A Temporary VAT Cut in Three Acts: Announcement, Implementation and Reversal

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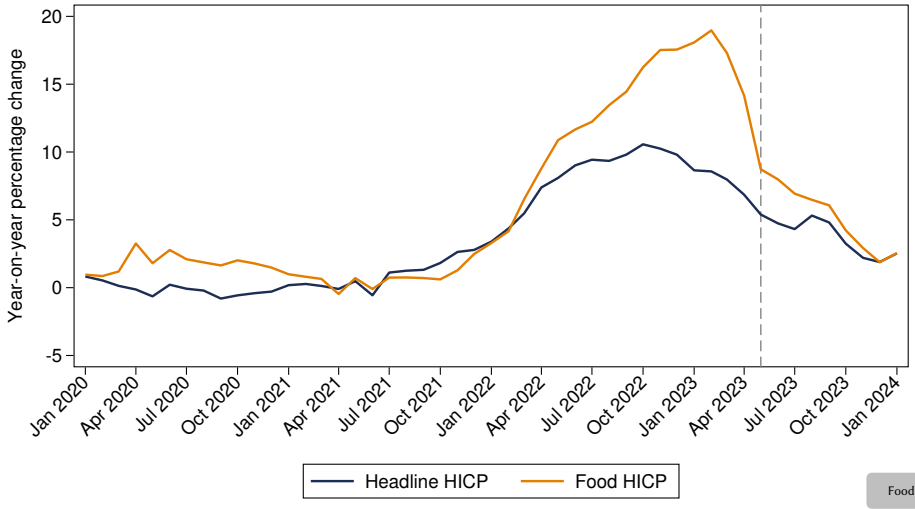
Motivation

- **High inflation rates** in 2022 and 2023 across euro area countries
  - → Several governments decided to **reduce consumption taxes** as a response
  - → Consumption taxes are the largest tax revenue category in most European countries
- In this paper, we revisit a classical question in Economics:
  - → What is the **price pass-through of a VAT change**?
- Using Portugal's temporary VAT cut in 2023 as a laboratory:
  - → Look at the **complete policy lifetime**: announcement, implementation and reversal

Inflation in Portugal



Food inflation

What we do

- Using a novel **high-frequency online retail prices dataset:**
  - → Compare the price evolution of **food items affected vs. non-affected** by the VAT cut
  - → Estimate **pass-through of the VAT cut** into prices during the complete policy lifetime
  - → Explore the pass-through **persistency** and **heterogeneity** along different dimensions
  - → Estimate the impact of the VAT cut on the **inflation rate**

- Investigate the **mechanism** of the price pass-through:
  - → **Salience** of the policy
  - → **Producer price** dynamics

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Preview of the results

- We estimate the price **pass-through** of the VAT cut to food prices in three different acts:
  - → **Announcement**: relative prices of treated items increased by 0.9% vs. non-treated
  - → **Implementation**: relative prices fell 5.42% $\implies$ **pass-through** $\approx$ **96%**
    - → Persistent high pass-through that only reverts in the last weeks of the policy
  - → **Reversal**: relative prices increased by 4.23% retuning to the trend before the policy
- No evidence of heterogeneity in the **pass-through** for different goods
- The VAT cut had a direct effect on **headline inflation** of approximately 0.7 p.p.
- We find suggestive evidence that **producer price dynamics** and the high policy salience can explain the high pass-through found

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Related literature

- Pass-through of consumption tax cuts
  - Restaurants (Harju and Kosonen, 2014); Cinema (Arce and de Antonio, 2020); Hairdressers (Benzarti et al., 2020); Gas (Gautier et al., 2023); Food (Benzarti et al., 2023 and De Amores et al., 2023)
  - Average pass-through estimate around 60%

→ **Contributions:**
  - evidence of the full policy lifetime dynamics of the pass-through
  - estimation of an unusually high pass-through

Background

Data

Results

Inspecting the mechanism

Conclusion

Background

Timeline of a surprising policy

Medina rejeita taxa zero de IVA nos alimentos por temer oportunismo

Flávio Nunes
11 Outubro 2022

Governo optou por não descer o IVA dos produtos alimentares para "taxa zero" por entender que a borla poderia ser aproveitada "oportunisticamente" para subidas de preços.

Rejection (Oct 11, 2022)

Timeline of a surprising policy

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Lusa e SIC Notícias
12:09, 14 mar.2023

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IVA Zero. Medina passou a acreditar em medida que criticava há 10 dias

24-03-2023 - 13:30 • João Carlos Malta

Rejection (Oct 11, 2022) → Denial (Mar 14, 2023) → Announcement (Mar 24, 2023)

Timeline of a surprising policy

- Mar 14, 2023: Minister of Finance rejects any reduction on VAT for food items
- Mar 24, 2023: A VAT cut is announced for “essential products” **(Act I)**
- Mar 27, 2023: Official announcement of the list of products covered by the measure
- Apr 18, 2023: Implementation of the policy **(Act II)**
- Sep 6, 2023: Announcement of an extension until the end of 2023
- Oct 27, 2023: Announcement of the official ending date of the policy
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List of food items in the VAT cut

