

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

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The US-China Trade War Timeline (2018 - May 2019)

Exhibit 11 2018 U.S. Tariffs and Retaliations

DATE	U.S.	CHINA	OTHER COUNTRIES
January - March 2018	Safeguard tariffs <ul style="list-style-type: none"> • Solar Panels (+30%, \$8.5 bn) • Washing Machines (+20% to +50%, \$1.8 bn) 	Files WTO dispute	South Korea files WTO dispute
March – April 2018	National Security Tariffs <ul style="list-style-type: none"> • Steel (+25%, \$10.2 bn) • Aluminum (+10%, \$ 7.7 bn) 	Retaliation <ul style="list-style-type: none"> • Tariffs on \$3 bn of U.S. imports (aluminum waste, pork, fruits, nuts, and other U.S. products) 	Retaliations (Canada, Mexico, EU) <ul style="list-style-type: none"> +10% to +25% on \$3 to \$13 bn worth of U.S. goods
July 2018	China Tariffs – Stage 1 <ul style="list-style-type: none"> • +25% on \$34 bn 	Retaliation <ul style="list-style-type: none"> • +25% on \$34 bn 	
August 2018	China Tariffs – Stage 2 <ul style="list-style-type: none"> • +25% on \$16 bn 	Retaliation <ul style="list-style-type: none"> +25% on \$16 bn 	
September 2018	China Tariffs – Stage 3 <ul style="list-style-type: none"> • +10% on \$200 bn <p>½ are intermediate goods, ¼ are consumer goods.</p>	Retaliation <ul style="list-style-type: none"> +10% on \$60 bn 	
December 2018	US and China agree to postpone scheduled stage 3 tariff increases while they negotiate		USMCA (new NAFTA) deal signed
May 2019	Stage 3 tariffs increased to +25%	Stage 3 tariffs increased to +25%	

Source: Casewriter, based on Bown, Chad, and Melina Kolb. 2018. "Trump's Trade War Timeline: An Up-to-Date Guide." [https://piie.com/blogs/trade-investment-policy-watch/trump-trade-war-china-date-guide.](https://piie.com/blogs/trade-investment-policy-watch/trump-trade-war-china-date-guide)

What we do

- Measure the impact of tariffs on US prices
- *At the Dock*
 - Chinese tariffs
 - Steel tariffs
 - Retaliation tariffs on US exports
- *At the Store*
 - Case studies (washing machines, handbags, refrigerators, tires, bikes, sneakers) using data from largest US retailers
 - Retail data with country of origin (COO) and HS details from 2 large retailers

Summary of Findings

- Tariff burden falls mostly on the US
 - Full import tariff passthrough
 - Chinese exporters are not reducing their prices à US importers bear the full cost of the tariff
 - Tariff passthrough much greater than exchange rate passthrough à so RMB depreciation is not helping much
 - US exporters are reducing prices à undifferentiated products
- Partial response at the retail level
 - Some goods prices increased, others did not
 - Importer/retailers reducing markups
 - Similar effects for affected and not-affected categories
 - spreading the cost or indirect effect of tariffs
 - Significant front-loading and little trade diversion

Data Sources

- BLS International Price Program (IPP)
 - Survey of transactional prices for imported goods, 2005-2019
 - Access to micro data used to construct the US Import/Export price indices
 - Not affected by unit-value problems in Census data (no compositional differences over time)
- The Billion Prices Project
 - Daily data collected from websites of largest multi-channel retailers in the US (this paper: from 2017 to 2019)
 - For 2 retailers we further obtain country of origin and HS code classifications for each individual product

At the Border Chinese Tariffs

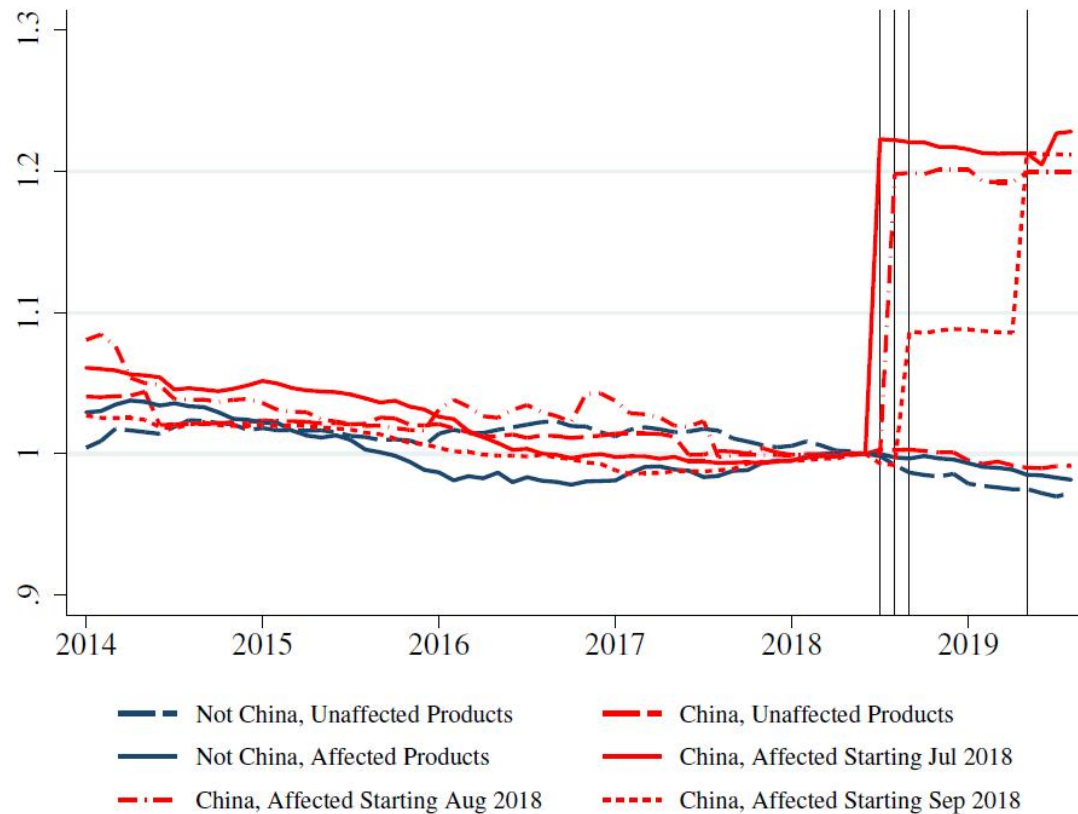
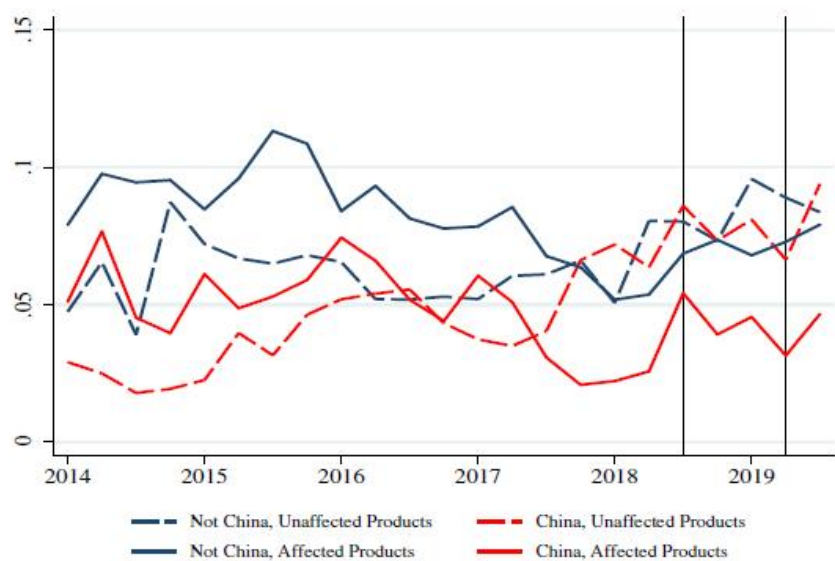


