Price Discounts and Cheapflation During the Post-Pandemic Inflation Surge

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Harvard Business School
and NBER

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Bank of Canada

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The views expressed herein are those of the authors and are not necessarily those of the Bank of Canada

How do retailers and households adapt to higher inflation?

- Inflation of consumption basket in United States peaked at 9% in June 2022

- Substantial dispersion of prices in the basket (Kaplan and Menzio, 2015)
  - Across retailers: premium vs value stores, brick-and-mortar vs online
  - Within retailers: cheap vs expensive brands, regular vs discounted

- Literature: price variation across retailers
  - Models with sticky prices and/or information costs
  - Retailers are fast to pass through large shocks (Cavallo, Lippi, and Miyahara, 2023)
  - Price dispersion rises with inflation (Sheremirov, 2020)

- This paper: focus on within-retailer-category price variation
  - Effect of inflation on relative prices for similar products
  - How households exploit it to attenuate the inflation burden

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How within-retailer-category prices evolved?

Micro data for food products between 2019 and 2023:

- Posted prices from 92 large multi-channel retailers in 10 countries
- Transaction prices from Canadian Homescan Panel Data (NielsenIQ)
- Analyze unit prices within narrowly defined product categories

Two dimensions of price variation within retailer-category

1. Prices around temporary discounts
   - Did not contribute to inflation surge
   - Buying on sale reduced cumulative inflation by 4.4 ppt
2. Prices of cheaper brands
   - Grew 1.5x faster than prices of expensive brands (*Cheapflation*)
   - Switching to cheaper brands *raised* the growth in avg unit price by 1.6 ppt

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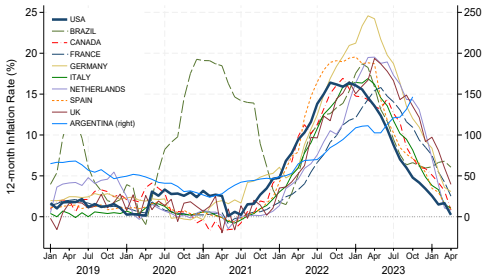
Micro price data (The Billion Prices Project)

- Prices scraped from websites of large multi-channel retailers by PriceStats
- Daily posted prices from January 1, 2019, to November 27, 2023

	# Retailers	# Categories	# Products	# Unit Prices
ARGENTINA	9	6,832	170,923	72,816
BRAZIL	12	8,891	228,497	1,632
CANADA	12	11,317	271,890	55,939
FRANCE	12	17,396	364,920	268,583
GERMANY	7	8,743	178,152	91,050
ITALY	5	3,578	80,711	68,674
NETHERLANDS	7	22,472	161,145	55,565
SPAIN	9	12,159	177,025	99,887
UK	10	21,728	193,521	145,719
USA	8	13,366	296,108	155,786

Focus on "Food and Beverages"

- Significant weight in the goods component of CPI (≈10%–20%)
- Experienced highest inflation rates among goods
- High quality and comparability of the data across different countries



CPI - Annual Inflation

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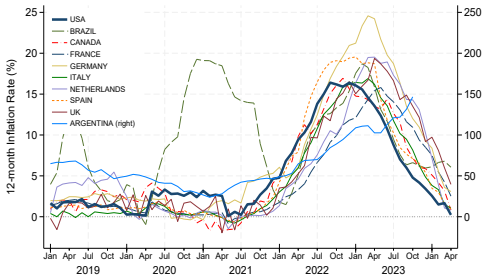

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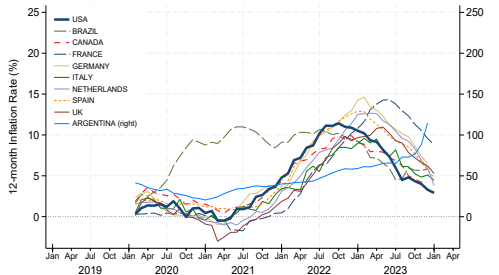