Category	Items	VAT cut size
Cereals and Tubers	Bread, Potato, Pasta and Rice	6%
Dairy Products	Cow's Milk, Yogurt or Fermented Milk, Cheese	6%
Fruits	Apple, Banana, Orange, Pear, Melon	6%
Legumes	Red Beans, Black-Eyed Peas, Chickpeas	6%
Vegetables	Onion, Tomato, Cauliflower, Lettuce, Broccoli, Carrot, Zucchini, Leek, Pumpkin, Turnip Tops, Portuguese Cabbage, Spinach, Turnip, Peas	6%
Meat and Fish	Pork, Chicken, Turkey, Beef, Codfish, Sardine, Hake, Horse mackerel, Sea Bream, Mackerel	6%
Fats and Oils	Olive Oil, Butter	6%
	Vegetable Oils	23%
Other Products	Canned Tuna, Chicken Eggs, Plant-Based Drinks and Yogurts, Gluten-Free Products	6%

Data

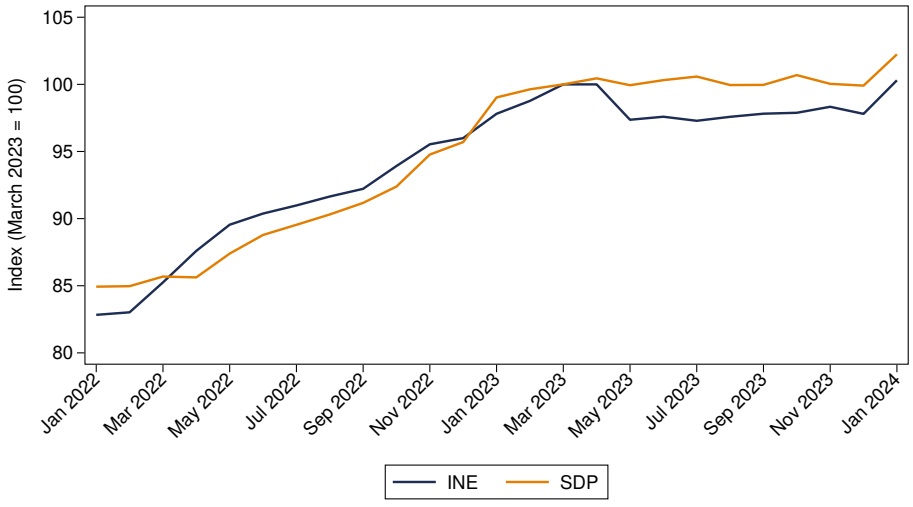
Data: Consumer Prices

Supermarket Daily Prices collected by Banco de Portugal Microdata Research Laboratory

- High-frequency data from **online stores** of 4 supermarkets ($\approx 55\%$ of retail market in 2022)
  $\rightarrow$ collected through **automated web scraping algorithms**
- The dataset covers the products sold on each website **since mid-2021**
- Variables: day, the product's name, brand, COICOP code, capacity, and **prices**
  $\rightarrow$ Includes identifier of products in Zero VAT basket
- We include only **food items**:
  $\rightarrow$ **44 251 items** (product $\times$ supermarket), from which **12% are treated items**

Data treatments

Data quality: Webscrapping vs Official inflation numbers



Data: Other sources

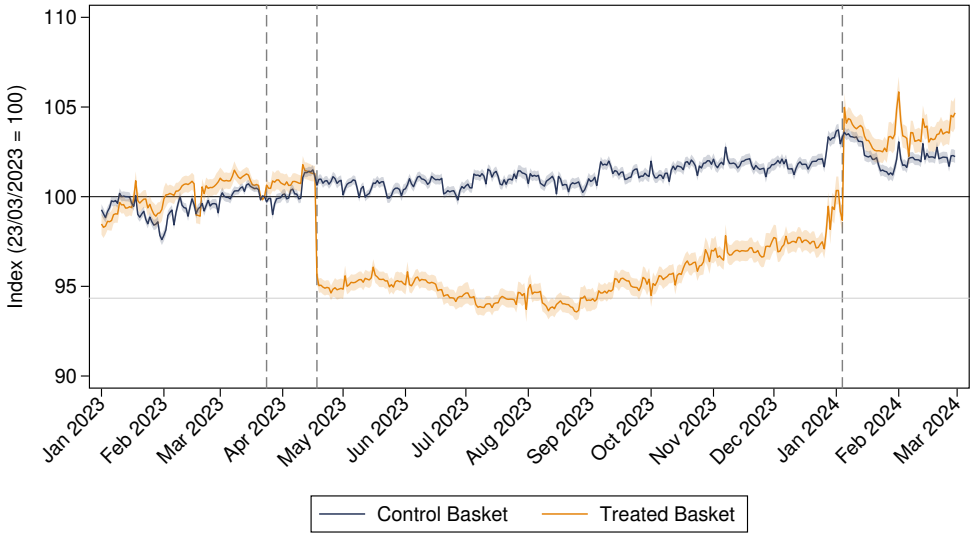
Aggregate Consumer Prices from the Eurostat