Figure 1: Import Price Indices, by China Tariff Wave

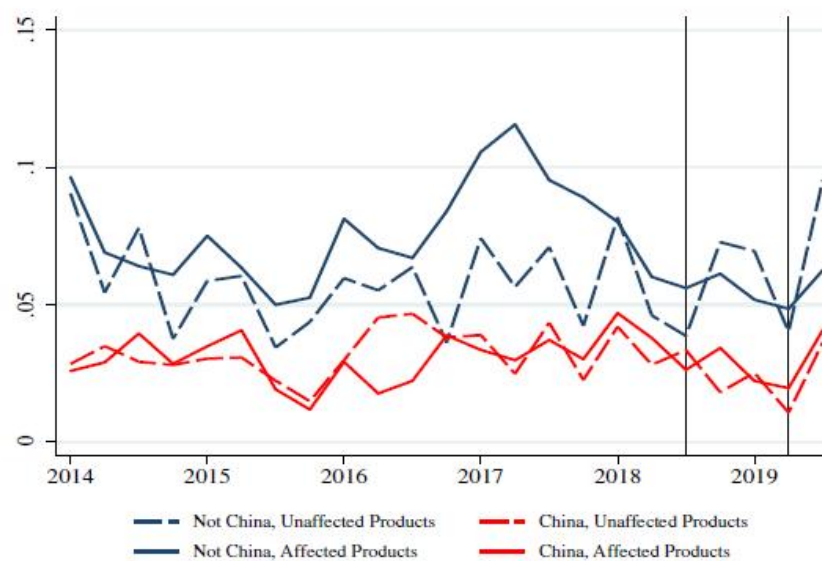
- Affected goods from China → immediate jump in post-tariffs prices (i.e. no reduction in the Chinese exporter's prices)

Frequency Of Price Changes

- No wait-and-see → Tariffs have not changed the frequency of import price changes



(a) Price Decreases



(b) Price Increases

Figure 2: Frequency of Monthly Price Changes (Averaged to Quarter)

Passthrough Regression

- Standard passthrough regression with distributed lags

$$\begin{aligned} \Delta \ln (P_{i,j,k,t}^{\mathcal{I}}) &= \delta_k^{\mathcal{I}} + \phi_{CN}^{\mathcal{I},\Omega} + \phi_{CN}^{\mathcal{I},-\Omega} + \sum_{l=0}^{11} \gamma_{CN,l}^{\mathcal{I}} \Delta \tau_{CN,k,t-l} \\ &+ \sum_{l=0}^{11} \beta_l^{\mathcal{I},S} \Delta \ln (S_{j,t-l}) + \sum_{l=0}^{11} \beta_l^{\mathcal{I},X} \Delta \ln (X_{j,t-l}) + \epsilon_{i,j,k,t}, \end{aligned} \quad (2)$$

- Notation
 - i is the item
 - j is country of origin
 - k is the sector (between HS4 and HS6)
- δ_k captures an average sectoral inflation rate
- ϕ_{CN}^{Ω} and $\phi_{CN}^{-\Omega}$ capture constant deviations from sectoral trend for Chinese goods affected and unaffected by the tariffs
- $\Delta \tau_{CN,k,t}$ measures the log additional tariff rate (multiple lags)
- S_j is the value of j 's currency in USD
- X is the country of origin's PPI

Passthrough Regression

		(1)	(2)	(3)	(4)
Tariffs 1 yr.	$\left(\sum_{l=0}^{11} \gamma_{CN,t}^{\mathcal{I}}\right)$	-0.079*** (0.026)	-0.076*** (0.028)		-0.018 (0.030)
ERPT 1 yr.	$\left(\sum_{l=0}^{11} \beta_l^{\mathcal{I},S}\right)$			0.219*** (0.027)	0.221*** (0.027)
PPI PT 1 yr.	$\left(\sum_{l=0}^{11} \beta_l^{\mathcal{I},X}\right)$			0.019 (0.070)	0.012 (0.073)
China Affected	$\left(\phi_{CN}^{\mathcal{I},\Omega}\right)$		0.000 (0.000)		-0.000 (0.000)
China Not-Affected	$\left(\phi_{CN}^{\mathcal{I},-\Omega}\right)$		-0.000 (0.001)		-0.001 (0.001)
	Adj. R^2	0.000	0.003	0.004	0.004
	Obs.	820,318	820,318	820,318	820,318
	Sector FEs?	No	Yes	Yes	Yes

Notes: Robust standard errors in parentheses. ***, **, and * denote statistical significance at the 1, 5, and 10 percent level.

Table 1: Regression Analysis of Chinese Import Tariffs, Monthly Data

- A 20% tariff is associated with a 1.6% lower ex-tariff price and a 18.4% higher overall price faced by the importer
- Tariff passthrough is much higher than for an equivalent exchange rate shock
 - The RMB has depreciated about 10%, which lower prices faced by importers by 2.2%

At the Border Steel Imports

- Results are similar for the steel tariffs (March 2018, affecting multiple countries)