Multi-channel retailers - Annual Inflation

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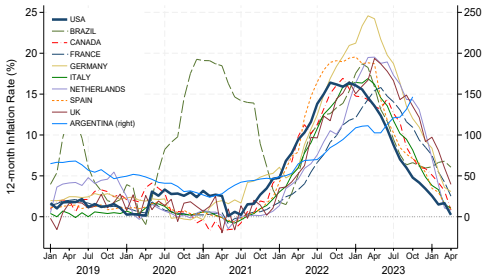

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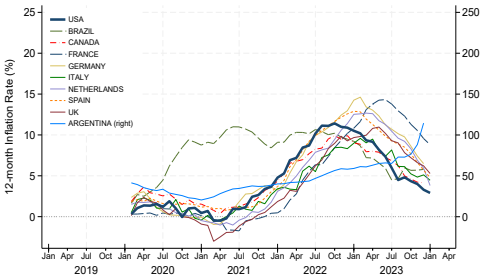

Multi-channel retailers - Annual Inflation

Products, unit prices and price discounts

Categories | Dairy, Eggs & Cheese | Eggs

$1.18 19.7 ¢/count

Value Large White Eggs, 6 Count

$3.96 33.0 ¢/ea

Organic Cage-Free Large Brown Eggs, 12 Count

$6.12 51.0 ¢/ea

Pasture Raised Grade A Large Brown Eggs, 12 Count

$2.98 ~~$3.38~~ 30.6 ¢/oz

Farms Hard-Boiled Eggs, 9.75 oz

- Highly similar products identified by URL-unit (e.g., fresh eggs, dry pasta, milk)
- Unit price = package price / package units
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Regular and sale-related price changes (sales flag)

- Sale-related price changes (inside shaded) and RR changes (outside shaded)
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Inflation during sale events

- P_{it} – unit price on day t, I_{it} – indicator price chg, I_{it}^S – indicator price discount
- Inflation rate at t

$$\pi_t \equiv \sum_i \omega_i I_{it} (\ln P_{it} - \ln P_{it-1})$$

- Regular price inflation at t

$$\pi_t^{RR} \equiv \sum_i \omega_i I_{it} (1 - I_{it}^S)(1 - I_{it-1}^S)(\ln P_{it} - \ln P_{it-1})$$

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- Regular price inflation and Sale-related inflation at t

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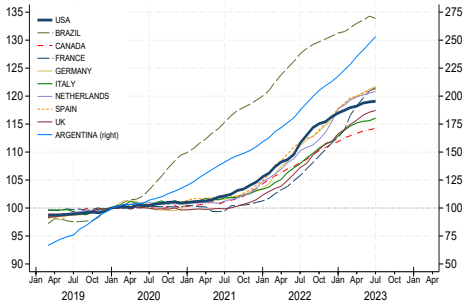
$$\pi_t^{Sales} \equiv \pi_t - \pi_t^{RR}$$

Cumulative inflation during sales



Regular price changes, $\sum \pi_t^{RR}$

- Sale-related price changes did not contribute much to inflation
- Similar results for non-food sectors, ex. semi-durables (U.K. CPI micro data)

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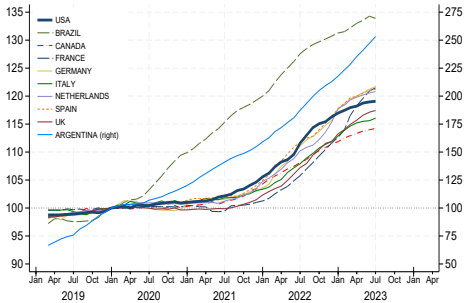

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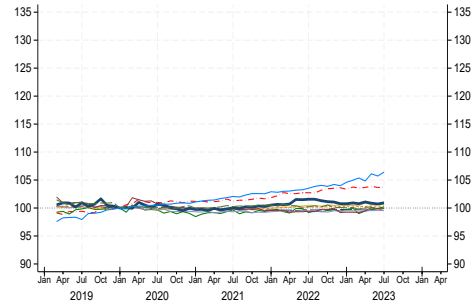