- Data by 5-digit COICOP level for Portugal and Spain

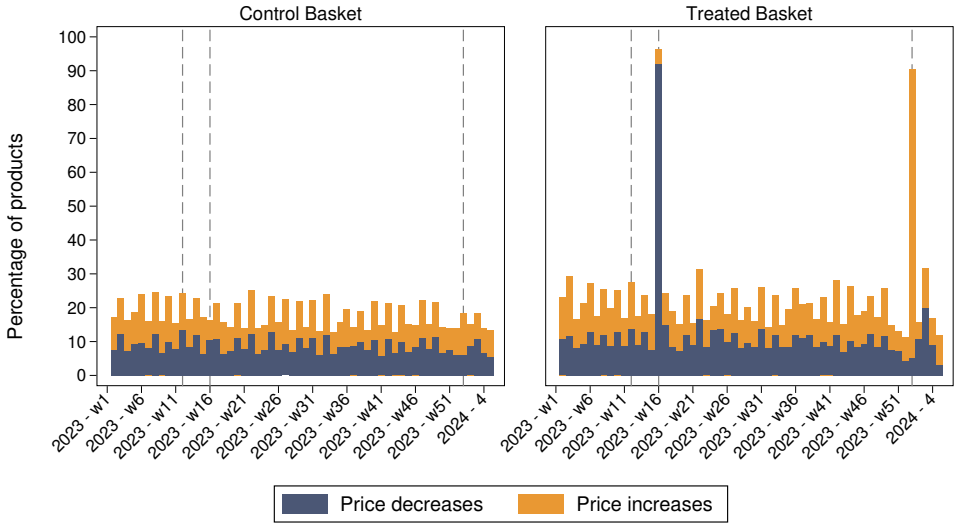
Weekly wholesale prices from the Agricultural Markets Information System of the Planning, Policy and General Administration Office

- Granular data for different product species, regions, and local markets
  → We select 13 product categories based on the existence of a COICOP 5 match
  → Proxy for the **cost changes faced by supermarkets**

Consumer price index by treatment assignment



Frequency of positive and negative price changes per week



Results

Event-study setting

- Estimate the **reduced-form effect of the policy** at key events: announcement, implementation and reversal
  - Compute the pass-through of the VAT policy change to consumer prices along the policy lifetime

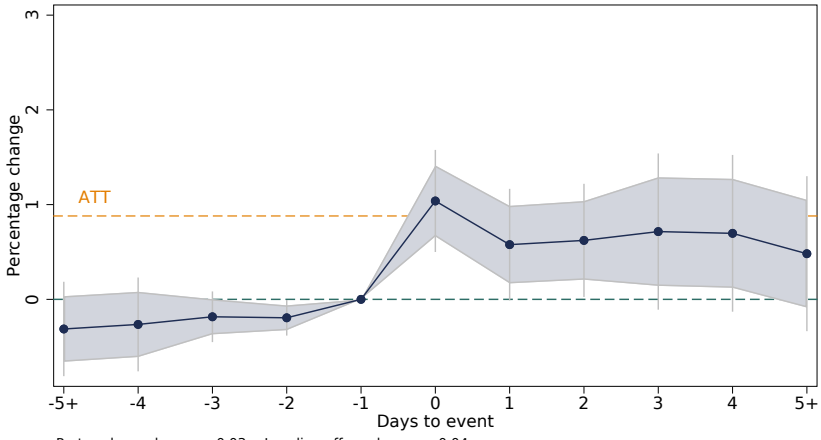
- We consider the following **linear panel model with dynamic policy effects**:

$$P_{it} = \alpha_i + \gamma_t + \sum_{m=-G}^{M} \beta_m Z_{i,t-m} + \varepsilon_{it}$$

- $\{\beta_m\}_{m=-G}^{M}$ summarize the **magnitude of the dynamic effects** of the policy
  - $Z_{i,t}$ refers to the event study indicators
  - Control group: all other food products with no VAT cut