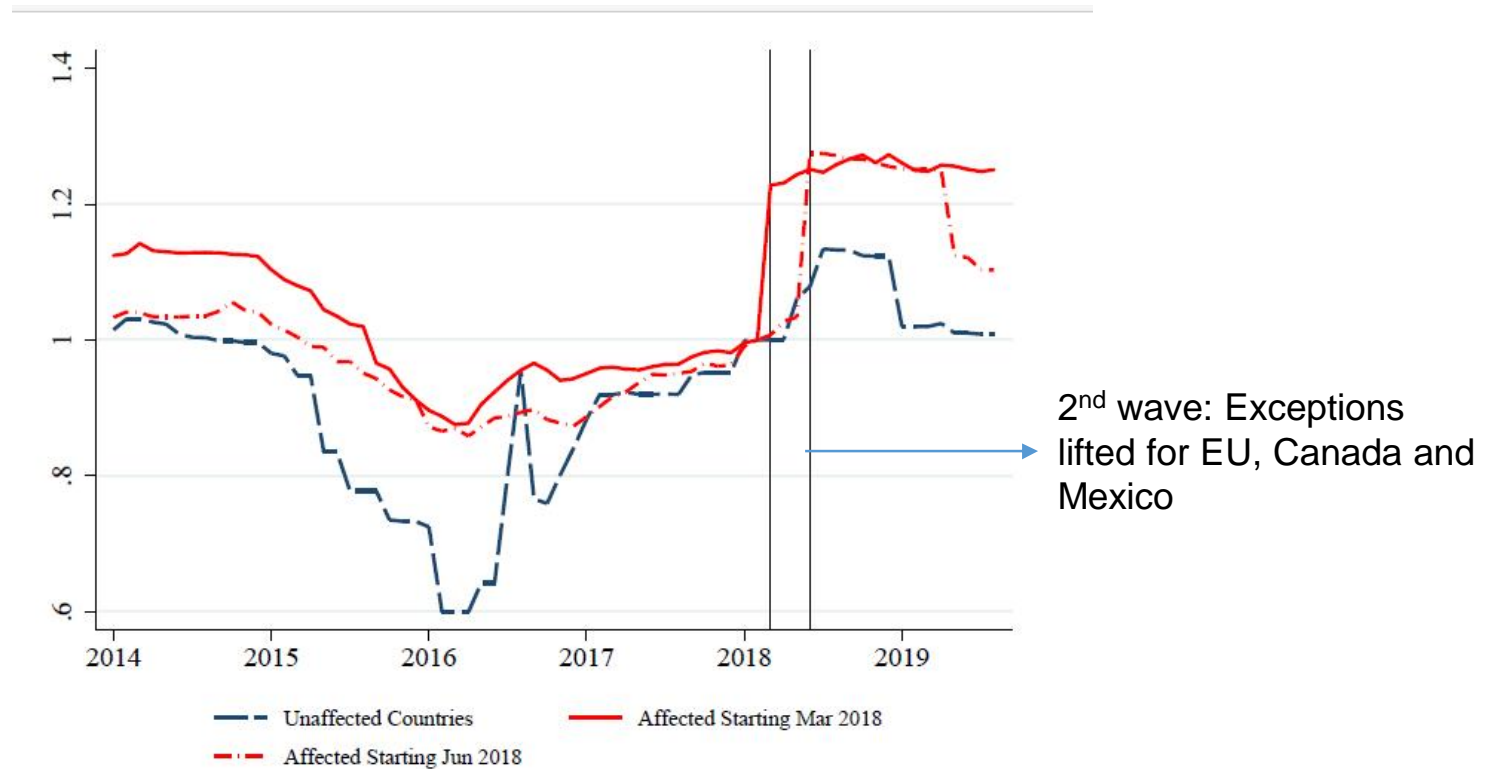


Figure 3: Steel Import Price Indices, by Tariff Wave

At the Border US Exports

- Opposite results for exports → US prices fell about 7%

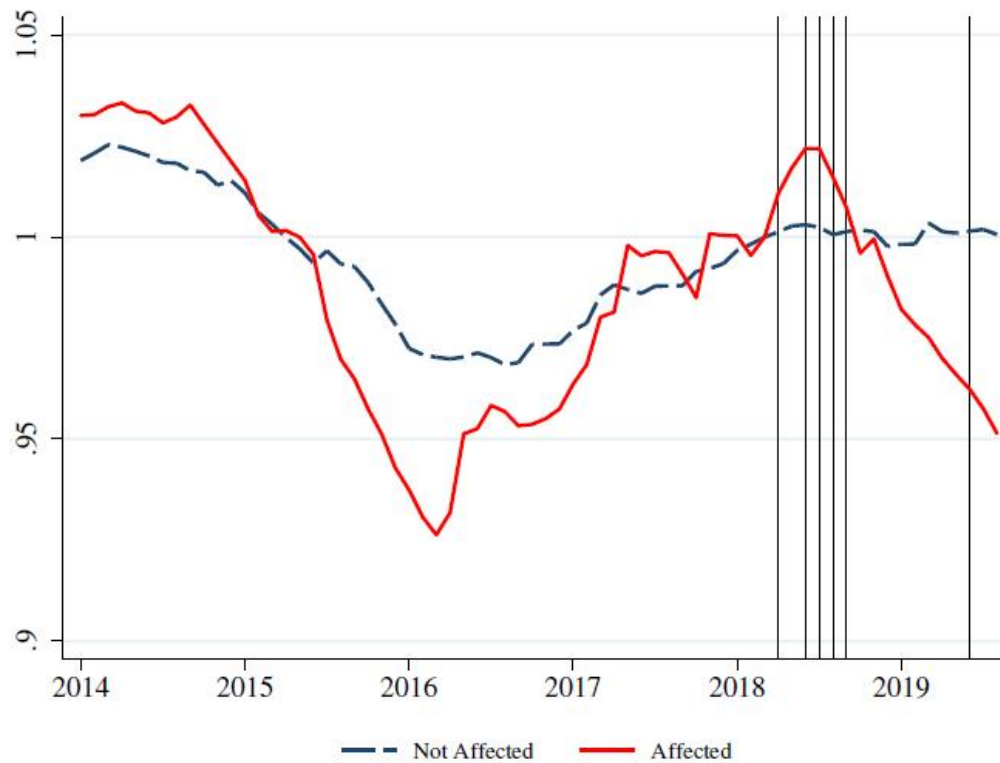


Figure 12: US Export Price Indices, Affected vs. Not Affected Countries and Goods

At the Border US Exports

$$\Delta \ln (P_{i,j,k,t}^{\mathcal{E}}) = \delta_k^{\mathcal{E}} + \sum_{l=0}^{11} \gamma_l^{\mathcal{E}} \Delta \tau_{k,t-l} + \sum_{l=0}^{11} \beta_l^{\mathcal{E},S} \Delta \ln (S_{j,t-l}) + \sum_{l=0}^{11} \beta_l^{\mathcal{E},X} \Delta \ln (X_{j,t-l}) + \epsilon_{i,j,k,t} \quad (5)$$