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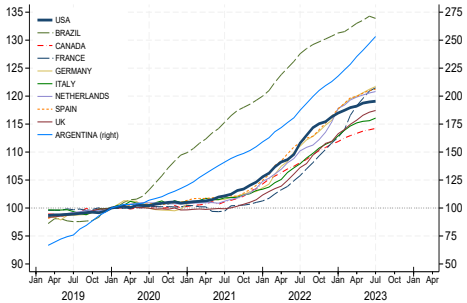

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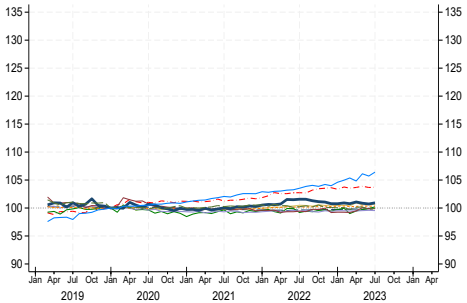

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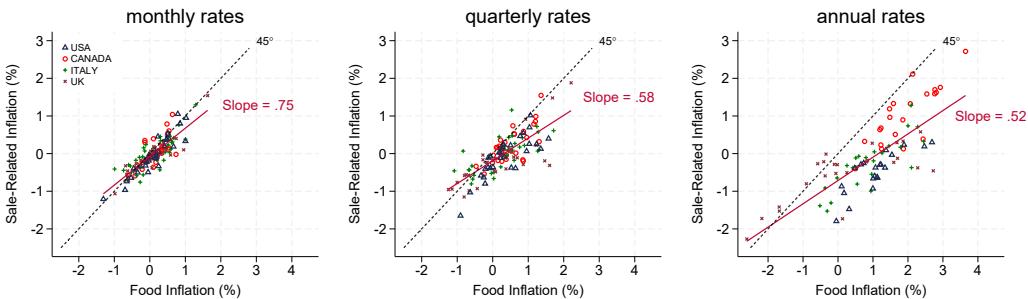
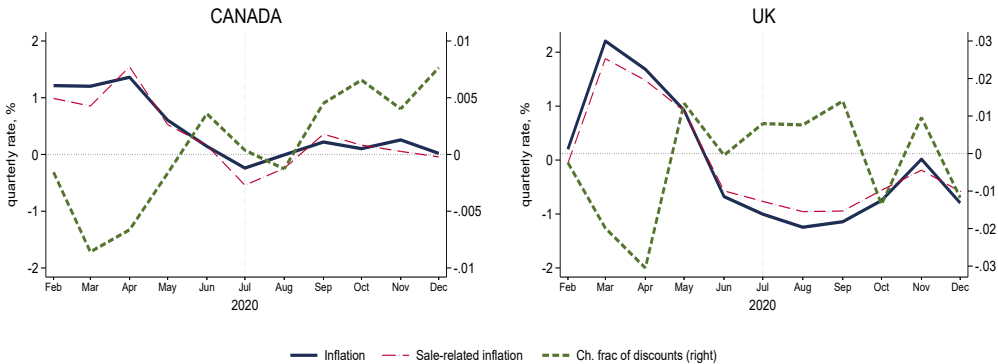
- Before surge: π_t^{Sales} accounts for a large fraction of π_t variance



π_t and π_t^{Sales} rates before surge, pooled across USA, UK, CANADA, ITALY

Why didn't sales contribute to inflation?

- During lockdowns: fall in discounts drove up inflation
  - ◇ Jaravel and O'Connell (2020): half of 2.4% UK grocery inflation in March 2020



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π_t^{Sales} stems from changes in # of discounts and end-of-sale regular price changes:

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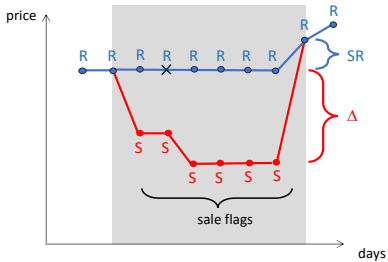