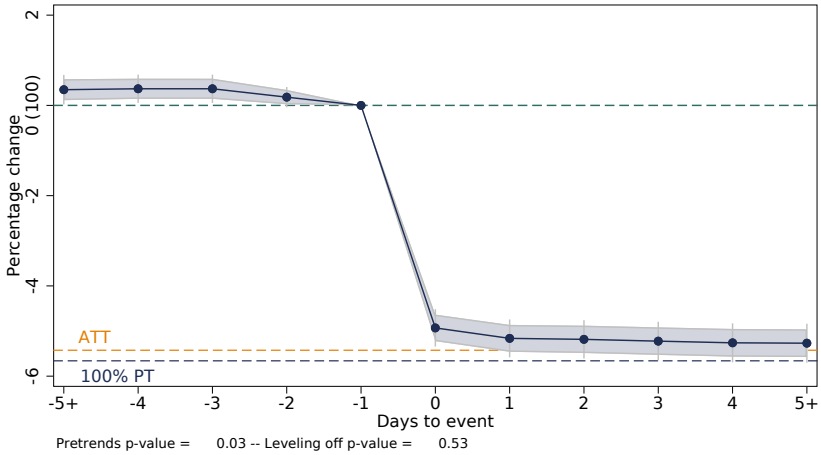
Pass-through calculation

Act I: The Announcement



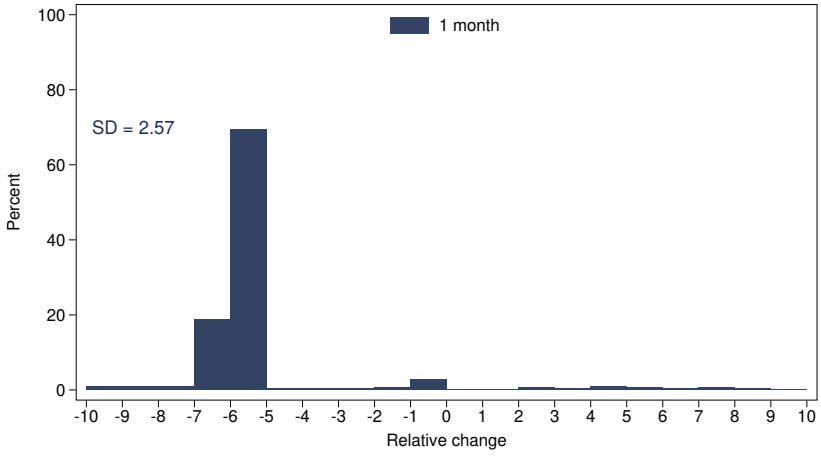
Difference between pre- and post-treatment averages: 0.88%

Act II: The Implementation



Difference between pre- and post-treatment averages: -5.42% $\implies$ pass-through $\approx$ 96%

Pass-through Persistency



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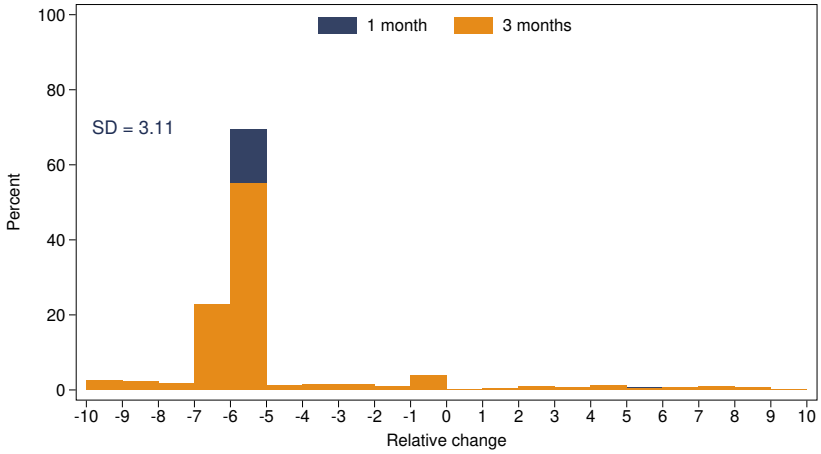

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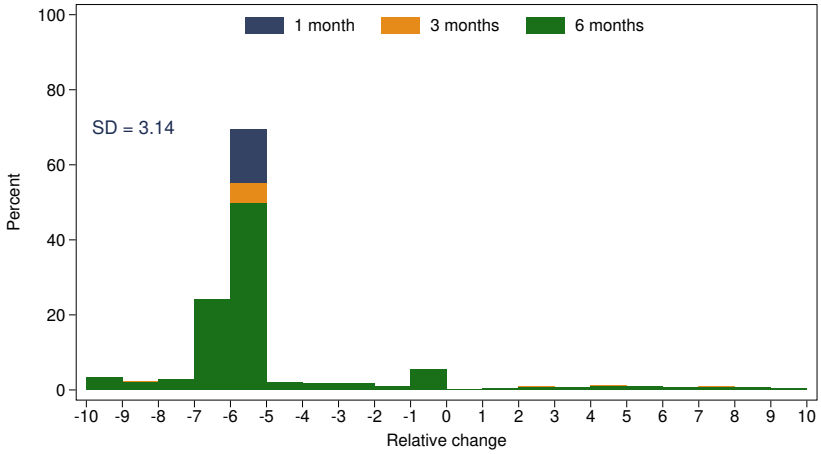