		(1)	(2)	(3)	(4)	(5)
Tariffs 1 yr.	$(\sum_{l=0}^{11} \gamma_l^{\mathcal{E}})$	-0.541*** (0.107)	-0.525*** (0.111)		-0.481*** (0.111)	
China Tariffs 1 yr.	$(\sum_{l=0}^{11} \gamma_l^{\mathcal{E},CN})$					-0.628*** (0.152)
Non-China Tariffs 1 yr.	$(\sum_{l=0}^{11} \gamma_l^{\mathcal{E},-CN})$					0.064 (0.115)
ERPT 1 yr.	$(\sum_{l=0}^{11} \beta_l^{\mathcal{E},S})$			0.188*** (0.018)	0.187*** (0.018)	0.187*** (0.018)
PPI PT 1 yr.	$(\sum_{l=0}^{11} \beta_l^{\mathcal{E},X})$			0.239*** (0.040)	0.238*** (0.040)	0.235*** (0.039)
	Adj. R^2	0.000	0.001	0.002	0.002	0.002
	Obs.	433,664	433,664	433,664	433,664	433,664
	Sector FEs?	No	Yes	Yes	Yes	Yes

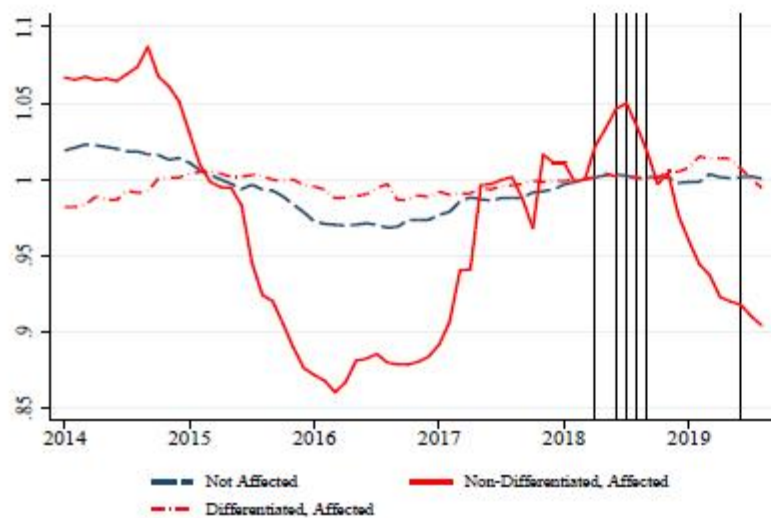
Notes: Robust standard errors in parentheses. ***, **, and * denote statistical significance at the 1, 5, and 10 percent level.

Table 5: Regression Analysis of Retaliatory Export Tariffs, Monthly Data

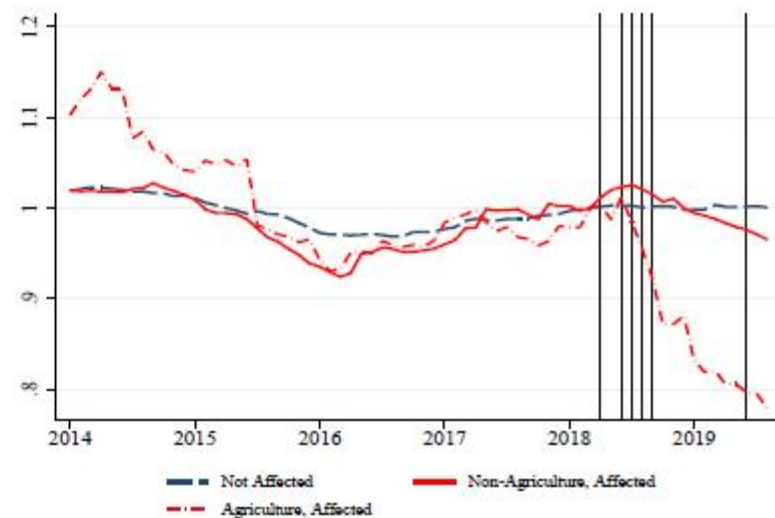
- A 20% tariff increase associated with a 10.8 % decrease in export prices

At the Border US Exports

- The type of goods matters → undifferentiated and agricultural products explain the decline in US export prices



(a) Differentiated and Non-Differentiated



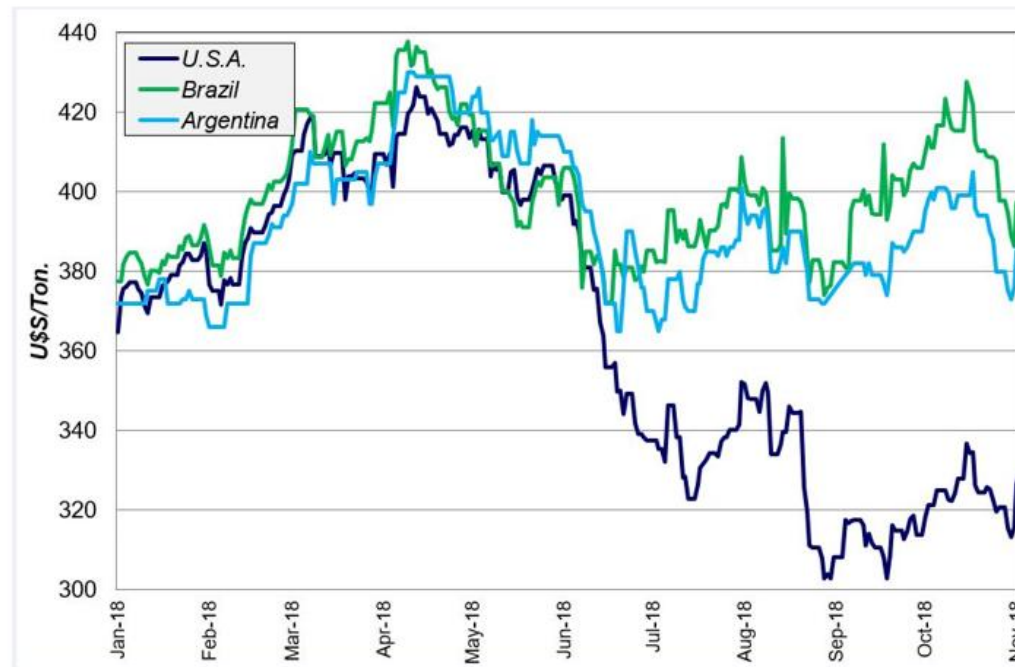
(b) Agriculture and Non-Agriculture

Figure 13: Decomposition US Export Price Indices

At the Border US Exports

- US soybean prices immediately fell by 25% relative to Brazil/Argentina (this graph is not in paper)

Exhibit 12 Soybean Prices, U.S.A., Brazil, and Argentina (FOB)



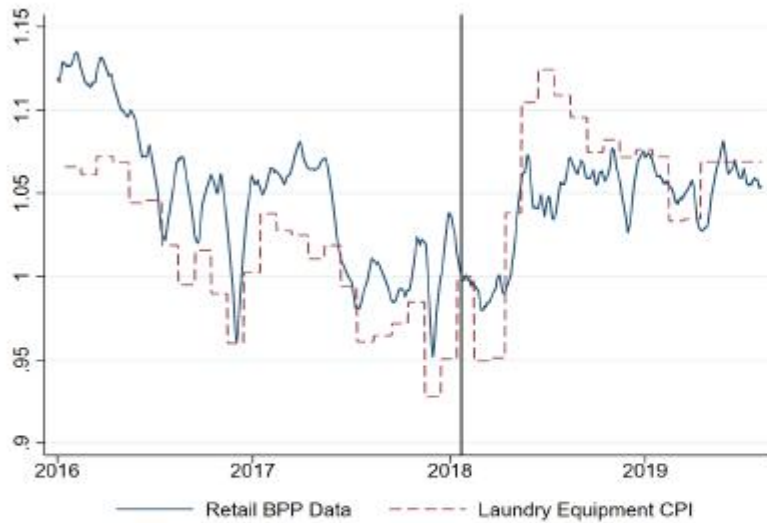
Source: Novitas SA (<http://www.novitas.com.ar/>), based on data from Thompson Reuters.