Sale-related price changes

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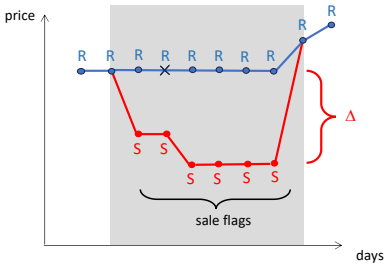
$$\pi_t^{Sales} = -\underbrace{(H_t - H_{t-1})}_{\text{Ch. frac of sales}} \times \underbrace{\Delta_t}_{\text{Size of disc}} +$$



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	H	Δ (%)
ARGENTINA	0.06	26.5
BRAZIL	0.08	26.5
CANADA	0.19	29.1
FRANCE	0.02	27.2
GERMANY	0.04	34.7
ITALY	0.08	32.0
NETHERLANDS	0.02	30.4
SPAIN	0.06	18.0
UK	0.15	35.3
USA	0.10	31.2

Discounts in 2019

Monthly share of discounts, H_t

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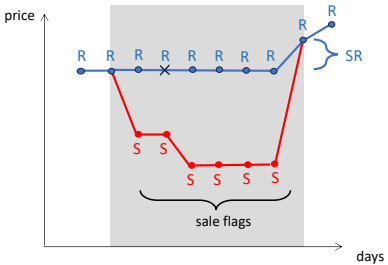

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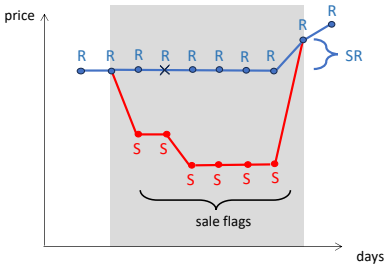

Sale-related price changes

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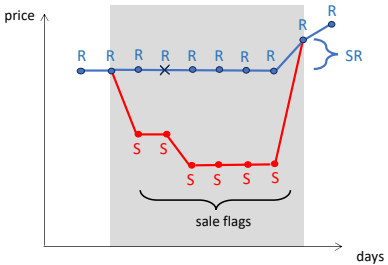

Sale-related price changes

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Can consumers "escape" inflation by switching to cheaper varieties?

- Within URL-unit categories: rank products by avg unit reg price in 2019
- For each quartile construct a fixed-weight regular price index

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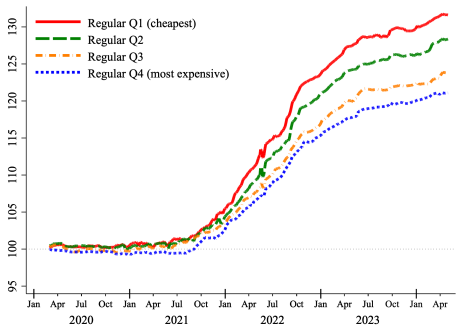

Regular price index, by quartile (United States)

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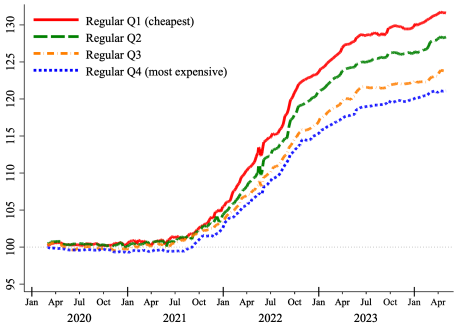

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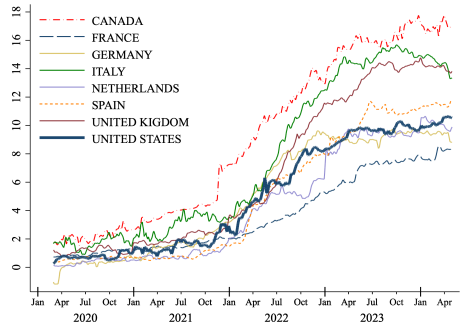

Cheapflation: Q1–Q4 inflation since Jan 2020

Unit price dispersion (within narrow food categories)

- Discounts increase dispersion — Cheapflation decreases dispersion
- For each URL-unit category take inter-quartile ratio (IQR)
- All models or constant basket (16,897 products entered before March 2020)