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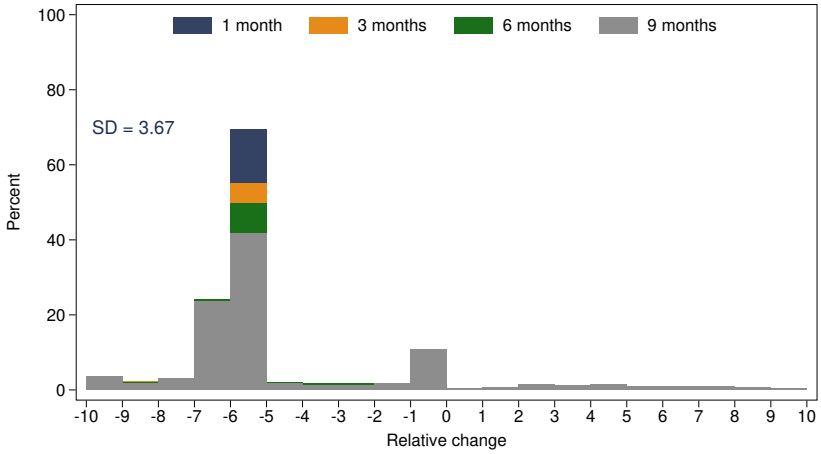
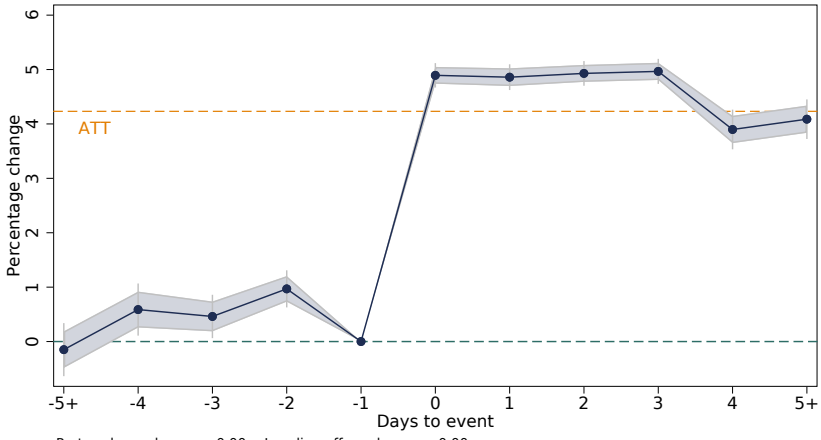
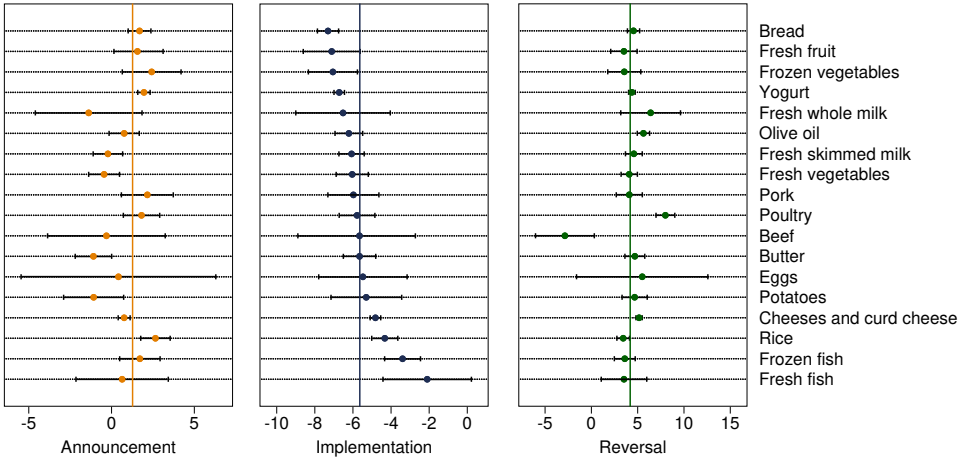


Act III: The Reversal



Difference between pre- and post-treatment averages: 4.23%

Heterogeneous effects



Difference between pre- and post-treatment averages for each COICOP 5 with treated products

Robustness exercises

- **Synthetic Control Difference-in-Difference** estimator à la Arkhangelsky et al. (2021)
- **Alternative identification strategy**: Spain as a control group
- **Missing information**: different data imputation and constant basket
- **Outcome variable**: price per unit and regular price
- **Alternative control groups**: all products, only food and drink, only non-food

SC DiD | PT vs. ES | Other Rob. results | Vegetable oils

Taking stock

- A temporary VAT cut in 6% policy in three acts:
  - **Announcement:** relative prices of treated items increased 0.88% vs. non-treated ones
  - **Implementation:** relative prices fell 5.42% implying a pass-through of 96%
    - Persistent result: only by the end of the policy, the gap treated/control shrinks
  - **Reversal:** relative prices increased 4.23%

- **Heterogeneity** along different food categories: no apparent pattern

- **Contribution to headline inflation**:
  - Products with VAT 0 represent 12.9 – 13.3% of the consumer basket (CPI weights)
  - The direct effect of the VAT cut on monthly headline inflation is then 0.69 – 0.72 pp

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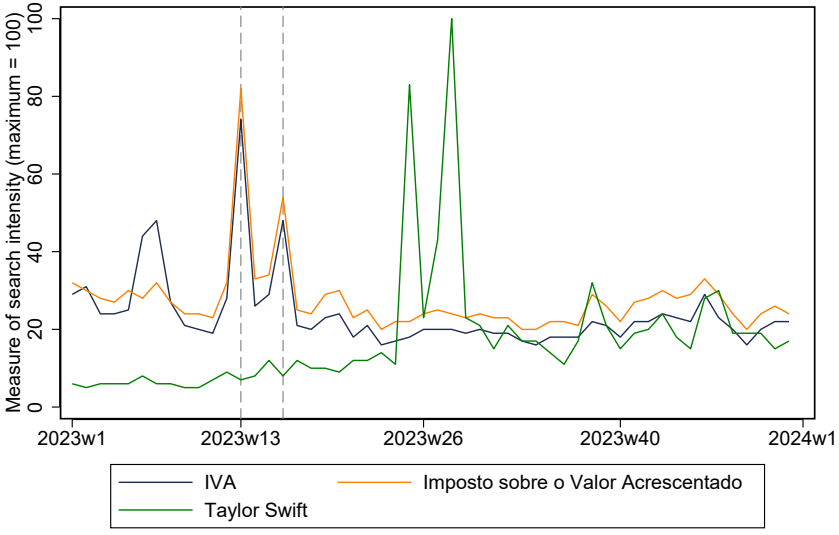
- Higher pass-through than previous literature $\Longrightarrow$ **possible mechanisms**:
  1. Strong media and popular scrutiny
  2. Agreements with economic agents
  3. Increased attention during high inflation periods (Binder and Kamdar, 2022; Pfäuti, 2023)
  4. Dynamic interaction between government and supermarkets
  5. Producer prices dynamics