At the Store (Retail)

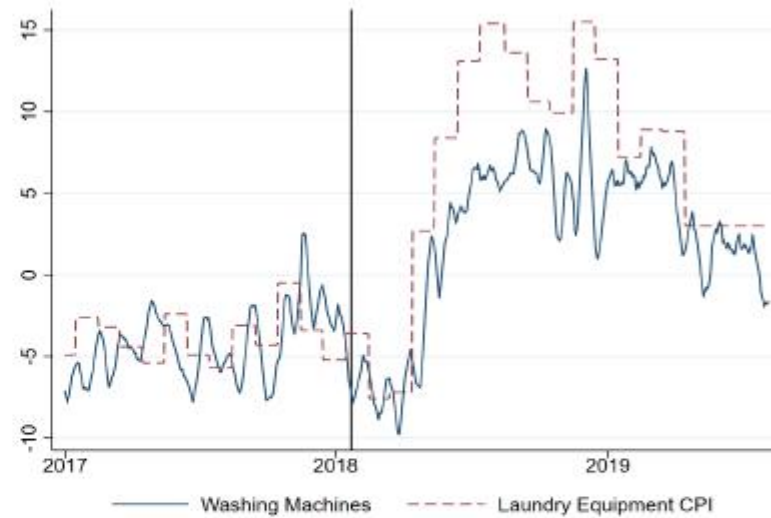
- We start with some case studies of goods that are often cited in the US media → easy to identify, mostly coming from China
- Advantage vs CPI: more disaggregated, daily data, with brands and other product characteristics

