

Cross-country price and inflation dispersion: Retail network or national border?

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National borders typically with barriers ... and frictions



Open borders within Europe



This paper: national border between Austria and Bavaria (Germany)

Is this an (economic) barrier or a just a line on the map?



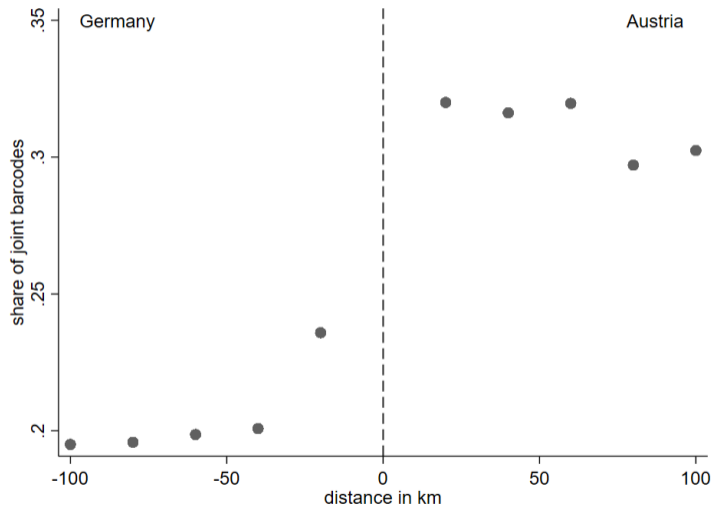
(Why) do prices and inflation differ within the European Union?

- 1 Are prices within a *homogenous cross-border* region similar, i.e. dispersed as within a country?
- 2 What causes (*ceteris paribus*) price and inflation differences between EU member countries?
- 3 Does this translate into inflation differences?

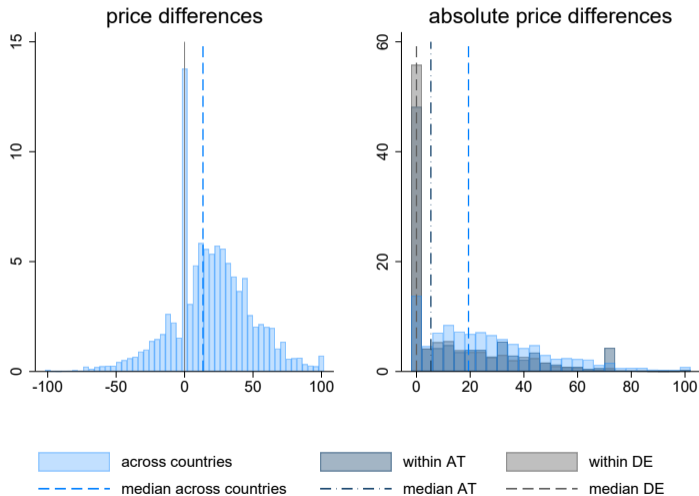
Relevance of a national border for consumer prices in the otherwise very homogenous and highly integrated border region.

- “Everyday” purchases scanned by households, 2008–2018
- Only products (barcodes) available in both countries ($\sim 21,000$ matched barcodes = $1/10$ of unique barcodes, $1/5$ of transactions)
- Controlling for retailer: 5+1 retailers operating in both countries, 2 retailers operating only in either country.
- Transactions within approx. 50 km band along AT-DE border (i.e. short distances)
- Dividing border strip of each country into 19 similar-sized, compact regions (19 AT, 19 DE) [robustness 3 AT, 3 DE]