Media coverage

Popular attention



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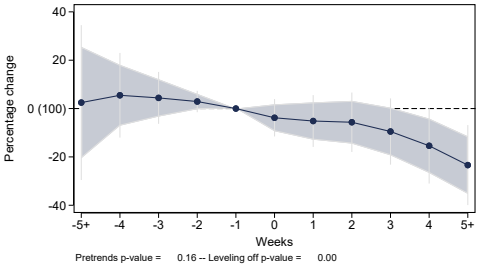
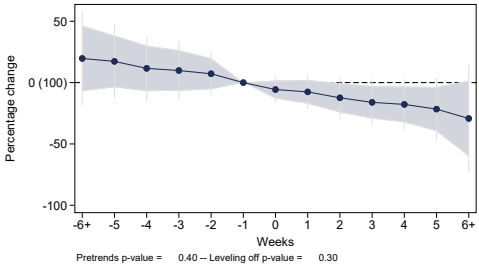
Producer prices dynamics

(a) Announcement



Pretrends p-value = 0.16 -- Leveling off p-value = 0.00

(b) Implementation



Pretrends p-value = 0.40 -- Leveling off p-value = 0.30

Conclusion

Final remarks

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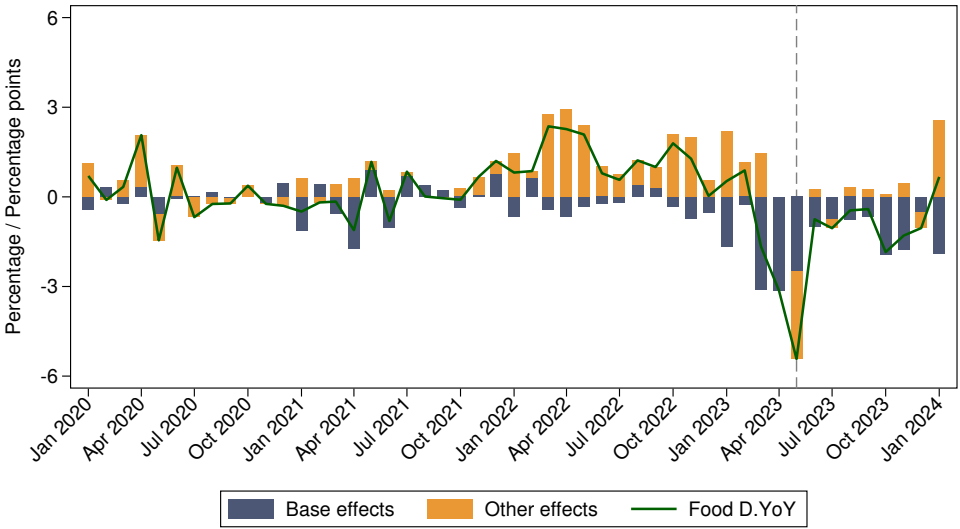
Food inflation in Portugal

Back



Data: Consumer Prices

Back

Step	Description	Products	Observations
0	Web scraped products	60,445	44,799,544
1	Keep observations after Dec-22	60,445	24,272,188
2	Drop treated products that raised doubts	48,474	19,399,736
3	Drop treated products with a decrease of 23%	48,433	19,382,934
4	Drop outlier observations	48,433	18,499,204
5	Drop non-food product	27,780	10,589,024
	Treated products	**3,225 (12%)**	**1,231,197 (12%)**

- We test 3 methods to deal with **missing values** in the dataset:
  1. Carryforward for a max of 7 days if P[t-1] = P[t+x] until product exits
  2. Carryforward with P[t-1] until product exits

Pass-through calculation

Back

We estimate the pass-through for each moment t as:

$$\gamma_t = \frac{\frac{\sum_{m=0}^{M} \beta_{mt}}{M+1} - \frac{\sum_{m=-G}^{-1} \beta_{mt}}{G}}{\frac{\Delta \tau_t}{(1+\tau_t)}}$$

with $M = 7$ and $G = 7$ and τ_t the VAT rate in place before (after) the cut

Note that the VAT is decreasing from 6% to 0% in the implementation, which corresponds to