United States, posted prices

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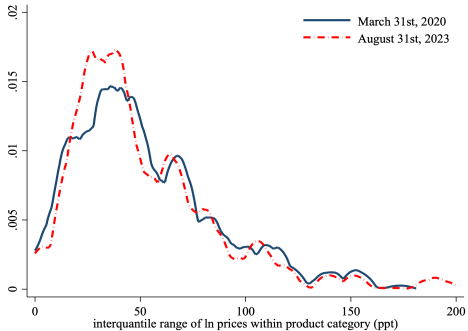

Unit price IQR across categories

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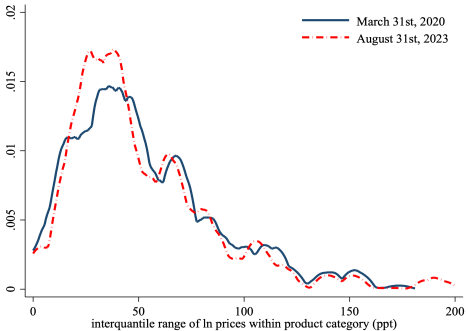

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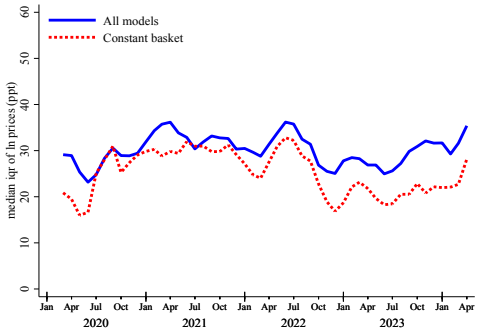

Median IQR

United States, posted prices

Do households shift their spending?

Household transactions from Canadian Homescan Panel data (NielsenIQ)

- 164 fast-moving grocery products (104 food, 60 non-food)
- Unit prices for 175,155 UPCs
- 28,605,666 transactions for 12,000 hhlds across 533 retailers and 53 locations

Expenditure shifts across groups of transactions:

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- Expensive to cheaper brands

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- Expensive to cheaper brands

For each group construct a fixed-weight price index

- Let P_{it} (P_t^R) denote avg unit price for retailer-barcode (UPC) i in month t
- ω_i (ω_i^R) is avg monthly \$ expenditure share for retailer-UPC i during 2019–2023
- Fixed-weight inflation rates

$$\pi_t \equiv \sum \omega_i \left(\ln P_{it} - \ln P_{it-1}\right)$$

$$\pi_t^{RR} \equiv \sum \omega_i^R \left(\ln P_{it}^R - \ln P_{it-1}^R\right)$$

$$\pi_t^{Sales} \equiv \pi_t - \pi_t^{RR}$$

Incorporate variation in expenditures across groups

- Let s_{it}^{Sales} (s_{it}) denote \$ expenditures on discounted (all) transactions
- Share of spending on discounts is

$$\omega_t^{Sales} = \frac{\sum_i s_{it}^{Sales}}{\sum_i s_{it}}$$

- Varying-weight inflation rate

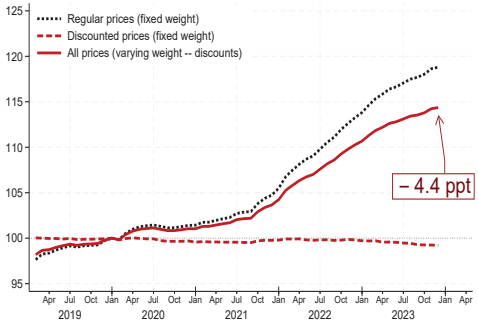
$$\widetilde{\pi}_t = \left(1 - \frac{\omega_t^{Sales} + \omega_{t-1}^{Sales}}{2}\right)\pi_t^{RR} + \frac{\omega_t^{Sales} + \omega_{t-1}^{Sales}}{2}\pi_t^{Sales}$$

