Tariff Passthrough at the Border and at the Store: Evidence from US Trade Policy

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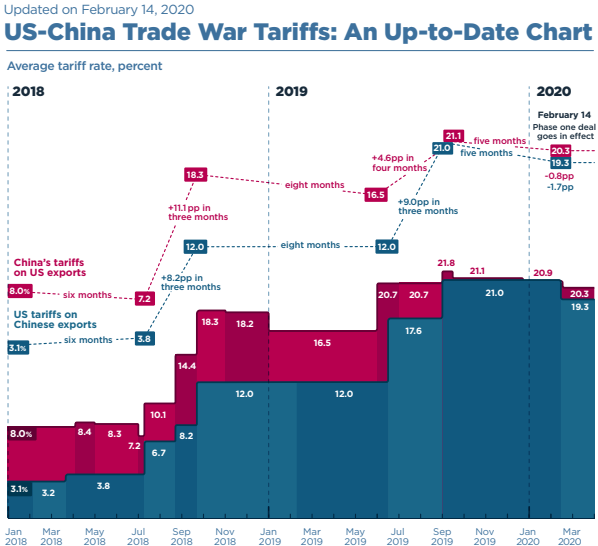
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The US Trade War



Source: Bown, Chad P. 2020. "US-China Trade War Tariffs: An Up-to-Date Chart." https://www.piie.com/research/piie-charts/us-china-trade-war-tariffs-date-chart.

This Paper

Estimate tariff effect on prices and compare with exchange rate passthrough.

At the Border

- Product-level import and export prices
- Imports from China
- Retaliatory tariffs on US exports

At the Store

- Product-level data from largest US retailers with country of origin information for two specific retailers
- Imports from China

Jointly examining border and retail prices allows us to determine the incidence of the tariffs.

This paper is largely silent on quantities and welfare. See Amiti, Redding, and Weinstein (2019) and Fajgelbaum et al. (2020).

Main Findings

US bearing the burden

- Chinese import tariffs passed through fully to US importers
  - Stark contrast to modest degree of exchange rate passthrough (also documented in Gopinath, Itskhoki, and Rigobon (2010) and Gopinath et al. (2010))
  - Contrary to some claims, RMB depreciation did little to offset the impact of tariffs
  - Has implications for analysis of fiscal devaluations and border adjustment taxes
- Retaliatory tariffs on US exports saw significantly lower passthrough
- Difference in import vs export tariff passthrough explained by composition of goods and lower passthrough rates for undifferentiated goods

Uneven passthrough to consumers

- Differences across goods, but overall passthrough is low
- Using other margins of adjustment: avoiding tariffs by front-running and then diverting trade to other countries

Micro Data Sources

Trade prices: BLS International Price Program (Gopinath and Rigobon (2008))

- Transactional prices for imports and exports at the good level; used in construction of import and export price indices
- Sample used: Monthly data over 2005–2020 period
- Avoid compositional effects

Retail prices: The Billion Prices Project (Cavallo and Rigobon (2016) and Cavallo (2017))

- Posted prices from websites of over 30 large multi-channel retailers in the US
- Sample used: Daily data over 2017–2019 period
- Also have country of origin and HS code classifications for 2 individual retailers

At the Border: Imports from China

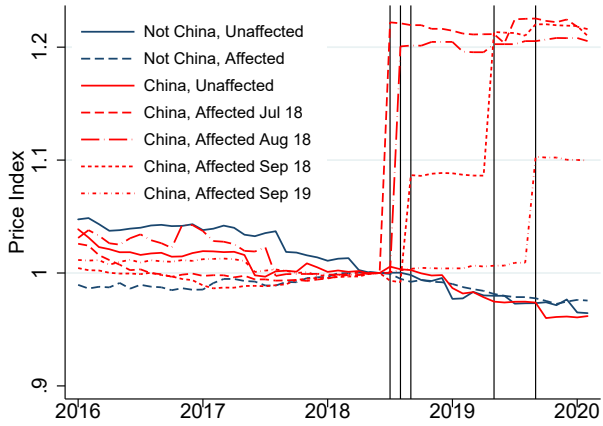


Figure 1(a): Import Price Indices (including tariffs)

Prices paid by US importers jumped up by about the full amount of the tariffs and did not meaningfully decline afterwards. Steel