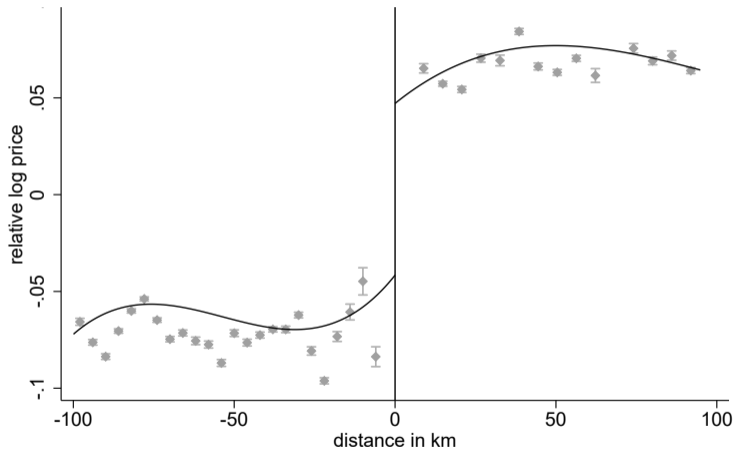
Barcodes common across the border



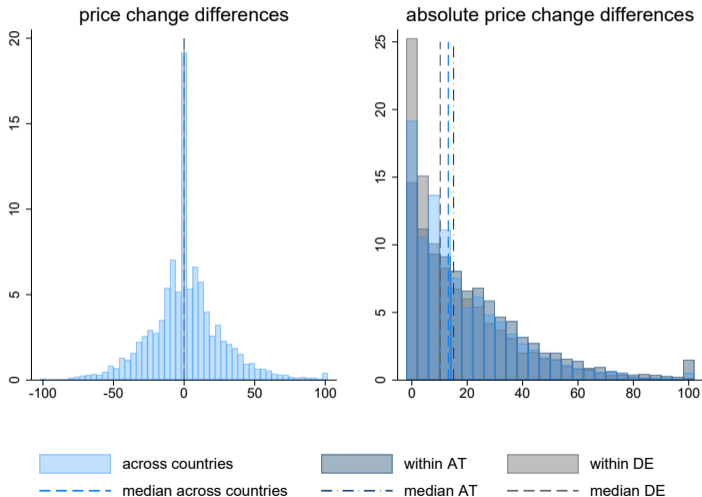
Price differences in either direction, but asymmetric distribution



Price gaps at the border (identical barcodes)



Price change differences are symmetrically distributed



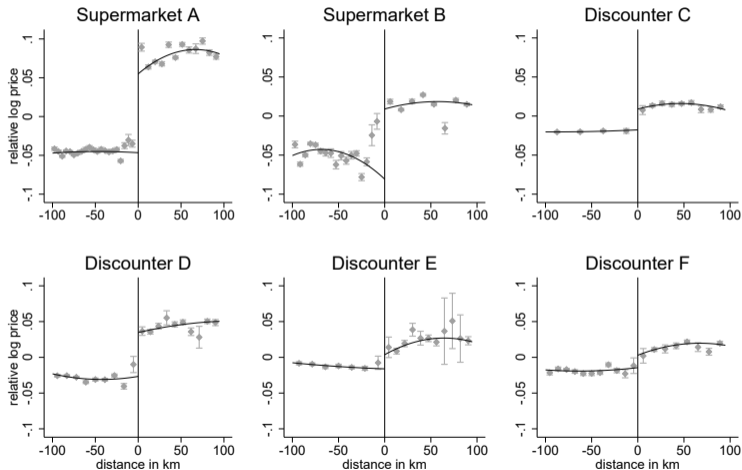
Why does a green border show a “border effect” ?

Mode of cross-country price differences at zero, but variation across the border in both directions.

- Similar consumption preferences (0.75 correlation of COICOP5 expenditure)
- No regulation or extra shipping cost when crossing national border
- International retailers, similar local costs
- Products purchased differ across the border
- Information costs impede arbitrage
- Obfuscation: Random price changes, not synchronized. Product relabeling?

Small gains from blindly shopping across the border, large gains from product-by-product arbitrage (“cherry-picking”).

Price gaps at the border by retailer (same barcodes)



The border *within* retailers: national pricing

Retailer	within Germany	within Austria (additional)	Cross-ctry (additional)	Test cross-ctry = max. within (p -value)
Supermarket A	9.9***	3.3***	16.4***	0.00
Supermarket B	11.6***	4.7***	16.5***	0.00
Discounter C	0.5	1.0	18.1***	0.00
Discounter D	6.2***	1.9**	15.1***	0.00
Discounter E	3.0***	3.2**	8.7***	0.00
Discounter F	7.5***	2.8**	13.0***	0.00