Expenditure shift: regular to discounted prices

Fixed-weight price indexes

Expenditure share: discounted transactions

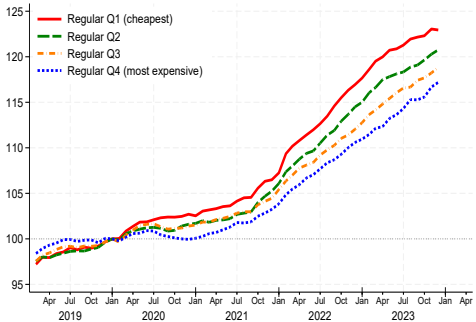
Expenditure shift: regular to discounted prices



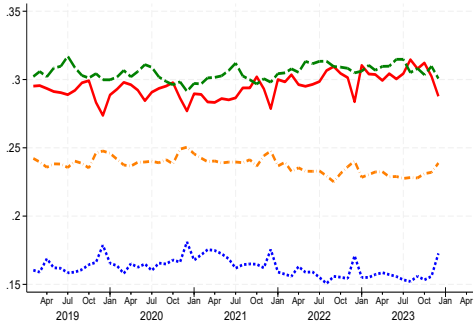
Varying weight — discounts

Expenditure share: discounted transactions

Expenditure shift: expensive to cheaper brands

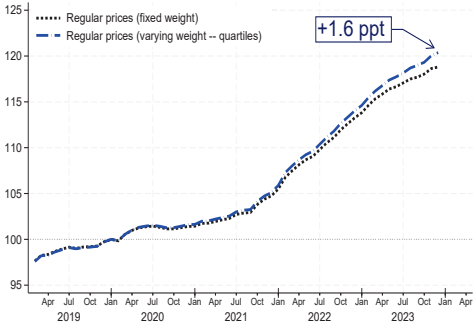


Fixed-weight regular prices, quartiles

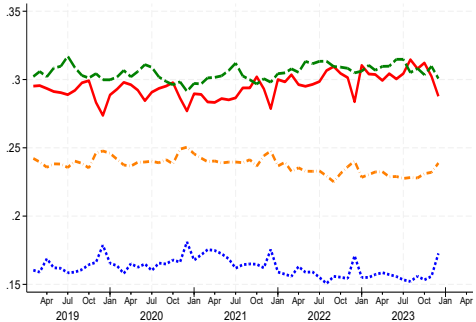


Expenditure shares: unit price quartiles

Expenditure shift: expensive to cheaper brands



Varying weight — quartiles



Expenditure shares: unit price quartiles

Conclusions

- Higher inflation: significant movements in relative prices within product categories

- Evidence for posted prices
  - Sales do not matter much for inflation
  - Cheapflation: inflation for cheaper brands 1.5x inflation for premium brands

- Evidence for transacted prices for Canada
  - Buying during sales lowers cumulative inflation by 4.4 ppt
  - Switching to cheaper brands raises it by 1.6 ppt

- Future work on cheapflation
  - *Permanent* increase in relative prices—hidden consumption or income inequality
  - Utility cost of switching to lower quality goods

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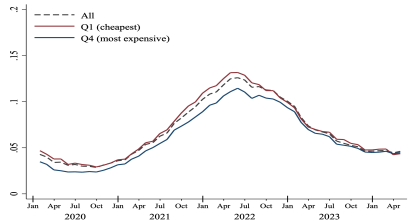
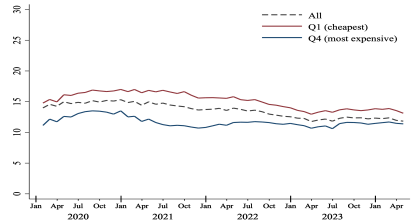
Additional slides

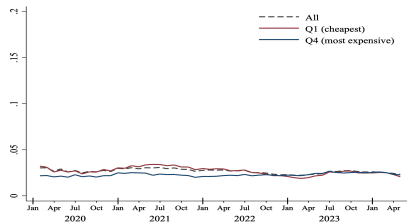
Proportion of increases vs decreases drives inflation