$$\Delta \tau_i / (1 + \tau_i) \times 100 = -6/106 \times 100 = -5.66$$

Synthetic Control DiD estimator

Back

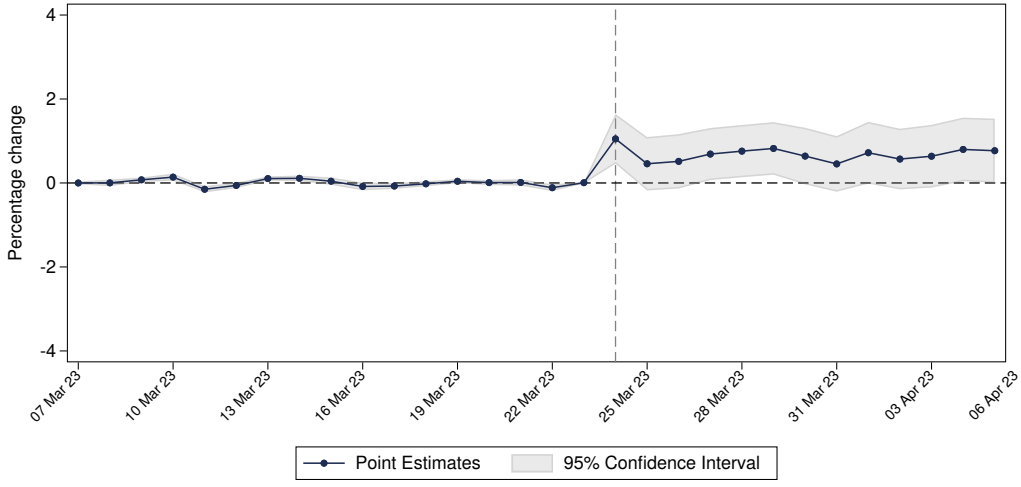
- We use the **Synthetic Control DiD** as an alternative to estimate causal effects of VAT cut
  - the method gives more weight to products and periods that have a similar price behavior to the treated units in the pre-treatment window
- We use the estimator proposed by Arkhangelsky et al. (2021) where the standard errors are computed using a block bootstrap:

$$\left(\hat{\tau}^{\text{sdid}}, \hat{\mu}, \hat{\alpha}, \hat{\gamma}\right) = \arg\min_{\tau,\mu,\alpha,\gamma} \left\{ \sum_{i=1}^{N} \sum_{t=1}^{T} \left(P_{it} - \mu - \alpha_i - \gamma_t - Z_{it}\tau\right)^2 \hat{\omega}_i^{\text{sdid}} \hat{\lambda}_t^{\text{sdid}} \right\}$$

- τ is our coefficient of interest that measures the average effect on the treatment (Z_{it})

Synthetic Control DiD: Announcement

Back



Synthetic Control DiD: Implementation

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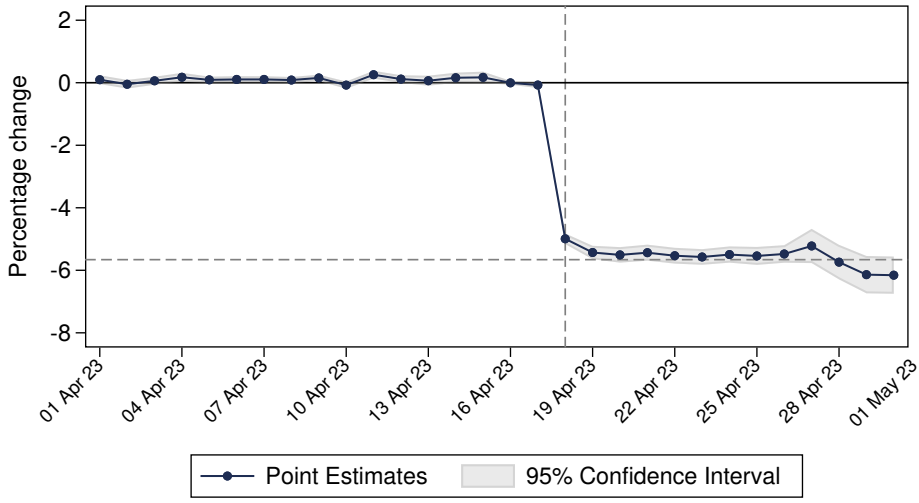

Synthetic Control DiD: unit-weights (top 20)

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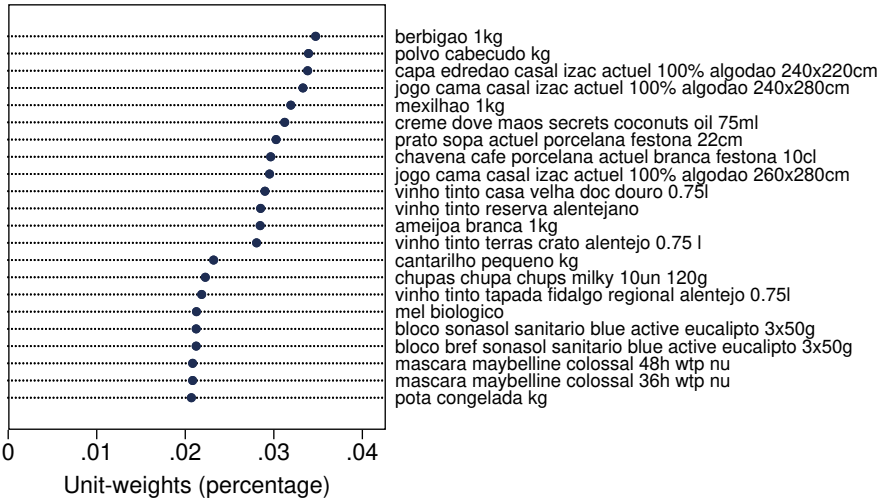