(dep. var.: absolute, within-retailer log price difference by region pair, bi-monthly frequency)

The border *within* retailers: less for price changes

Retailer	within Germany	within Austria (additional)	Cross-ctry (additional)	Test cross-ctry = max. within (p -value)
Supermarket A	11.3***	5.2*	5.6**	0.87
Supermarket B	18.9***	1.0	2.1	0.52
Discounter C	1.0	0.5	6.1**	0.04
Discounter D	11.3***	-1.2	3.5*	0.05
Discounter E	6.2**	-3.8	-0.7	0.20
Discounter F	10.5***	1.2	5.1**	0.15

(dep. var.: absolute, within-retailer y-o-y price change difference, bi-monthly frequency)

Conclusion

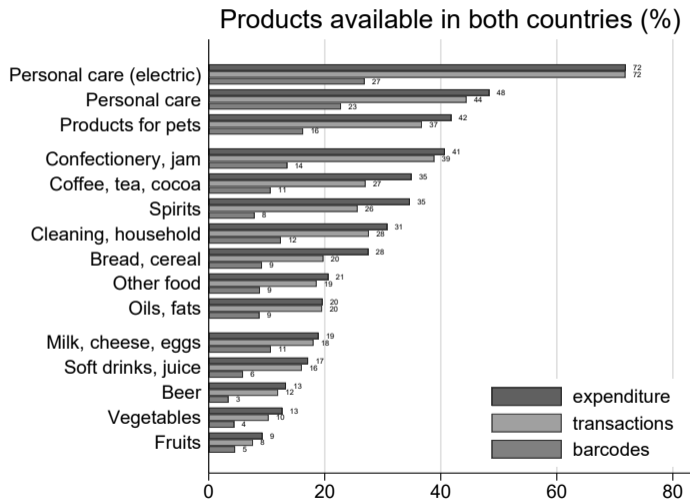
- 1 Large cross-border price differences despite homogenous and integrated region. (Absolute) LOP fails.
- 2 Retailers have market power. Significant *within*-retailer border effect (15%).
- 3 Retailers actively segment markets along national borders. History-dependence of (pricing-to-)market regions.
- 4 Inflation is less dispersed across the borders than prices: Both countries share important inflation drivers (shocks).

Appendix

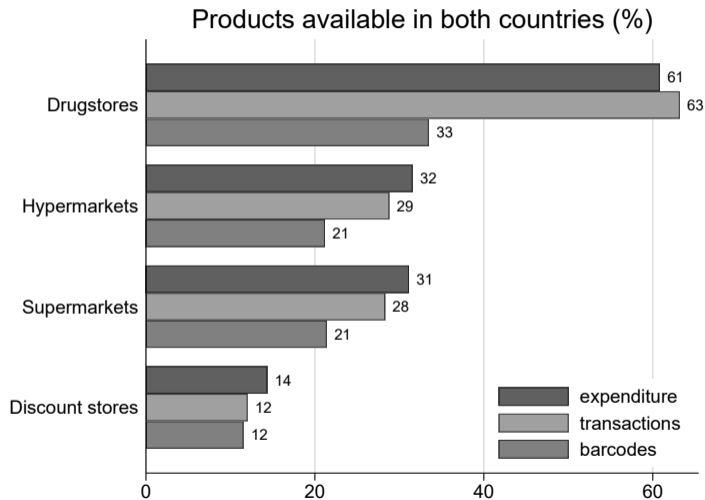
Harmonizing sample period, product categories (and COICOP classification), and retailers between both countries

- GfK household panel
- 2008-2018, average unit price per barcode \times month \times region \times retailer
- Product categories (COICOPs): 1.1 (food excl. fresh meat and fresh fish), 1.2 and 2.1 (beverages excl. wine), 5.6 (household maintenance), 9.3 (pet food, gardening), 12.1 (personal care)
- International retailers and sourcing providers, plus largest retailer in either country

