuations in cheapflation and inflation inequality.
- Pass-through in levels of cost changes $+$ diff varieties bought by income groups.
- Note: Mechanism applies to any units with different expenditures across varieties.
  - Cities with higher-priced varieties have muted response to national cost shocks.
  - Countries that import high-price varieties have less volatile import price inflation.
- Within-category inflation inequality invisible in official statistics due to aggregation.
- Substitution partially mitigates welfare costs, but nonhomotheticity amplifies costs.

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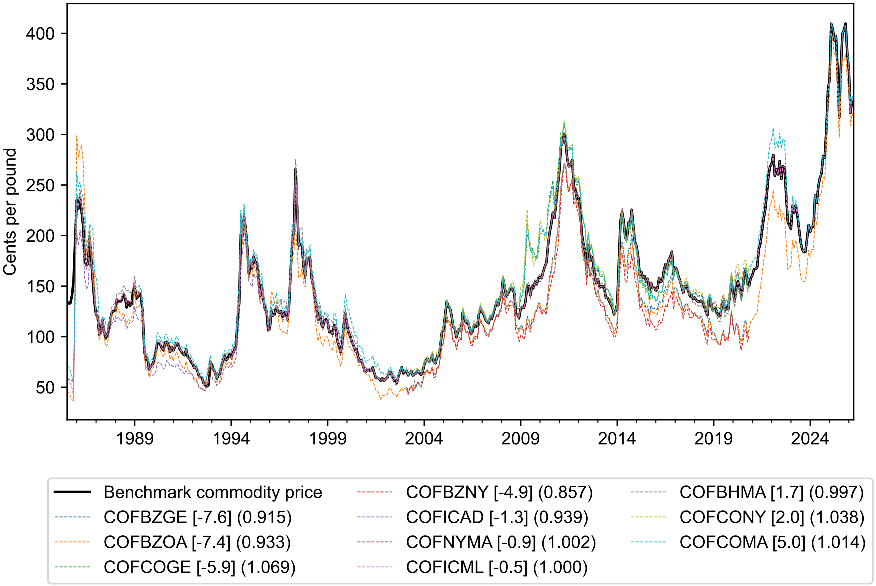
Comparing prices for coffee varieties to benchmark commodity series



Testing for pass-through in levels: Robustness with 5 groups

	Inflation of lowest-price quintile − highest-price quintile					
	(1)	(2)	(3)	(4)	(5)	(6)
Excess module inflation × Price gap	1.176**		1.181**		1.188**	
	(0.027)		(0.025)		(0.019)	
Module inflation × Price gap		1.178**		1.181**		1.188**
		(0.025)		(0.025)		(0.019)
Wage inflation × Price gap		-1.561**		-0.926**		-1.261**
		(0.299)		(0.243)		(0.336)
Post-2020			-0.048**	-0.056**		
			(0.011)	(0.014)		
Price gap	0.004	0.023*	0.012	0.001	0.051**	0.054**
	(0.010)	(0.011)	(0.007)	(0.006)	(0.007)	(0.013)
Time FEs					Yes	Yes
Product Module FEs					Yes	Yes
N	42405	42405	42405	42405	42405	42405
R^2	0.92	0.92	0.93	0.93	0.94	0.94

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Accounting for substitution and nonhomotheticity

- So far we have used Laspeyres price indices to measure inflation,

$$\underbrace{\Delta \log P_t}_{\substack{\text{Change in} \\ \text{cost of living}}} \approx \sum_i \underbrace{\lambda_{it-1}}_{\substack{\text{Initial} \\ \text{exp. shares}}} \times \underbrace{\Delta \log p_{it}}_{\substack{\text{Subsequent} \\ \text{price change}}} .$$

- Change in cost of living may differ from Laspeyres first-order approx for two reasons:
  1. Substitution: Households may substitute to products with smaller price increases.
  2. Nonhomotheticity: Households' spending shares may change with real income.

Accounting for substitution and nonhomotheticity

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  1. Substitution: Households may substitute to products with smaller price increases.
  2. Nonhomotheticity: Households' spending shares may change with real income.

- Approach:
  1. Törnqvist price index accounts for changes in spending shares.

$$\pi_t^{\text{Törnqvist}} = \prod_i (1 + \pi_{it})^{\frac{1}{2}(\lambda_{it-1} + \lambda_{it})} - 1.$$

  2. Nonhomothetic second-order adjustment from Jaravel and Lashkari (2024), which uses variation in inflation across hh's with different real consumption.

Accounting for substitution and nonhomotheticity

	Panel A. Growth in food-at-home price index from 2020Q4–2023Q4 (pp)			*Panel B. Variance of food-at-home inflation rates from 2006–2020 (pp^2)*		
Income	Homothetic		Nonhomothetic	Homothetic		Nonhomothetic
quintile	Laspeyres	Törnqvist	(Base=2020Q4)	Laspeyres	Törnqvist	(Base=2006Q1)
	(1)	(2)	(3)	(4)	(5)	(6)
1	27.27	25.43	27.01	4.69	4.67	4.89
2	26.92	24.90	26.41	4.62	4.59	4.92
3	26.57	24.52	25.99	4.45	4.43	4.78
4	25.74	23.87	25.27	4.21	4.23	4.55
5	24.89	23.13	24.45	3.86	3.90	4.15
Q1/Q5	1.10	1.10	1.10	1.21	1.20	1.18

- Substitution dampens inflation volatility, $\approx$ proportionately across incomes.
- Nonhomotheticity amplifies volatility: households trade down to low-price goods that inflate the fastest.