Washing Machines

- 20% tariff in January 2018



(a) Price Indices

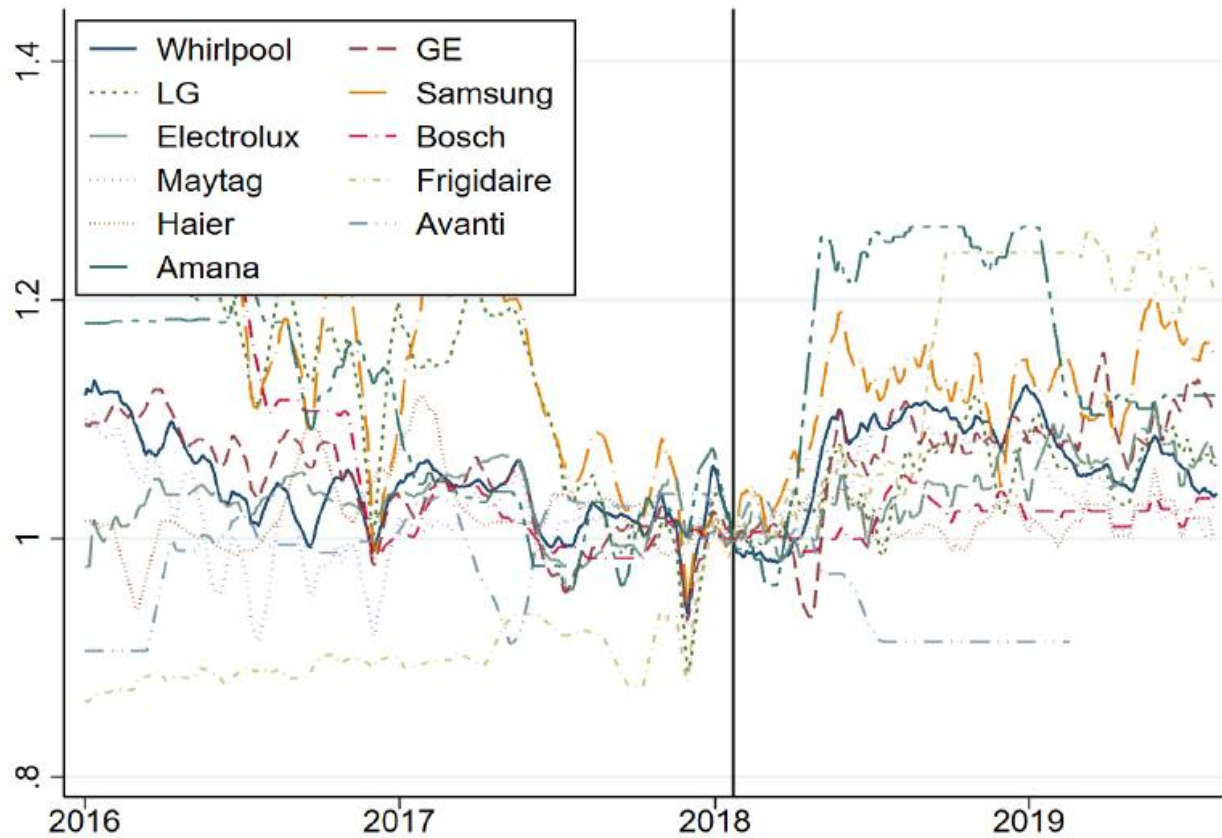


(b) Inflation Rates

Figure 4: Retail Washing Machine Prices, BPP and CPI

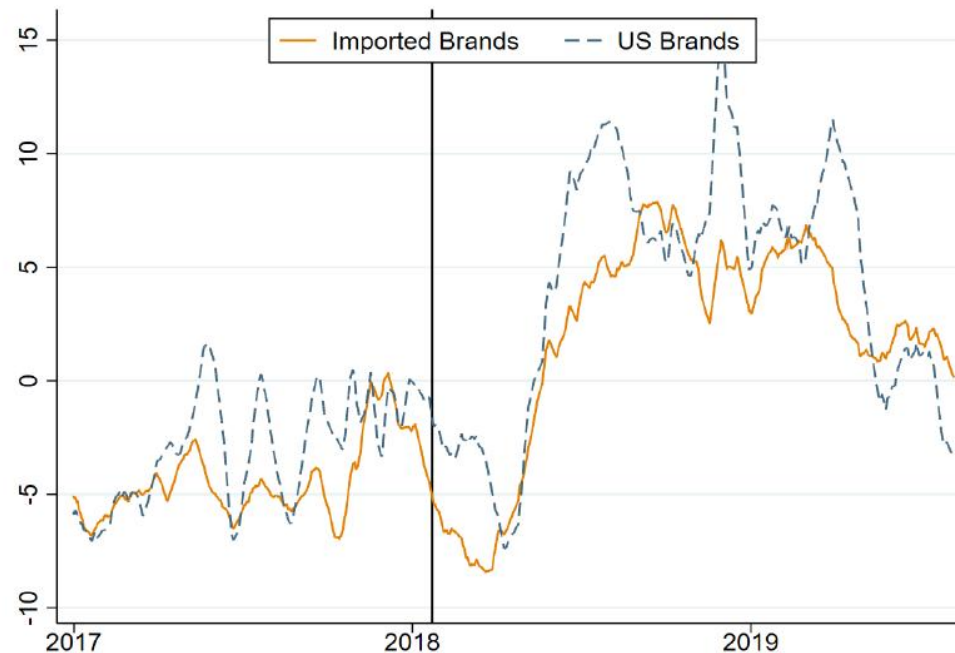
Washing Machines

- Huge heterogeneity across brands



(a) Price Indices

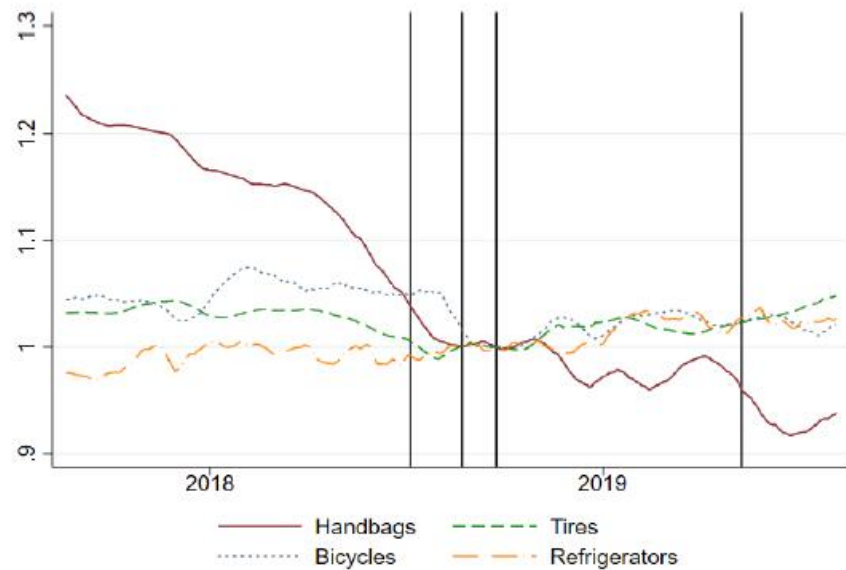
Washing Machines



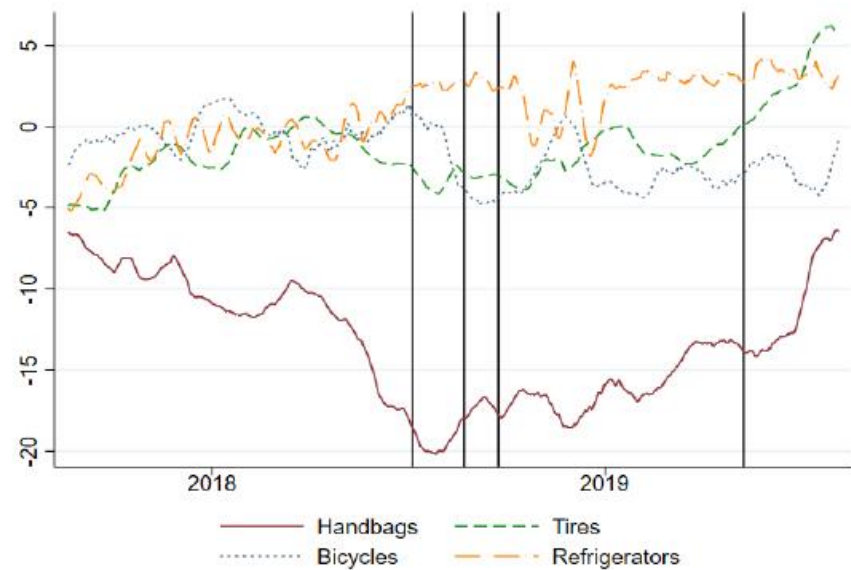
(b) Inflation Rates

- US and imported brands had similar inflation dynamics
 - Side-effect of steel imports? (hard to reconcile magnitudes)
 - Higher margins for US brands?

Other products (3rd round of Chinese tariffs)



(a) Price Indices



(b) Inflation Rates

Figure 6: Retail Prices, BPP, Multiple Affected Goods

- Handbags and tires are showing more inflation
- Not much impact for refrigerator and bicycles

Country of Origin and HS codes

- Caveats:
 - not clear if US brand is domestically produced
 - not clear if all bicycles or refrigerators are affected
 - we want to compare inflation relative to unaffected categories
- We focus on a subset of data with country of origin (COO) and HS code information for each individual good
 - Retailer 1
 - COO scraped,
 - HS code by 3CE (specialized firm) based on product description
 - Retailer 2 directly imports a large share of its foreign goods
 - COO provided by the firm.
 - Some HS codes provided by retailer (direct imports) and some classified by 3CE

Obtaining product level HS codes



DESCRIBE YOUR PRODUCT

Here Is What We Know About Your Light Emitting Diode (LED) Television Not Your Item?

Assumed Characteristics >

Known Characteristics ▾

broadcast use:

construction:

visual feature:

Please read all 10-digit descriptions to find the one that best matches your product

U.S. Census Bureau - Foreign Trade Schedule B (2019)
 Chapter 85
 CHAPTER 85 - ELECTRICAL MACHINERY AND EQUIPMENT AND PARTS THEREOF; SOUND RECORDERS AND REPRODUCERS, TELEVISION IMAGE AND SOUND RECORDERS AND REPRODUCERS, AND PARTS AND ACCESSORIES OF SUCH ARTICLES