At the Border: Retaliatory Tariffs on Exports

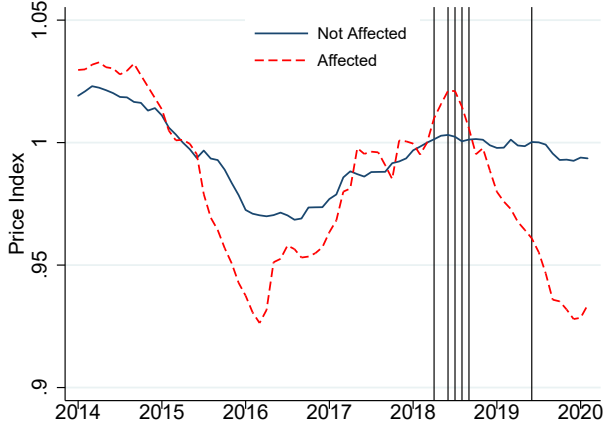


Figure 1(b): Export Price Indices (excluding tariffs)

In contrast, prices charged by US exporters fell by nearly 9% soon after the introduction of tariffs.

Estimating Passthrough

Based on a standard model with variable markups, we estimate 1-year import passthrough rates with:

$$\begin{aligned}\Delta \ln\left(P^{\mathcal{I}}_{i,j,k,t}\right) &= \delta^{\mathcal{I}}_{k} + \phi^{\mathcal{I},\Omega}_{\text{CN}} + \phi^{\mathcal{I},-\Omega}_{\text{CN}} + \sum_{l=0}^{11} \gamma^{\mathcal{I}}_{l} \Delta\tau_{i,t-l} \\ &+ \sum_{l=0}^{11} \beta^{\mathcal{I},S}_{l} \Delta \ln\left(S_{j,t-l}\right) + \sum_{l=0}^{11} \beta^{\mathcal{I},X}_{l} \Delta \ln\left(X_{j,t-l}\right) + \epsilon_{i,j,k,t}\end{aligned}$$

- $P^{\mathcal{I}}_{i,j,k,t}$: Price of item i in sector k from country j at time t
- $\delta^{\mathcal{I}}_{k}$: Average sectoral inflation (Sectors: BLS "primary stratum" or 3-digit COICOP)
- $\{\phi^{\mathcal{I},\Omega}_{\text{CN}}, \phi^{\mathcal{I},-\Omega}_{\text{CN}}\}$: Average differential inflation in affected and unaffected Chinese imports (only in imports specification)
- $\Delta\tau_{k,t}$: Log newly imposed additional tariff rate (defined at the HS6 level)
- $S_{j,t}$ Value of country j currency against the dollar
- $X_{j,t}$ Country j aggregate price index

At the Border: Passthrough Rates

Border Price Regression Analysis Using Monthly Data

		US Imports from China			US Exports		
		(1)	(2)	(3)	(4)	(5)	(6)
Tariffs 1 yr.	$\left(\sum_{l=0}^{11} \gamma_l\right)$	-0.057	0.005				
		(0.023)	(0.025)				
Differentiated	$\left(\sum_{l=0}^{11} \gamma_l\right)$						
Undifferentiated	$\left(\sum_{l=0}^{11} \gamma_l\right)$						
ERPT 1 yr.	$\left(\sum_{l=0}^{11} \beta_l^S\right)$		0.218				
			(0.023)				
PPI PT 1 yr.	$\left(\sum_{l=0}^{11} \beta_l^X\right)$		0.047				
			(0.033)				
Adj. R^2		0.002	0.003				
Obs.		835,722	835,722				

- Prices of affected imports dropped slightly relative to trend, but this seems to be more strongly associated with the RMB's depreciation rather than the tariffs.
- Exchange rate pass-through is low, as documented in previous literature.