Why does non-homotheticity amplify volatility / welfare cost?

- In the cross-section, low-income households buy lower-price varieties.
- $\Rightarrow$ As real consumption falls, preferred spending shares shift to cheaper varieties.
- When prices rise, real consumption falls $\Rightarrow$ households want to trade down.
- But, pass-through in levels means households trade down to exactly those varieties that experience the greatest inflation!

Nonhomotheticity adjustment: Robustness to base period

	Panel A. Growth in food-at-home price index from 2020Q4–2023Q4 (pp)			*Panel B. Variance of food-at-home inflation rates from 2006–2020 (pp^2)*		
		Nonhomothetic			Nonhomothetic	
Income quintile	Baseline (1)	(b=2020Q4) (2)	(b=2023Q4) (3)	Baseline (4)	(b=2006Q1) (5)	(b=2020Q4) (6)
1	27.27	27.01	27.02	4.69	4.89	5.04
2	26.92	26.41	26.35	4.62	4.92	4.84
3	26.57	25.99	25.91	4.45	4.78	4.62
4	25.74	25.27	25.18	4.21	4.55	4.41
5	24.89	24.45	24.42	3.86	4.15	4.09
Q1/Q5	1.10	1.10	1.11	1.21	1.18	1.23

- Similar results using end of period as base.

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Evidence on cheapflation from Cost of Living Index (COLI) data

Category	Products
Grocery	Baby food, Bacon, Bananas, Beer, Chunk light tuna, Coffee, Corn flakes, Eggs, Fresh orange juice, Fried chicken, Frozen corn, Frozen meal, Frozen orange juice, Ground beef, Lettuce, Liquor, Margarine, Parmesan cheese, Peaches, Potato chips, Potatoes, Sausage, Shortening, Soft drink, Sugar, Sweet peas, T-bone steak, Tomatoes, White bread, Whole milk, Wine
Apparel	Boys' jeans, Boys' underwear, Men's denim jeans, Men's dress shirt, Men's slacks, Women's slacks
Other Goods	Aspirin, Board game, Cigarettes, Detergent, Facial tissues, Gasoline, Ibuprofen, Lipitor, Newspaper, Polysporin, Shampoo, Tennis balls, Toothpaste
Services	Beauty salon, Bowling, Commuter fare, Dental visit, Doctor visit, Dry cleaning, Fried chicken (at fast food restaurant), Haircut, Hamburger (at fast food restaurant), Hospital room, Movie ticket, Optometrist visit, Pizza (at restaurant), Tire balancing, Veterinary services, Washer repair
Housing & Utilities	Apartment rent, Electricity (both for all-electric homes and for homes using other types of energy), Home price, Monthly payment, Mortgage rate, Other energy, Telephone bill, Total energy

Evidence on cheapflation from Cost of Living Index (COLI) data

- Cost of Living Index (COLI) price data from 300 cities over 1990–2010.
  - Products chosen to be as standardized as possible across cities.
  - $\Rightarrow$ Prices not necessarily representative of product mix across cities.
- Test for cheapflation using prices of same product *i* across cities *c*:

$$\text{Inflation}_{ict+1} = \beta \left(\text{AvgProductInflation}_{it+1} \times \text{RelativePrice}_{ict}\right) + \alpha_{it} + \delta_{ic} + \kappa_{ct} + \varepsilon_{ict},$$

  - $\text{RelativePrice}_{ict} = \log p_{ict} - \log \bar{p}_{it}$ is relative price of product *i* in city *c* in quarter *t*.
  - Absorb product-quarter, product-city, and city-quarter FEs $\alpha_{it}, \delta_{ic}, \kappa_{ct}$.
  - Lower-priced products more sensitive to inflation ("cheapflation") implies $\beta < 0$.

Evidence on cheapflation from Cost of Living Index (COLI) data

	All	Grocery	Apparel	Other Goods	Services	Housing & Utilities
		Product Inflation in City				
	(1)	(2)	(3)	(4)	(5)	(6)
Avg. Product Infl. × Relative Price	−1.565**	−1.496**	−2.440**	−1.343**	−5.181**	−0.586*
	(0.250)	(0.329)	(0.522)	(0.366)	(1.996)	(0.274)
Product-Quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes
Product-City FEs	Yes	Yes	Yes	Yes	Yes	Yes
City-Quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	1 164 952	516 770	55 111	183 189	262 382	147 500
R^2	0.35	0.38	0.55	0.55	0.27	0.55

- Cheapflation in apparel, other nondurables, and even services.

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