Synthetic Control DiD: Reversal

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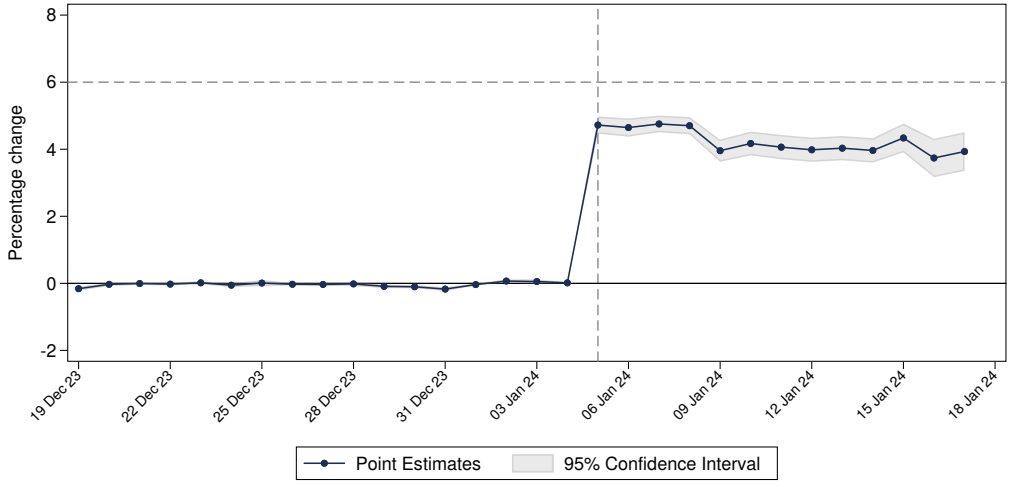

Empirical approach

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- What is the **effect of the policy on food inflation**?
  - Compare Portugal with Spain
- **Data:** CPI series at the COICOP-5 level
  - Future work: go more granular and use supermarket daily data
- We estimate the VAT cut on food inflation using a **DiD setting** with Spain as a control
  - Use observations after Jan 2023, after the Spanish VAT cut on a set of food items

Price evolution of food basket in Portugal and Spain

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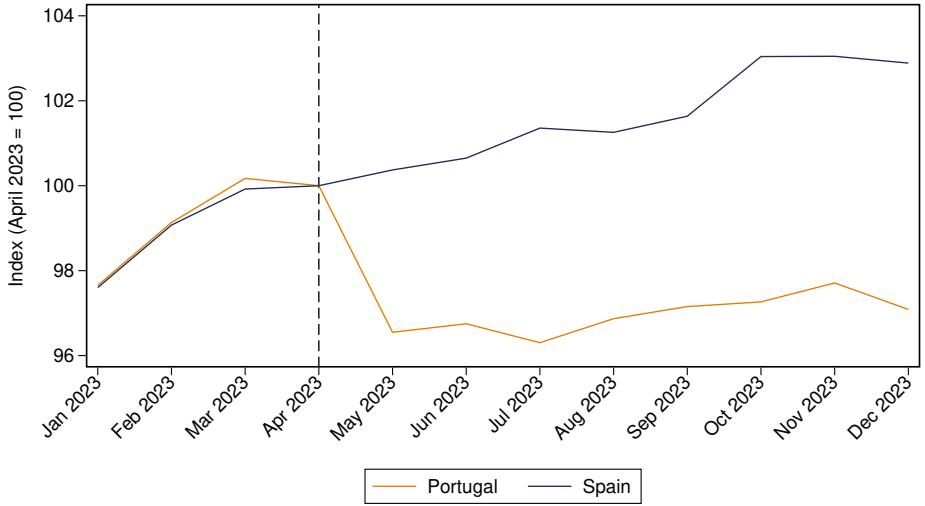

Difference-in-difference estimation

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$$P_{i,t} = \mu + \alpha C_i + \gamma T_t + \tau C_i T_t + \varepsilon_{it}$$

[C_i: Country dummy (1 if PT); T_t: Treatment time dummy (1 if after April 2023)]

	(1)	(2)	(3)
C_i	-1.88***		1.77***
	(0.000)		(0.000)
T_t		0.45	3.21***
		(2.74)	(0.000)
$C_i \times T_t$			**-5.48*** **
			(0.000)
$N \times T$	1 188	1 188	1 188

- Treated food items are **12.95 – 13.3% of the consumer basket** (CPI weights 2022/2023)
- The direct effect of the VAT cut on monthly headline inflation is then **0.72 – 0.74 pp**

Robustness results

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Different between pre- and post-treatment averages:

Test	Description	Announcement	Implementation	Reversal
2	Data Imputation (1)	1.19	-5.41	3.53
3	Data Imputation (2)	0.97	-5.76	3.39
4	Constant Basket	1.27	-5.87	5.15
5	Price per unit	0.97	-5.37	4.22
6	Regular Price	0.27	-4.68	4.04
6	Including all products	1.20	-5.86	4.29
7	Including all food COICOP 5	0.94	-5.38	3.68
8	Including only non-food products	1.43	-6.29	4.69
	Average pass-through		**99%**	**68%**

Act III: The Reversal (Vegetable Oils)

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