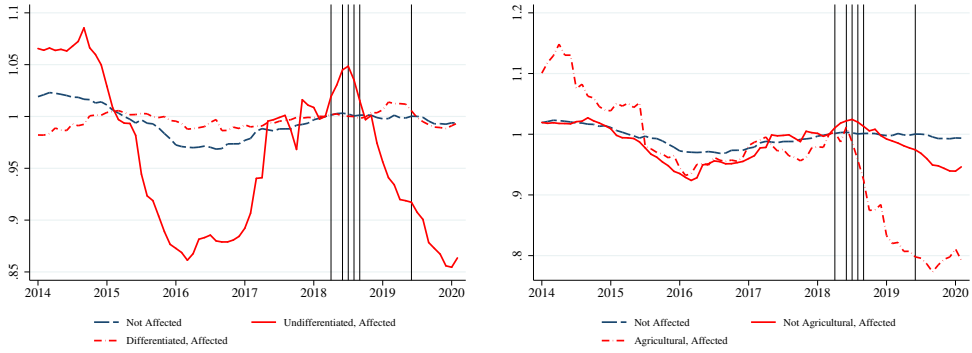
At the Border: Passthrough Rates

Border Price Regression Analysis Using Monthly Data

		US Imports from China			US Exports		
		(1)	(2)	(3)	(4)	(5)	(6)
Tariffs 1 yr.	$(\sum_{l=0}^{11} \gamma_l)$	-0.057	0.005		-0.329	-0.259	
		(0.023)	(0.025)		(0.089)	(0.089)	
Differentiated	$(\sum_{l=0}^{11} \gamma_l)$						
Undifferentiated	$(\sum_{l=0}^{11} \gamma_l)$						
ERPT 1 yr.	$(\sum_{l=0}^{11} \beta_l^S)$		0.218			0.195	
			(0.023)			(0.018)	
PPI PT 1 yr.	$(\sum_{l=0}^{11} \beta_l^X)$		0.047			0.250	
			(0.033)			(0.038)	
Adj. R^2		0.002	0.003		0.001	0.002	
Obs.		835,722	835,722		446,527	446,527	

- Tariff passthrough to pre-tariff export prices is about 30% (i.e., 70% to foreign importers).
- Robust to using only data on (non-zero) price changes. Details

At the Border: Passthrough Rates



(a) Differentiated and Non-Differentiated Goods

(b) Agricultural and Non-Agricultural Goods

Figure A3: Decomposition of US Export Price Indices

- Price declines for affected exports are concentrated in undifferentiated goods.

At the Border: Passthrough Rates

Border Price Regression Analysis Using Monthly Data

		US Imports from China			US Exports		
		(1)	(2)	(3)	(4)	(5)	(6)
Tariffs 1 yr.	$(\sum_{l=0}^{11} \gamma_l)$	-0.057	0.005		-0.329	-0.259	
		(0.023)	(0.025)		(0.089)	(0.089)	
Differentiated	$(\sum_{l=0}^{11} \gamma_l)$			-0.035			-0.087
				(0.034)			(0.096)
Undifferentiated	$(\sum_{l=0}^{11} \gamma_l)$			-0.272			-0.383
				(0.103)			(0.151)
ERPT 1 yr.	$(\sum_{l=0}^{11} \beta_l^S)$		0.218	0.288		0.195	0.213
			(0.023)	(0.026)		(0.018)	(0.023)
PPI PT 1 yr.	$(\sum_{l=0}^{11} \beta_l^X)$		0.047	0.091		0.250	0.274
			(0.033)	(0.037)		(0.038)	(0.045)
Adj. R^2		0.002	0.003	0.004	0.001	0.002	0.003
Obs.		835,722	835,722	583,391	446,527	446,527	295,179

- Substitutability plays a role in explaining the different export and import tariff passthrough rates.
- Prices of undifferentiated imports and exports drop by over 27% of the tariff rate.
- However, these goods make up only 10% of affected imports and over half of affected exports.

Discussion of Border Price Results

Back-of-the-envelope calculations:

- A 20% import tariff is estimated to result in a 18.9% increase in US importers' prices paid.
  - Consistent with Amiti, Redding, and Weinstein (2019) and Fajgelbaum et al. (2020).
- The 10% depreciation in the RMB since June 2018 lowered import prices by 2.2%, not nearly making up for the 10–25% in additional tariffs.
- In contrast, a 20% export tariff resulted in US exporters earning a 6.6% lower price on their exports, on average.
  - Prices of undifferentiated exports fell by much more in response to the tariff.