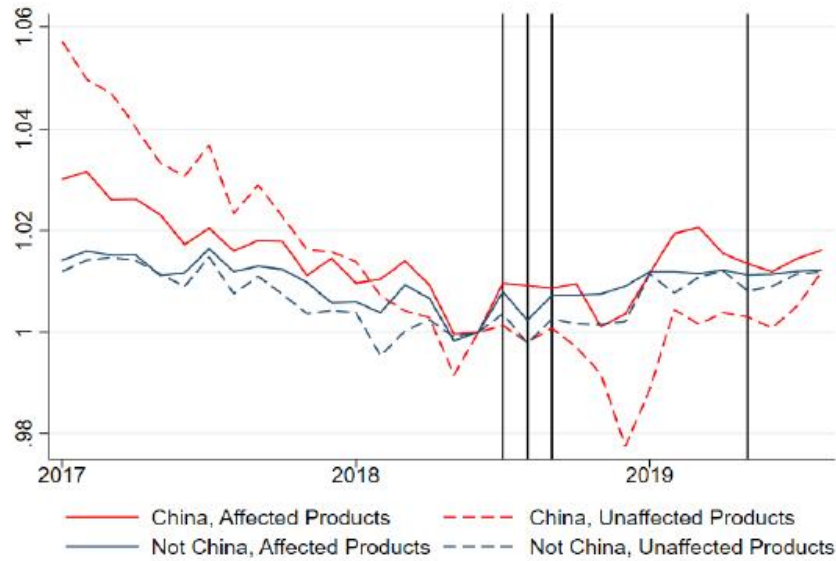
SCHEDULE B NUMBER	DESCRIPTION	UOM
85.28	<input type="checkbox"/> Monitors and projectors, not incorporating television reception apparatus; reception apparatus for television, whether or not incorporating radio-broadcast receivers or sound or video recording or reproducing apparatus:	
	<input type="checkbox"/> - Reception apparatus for television, whether or not incorporating radio-broadcast receivers or sound or video recording or reproducing apparatus:	
8528.72	<input checked="" type="checkbox"/> - - Other, color:	

Retail data with COO and HS information

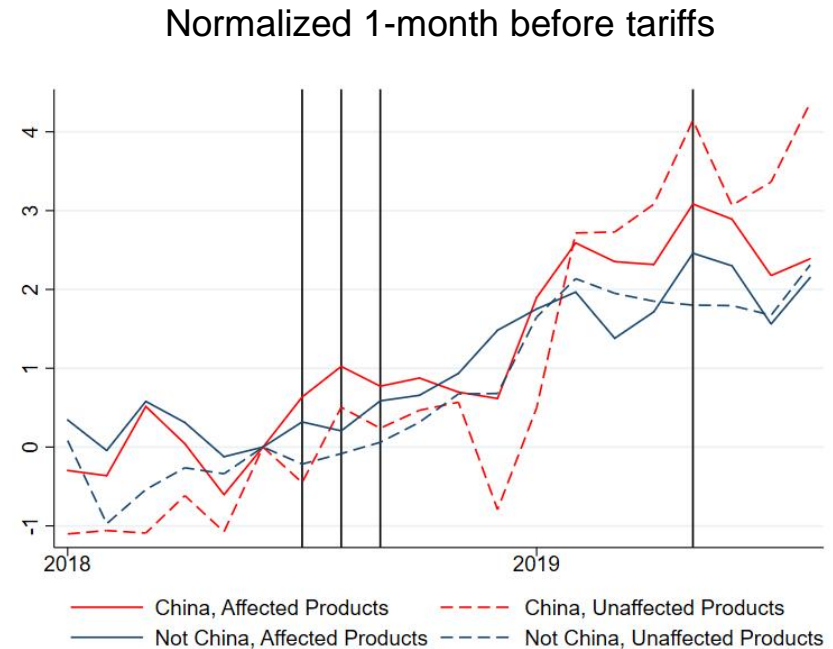
	Retailer 1 and 2	Retailer 1 Only	Retailer 2 Only	Imported Products	Household Products	Electronics Products
Products	92,624	37,840	54,784	59,978	64,421	10,891
Exporting Countries	82	65	66	81	72	43
HS6 Categories	1,991	1,651	831	1,498	1,406	781
Products Imported	59,978	21,144	38,834	59,978	46,836	6,679
Products Imported from China	43,490	13,646	29,844	43,490	35,748	3,566
Products in Affected Categories	59,460	23,219	36,241	40,333	43,505	6,269
Products from China & Affected	30,101	8,757	21,344	30,101	25,212	1,954
<i>Panel B: Pricing Behavior</i>						
Products Without Price Changes (%)	42	49	37	47	43	43
Mean Product Life (months)	18	16	19	18.18	15	
Abs. Val. Price Changes (med., %)	11.1	14.3	10.0	11.4	10.8	11.9
Abs. Val. Price Changes, Ex-Sales (med., %)	9.9	11.4	8.9	10.0	9.7	10.0
Implied Duration (med., months)	8.9	9.7	8.5	9.7	8.5	6.9
Implied Duration, Ex-Sales (med., months)	10.5	12.7	9.5	11.2	11.1	8.4

Table 3: Summary Statistics from Two Retailers

Price Indices



(a) Price Indices



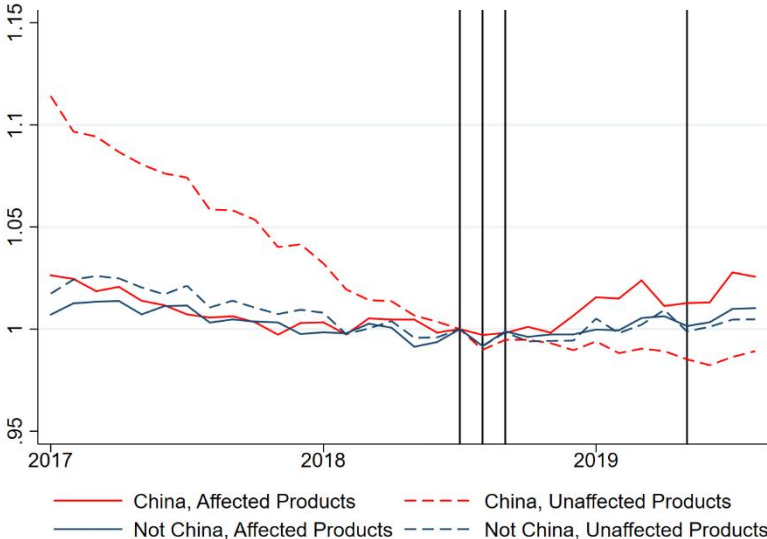
(b) Inflation Rates

Figure 7: Retail Price Response to China Tariffs, Two Retailers

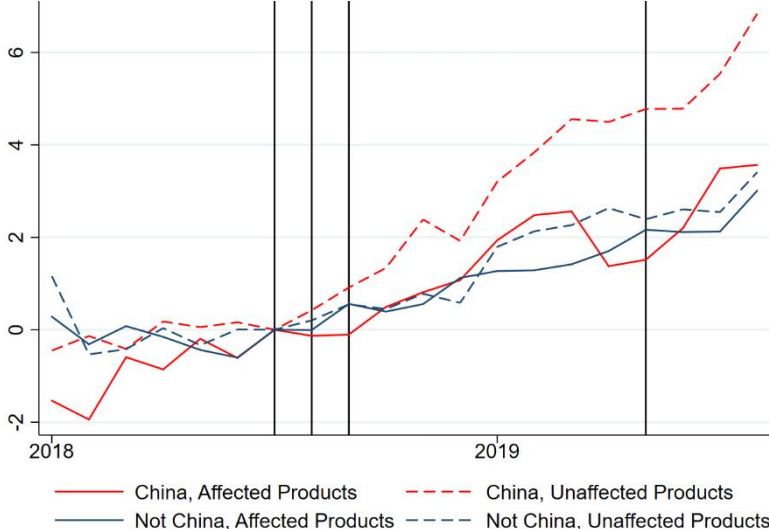
- All groups have more inflation since the tariffs (about 2-3%)
- But no difference between groups!