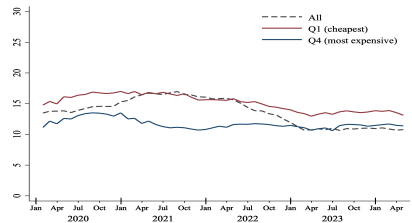
Fraction of reg price increases



Size of reg price increases

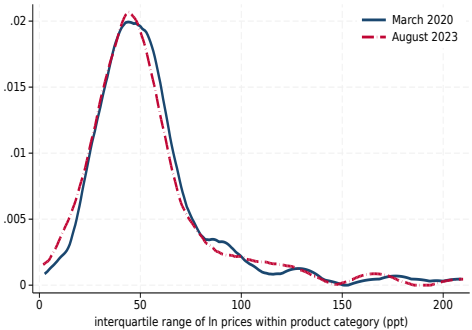


Fraction of reg price increases

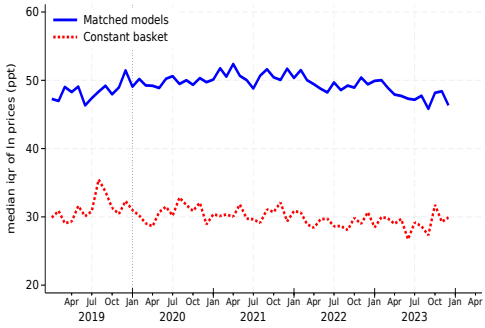


Abs Size of reg price decreases

Unit price dispersion (within narrow food categories)



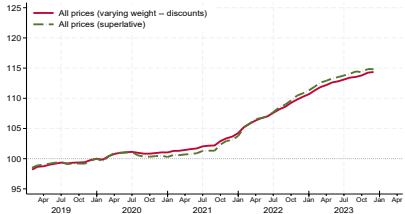
Unit price IQR across categories



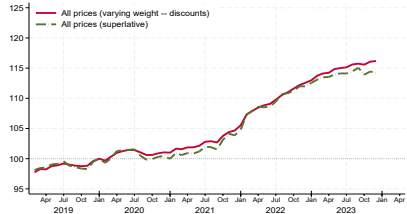
Median IQR

Canada, transaction prices

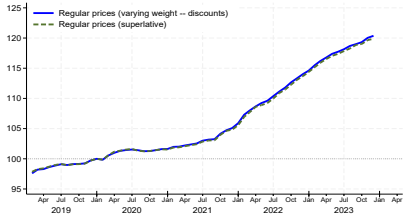
Superlative price indexes (incl. within-group expenditure weights)



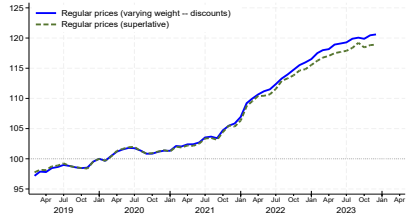
All prices (Matched models)



All prices (Constant basket)

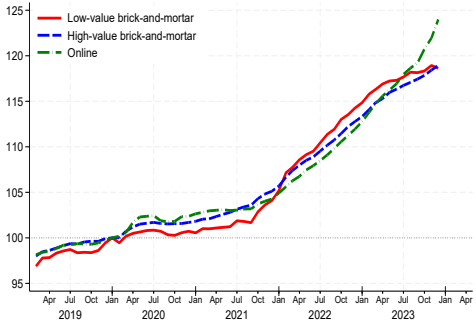


Regular prices (Matched models)

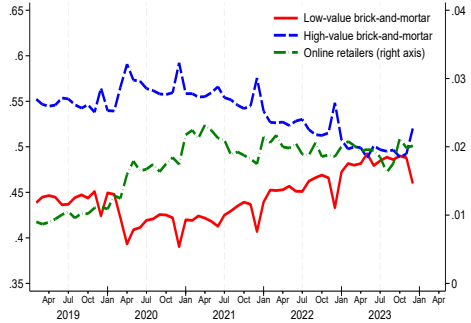


Regular prices (Constant basket)

Expenditure switching across retailers



Fixed-weight regular price indexes



Expenditure shares: retailers