Discussion of Border Price Results

Broader implications:

- Evidence against assumption of symmetric tariff and exchange rate passthrough rates often used in analyses of border adjustment taxes or fiscal devaluation. (For example, in Farhi, Gopinath, and Itskhoki (2014) and Barbiero et al. (2019).)
- Higher passthrough for undifferentiated goods puts US at a disadvantage.
  - Undifferentiated goods make up 25% of total US exports to China and only 2% of total US imports from China.

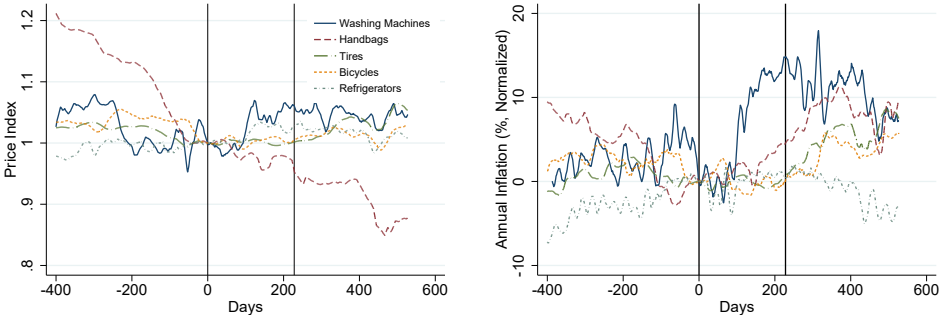
At the Store: Micro Retail Prices

From border price analysis: Assuming a 50% imported goods cost share, full retail passthrough would entail a 9.4% increase in prices.

Two exercises:

- Case studies of specific goods using data from largest US retailers that are:
  - Easily identified in the retail price data and tariff harmonized codes
  - Come mostly from China
- Regression analysis using data from two retailers that also contains country-of-origin information

At the Store: Heterogeneous Retail Response



(a) Price Indices

(b) Annual Inflation

Figure 2: Retail Price Impact for Selected Consumer Goods

- As studied in Flaaen, Hortaçsu, and Tintelnot (2019) and oft-cited in the media, there appears to be a high degree of passthrough of washing machine tariffs to retail prices. Details
- Impacts on handbags, bicycles, and tires were delayed.
- But refrigerator prices have had no tariff-related increase.

At the Store: Small Overall Response

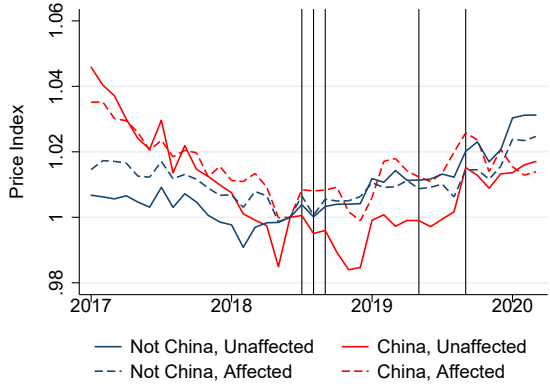


Figure 3(a): Retail Price Index (Based on All Products from Two US Retailers)

- For two retailers with country-of-origin, we conduct an analysis like the one for border prices.
- All products have started increasing in price since the tariffs were introduced, but there is no difference in the patterns for affected and unaffected goods.

At the Store: Passthrough Rates

$$\Delta \ln \left(P^{\mathcal{R}}_{i,j,k,t} \right) = \delta^{\mathcal{R}}_{k} + \phi^{\mathcal{R},\Omega}_{\text{CN}} + \phi^{\mathcal{R},-\Omega}_{\text{CN}} + \sum_{l=0}^{11} \gamma^{\mathcal{R}}_{l} \Delta \tau_{i,t-l} + \epsilon_{i,j,k,t}$$

Retail Price Regression Analysis Using Monthly Data

		All Goods	Manual HS Classification	Direct Imports
Tariff 1 yr.	$\left(\sum_{l=0}^{11} \gamma_{\mathcal{R},l}\right)$	0.035	0.075	0.158
		(0.020)	(0.025)	(0.091)
Adj. R^2		0.001	0.002	0.005
Obs.		1,118,870	356,151	72,762

- A 20% import tariff is estimated to only increase retail prices by 0.7%.
- For a subsample with less HS classification bias, this value increases to 1.5%.
- For directly imported goods (for which the retailer provides HS codes), this value increases to 3.2%, indicating that firms are still absorbing a large share of the import price increase.