Barcodes sold in border region of both countries by COICOP



Common barcodes in cross-border regions by store type



Comparison of cost and demand factors

	Property prices (€/m ²)	Corporate taxes (%)	GDP per cap. ('000€)	Med. HH income ('000€)	Population ('000)
<i>Austrian border regions</i>					
Northern Upper Austria	151	25.0	43	33	795
Salzburg & S. Upper Austria	255	25.0	41	34	847
(Part of) Tyrol	514	25.0	41	34	573
<i>German border regions</i>					
Lower Bavaria	76	28.1	32	30	494
Eastern Upper Bavaria	231	27.7	34	32	519
Western Upper Bavaria	538	27.8	31	34	568

Estimating a border effect in preferences and products

- 703 region pairs j
- Border dummy D_j^B , AT dummy D_j^{AT}
- Correlation of expenditure shares at the COICOP4- / COICOP5-level (annually)
- Count of common barcodes for each region pair (annually)

Estimation equation

$$Y_{jt} = \underbrace{\beta_0 + \beta_1 D_j^{AT} + \beta_3 D_j^B}_{\text{border/country effects}} + \underbrace{\gamma_1 t + \gamma_2 t \times D_j^{AT} + \gamma_3 t \times D_j^B}_{\text{border/country trends}} + \epsilon_{jt}$$

Estimating a border effect in prices

- (Absolute) price difference
- (Absolute) price change difference for each region pair (weekly, monthly, bi-monthly)

Estimation equation

$$Y_{irjt} = \underbrace{\beta_0 + \beta_1 D_j^{AT} + \beta_3 D_j^B}_{\text{border/country effects}} + \underbrace{\gamma_1 t + \gamma_2 t \times D_j^{AT} + \gamma_3 t \times D_j^B}_{\text{border/country trends}} + \underbrace{\theta_1 R_r}_{\text{retailer controls}} + \underbrace{\dots}_{\text{other controls}} + \epsilon_{irjt}$$

Border effect in prices and price changes

	(1) Basket correlation (COICOP4)	(2) Basket correlation (COICOP5)	(3) Common barcode share	(4) Abs. price difference	(5) Abs. price change difference
Constant	0.89*** (0.004)	0.88*** (0.003)	0.16*** (0.001)	8.11*** (0.398)	11.21*** (1.139)
Austria	0.05*** (0.005)	0.04*** (0.004)	0.08*** (0.001)	2.91*** (0.518)	2.30 (2.022)
Border	-0.03*** (0.004)	-0.10*** (0.004)	-0.14*** (0.001)	15.31*** (0.695)	4.64*** (1.410)
Common trend	0.004*** (0.001)	0.004*** (0.001)	0.001*** (<0.001)	0.00 (0.004)	0.01 (0.012)
Austria trend	-0.003*** (0.001)	-0.003*** (0.001)	-0.005*** (<0.001)	0.01 (0.006)	0.04 (0.026)
Border trend	-0.003*** (0.001)	-0.006*** (0.001)	-0.001*** (<0.001)	0.01 (0.008)	-0.01 (0.017)
Frequency	year	year	year	bi-month	bi-month
Observations	7,733	7,733	7,733	333,733	44,294
Adj. R^2	0.14	0.49	0.93	0.12	0.07

Literature on international price differences

On a global scale, price differences between countries are not surprising

- Deviations from law of one price (LOP)
- Trade restrictions, tariffs, transportation costs, and differences in taxes, currencies, income, preferences, ...
- Engel and Rogers (1996) using CPI data: cross-country $>$ within-country dispersion (or not: Gorodnichenko and Tesar (2009))

Mixed evidence from directly comparing Canadian and US supermarket prices

- Single retail chain: cross-country $>$ within-country (Gopinath et al., 2011; Burstein and Jaimovich, 2012)
- Multiple retail chains: cross-country \sim within-country (Broda and Weinstein, 2008)

Literature on international price differences in Europe

Evidence for sizeable “border effect” within euro area:

- Price comparison of set of products in 13 countries (Rumler and Reiff, 2014)
- Household scanner data for 3 countries (BE, DE, NL) until 2008 (Beck et al., 2020)
- Big-ticket items: TVs (Imbs et al., 2010) and cars (Dvir and Strasser, 2018)
- But: LOP holds within intl. retailers for products available online (Cavallo et al., 2014)

Austrian Chamber of Labour (2019) finds large AT-DE price differences (34 products, no explanation)

References I

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