At the Store: Little Evidence of "Spreading Price Increases"

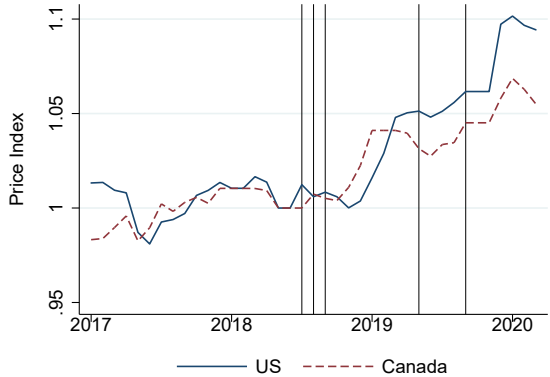
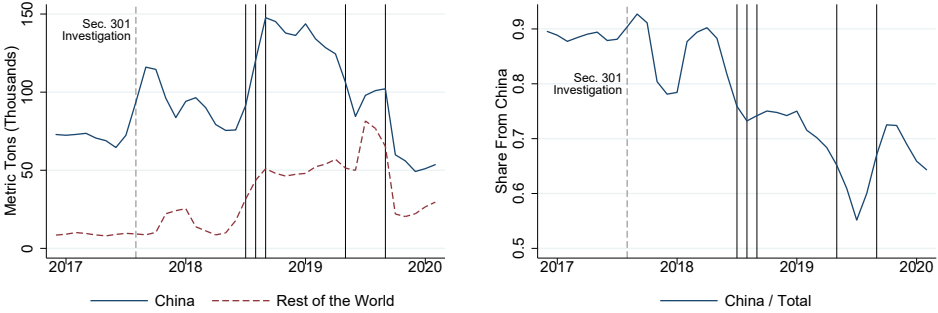


Figure 3(b): Retail Price Indices for Identical Products in US and Canada

- For a single retailer, we compare prices of identical goods sold in the US and Canada.
- Similar pattern suggests limited tariff passthrough to consumer prices via widespread price hikes that also include unaffected goods.

At the Store: Front Running and Trade Diversion



(a) Tons Imported, Thousands

(b) Share of Tons Imported from China

Figure 4: Front-Running and Trade Diversion by Two Major US Retailers

- Data from bills of lading shows that these two retailers increased the fraction of their imports from China in the period just before the tariffs.
- Import sourcing was diverted away from China after tariffs were introduced.

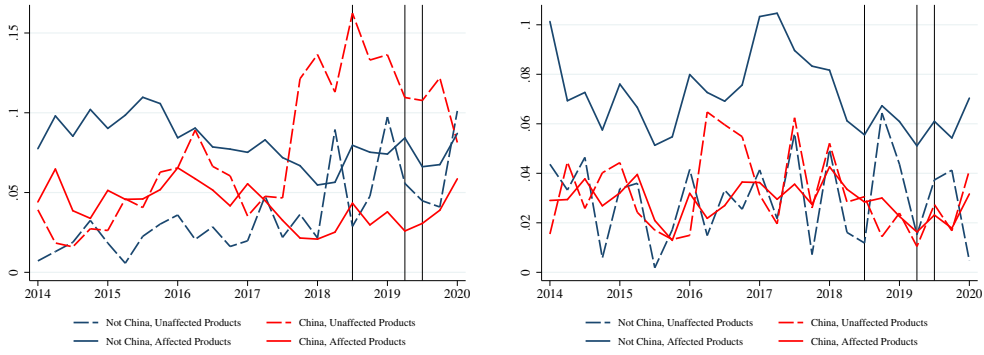
Closing Remarks

- Our results show that within the first year of tariff introduction, price responses have put the cost of the trade war on US firms
  - Import prices have seen at most a small decline and the low passthrough of exchange rates means that the RMB's depreciation didn't offset these increases.
  - On the contrary, US exporters had to lower their prices as retaliatory tariffs were concentrated in undifferentiated goods.
  - Retailers have yet to pass increased costs through to consumers.

- As the tariffs are perceived to be more permanent and as firms' profits deteriorate:
  - Pressure on foreign exporters to reduce prices will increase as more firms shift supply chains.
  - Retail passthrough should increase.

Appendix

At the Border: Price Change Frequency



(a) Price Decreases

(b) Price Increases

Figure A1: Frequency of Monthly Price Changes (Quarterly Averages)

Price stickiness did not change around introduction of tariffs.

At the Border: Steel Tariffs

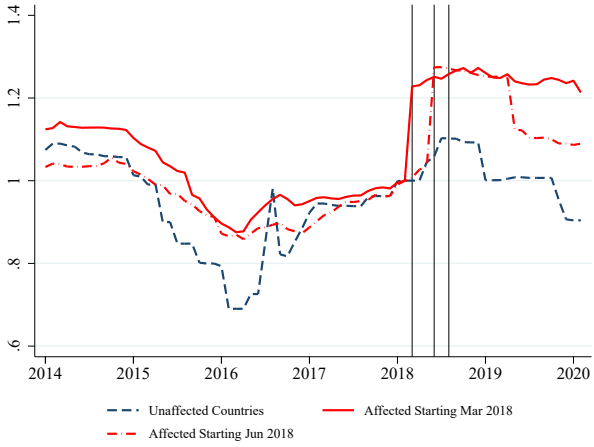


Figure A2: Steel Import Price Indices, by Tariff Wave

Ex-tariff prices of steel imports similarly did not fall with tariffs introduction.

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At the Border: Conditioning on Price Changes

$$\frac{1}{t_1-t_0}\ln\left(\frac{P^{\mathcal{I}}_{i,j,k,t_1}}{P^{\mathcal{I}}_{i,j,k,t_0}}\right) = \delta^{\mathcal{I}}_{k} + \phi^{\mathcal{I},\Omega}_{\text{CN}} + \phi^{\mathcal{I},-\Omega}_{\text{CN}} + \gamma^{\mathcal{I}}\tau_{i,t_1} + \beta^{\mathcal{I},S}\frac{1}{t_1-t_0}\ln\left(\frac{S_{j,t_1}}{S_{j,t_0}}\right) + \beta^{\mathcal{I},X}\frac{1}{t_1-t_0}\ln\left(\frac{X_{j,t_1}}{X_{j,t_0}}\right) + \epsilon_{i,j,k,t_1,t_0}$$

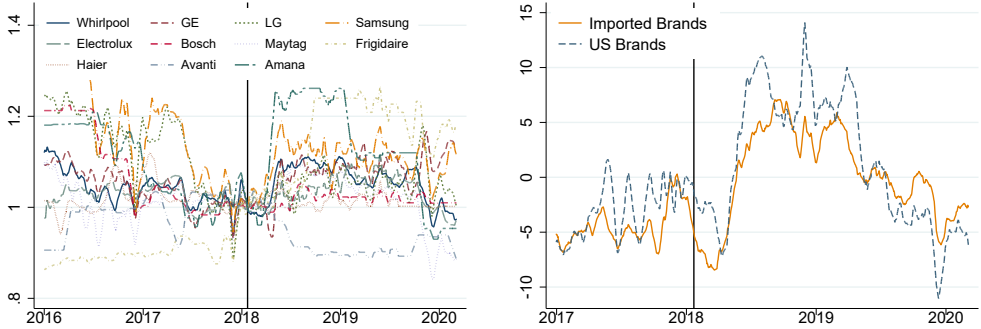
		US Imports from China		US Exports	
		(1)	(2)		
Tariffs	$12 \times \gamma$	-0.193	-0.094	-0.656	-0.505
(Annualized)		(0.138)	(0.147)	(0.144)	(0.139)
ERPT	β^S		0.365		0.334
			(0.052)		(0.029)
PPI PT	β^X		0.651		1.022
			(0.098)		(0.079)
	Adj. R^2	0.006	0.016	0.001	0.012
	Obs.	99,687	99,687	68,080	68,080

Regression Analysis Conditional on Price Changes

Conclusions are robust to estimation using only price changes.

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At the Store: A Closer Look at Washing Machines



(a) Price Indices

(b) Annual Inflation

Figure A5: Retail Washing Machine Prices from the BPP, Variation Across Brands

- Heterogeneity across brands
- Importantly, domestic brands saw the same price increases as imported foreign brands, consistent with Flaaen, Hortaçsu, and Tintelnot (2019).

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