Retailer comparison

Retailer 1

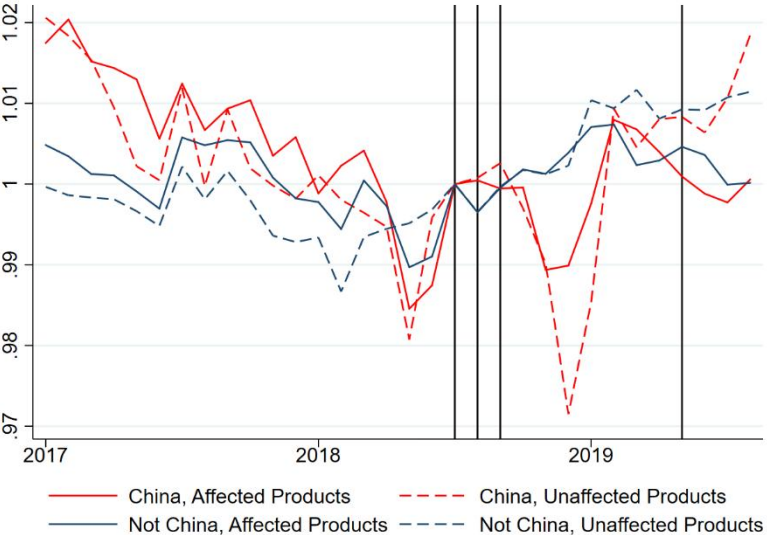


(a) Price Indices

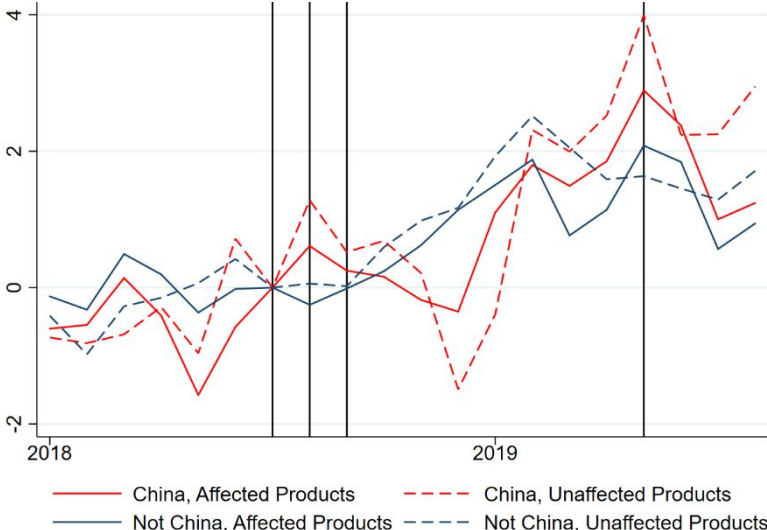


(b) Inflation Rates

Retailer 2



(a) Price Indices



(b) Inflation Rates

Passthrough Regression

- Same passthrough regression without exchange rate and PPI

$$\Delta \ln (P_{i,j,k,t}^{\mathcal{R}}) = \delta_k^{\mathcal{R}} + \phi_{\text{CN}}^{\mathcal{R},\Omega} + \phi_{\text{CN}}^{\mathcal{R},-\Omega} + \sum_{l=0}^9 \gamma_{\text{CN},l}^{\mathcal{R}} \Delta \tau_{\text{CN},k,t-l} + \epsilon_{i,j,k,t}, \quad (4)$$

- Notation
 - i is the item
 - j is country of origin
 - k is the sector (between HS4 and HS6)
- δ_k captures an average sectoral inflation rate
- $\phi_{\text{CN}}^{\Omega}$ and $\phi_{\text{CN}}^{-\Omega}$ capture deviations from sectoral trends for Chinese goods affected and unaffected by the tariffs
- $\Delta \tau_{\text{CN},k,t}$ measures the log additional tariff rate (multiple lags)

Retail Passthrough

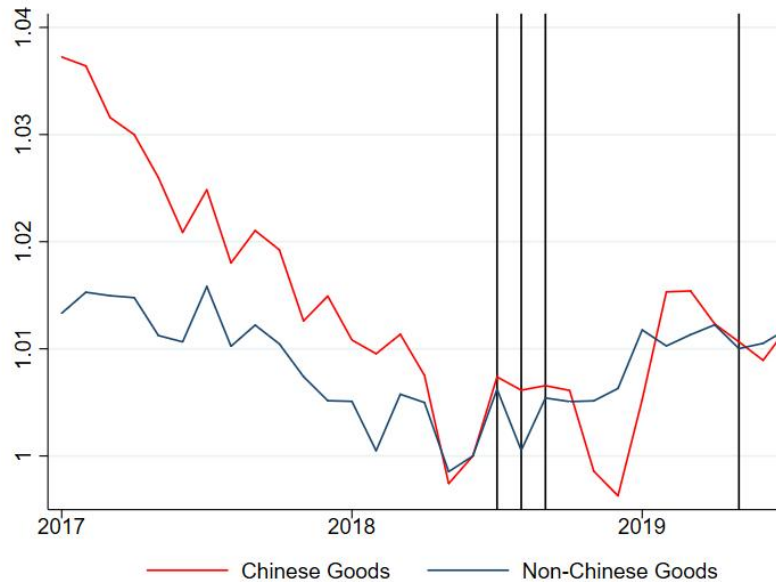
		Retailers 1 and 2	Retailer 1 Only	Retailer 2 Only	Imported Products	Household Products	Electronics Products
Tariffs 1 yr.	$(\sum_{l=0}^{11} \gamma_{CN,l}^{\mathcal{R}})$	0.044*** (0.009)	0.049*** (0.013)	0.046*** (0.011)	0.046*** (0.009)	0.045*** (0.010)	0.070*** (0.025)
China Affected	$\phi_{CN}^{\mathcal{R},\Omega}$	-0.001* (0.000)	-0.000 (0.000)	-0.001 (0.001)	-0.000 (0.001)	-0.001** (0.000)	-0.001 (0.001)
China Not Affected	$\phi_{CN}^{\mathcal{R},-\Omega}$	0.000 (0.000)	-0.001 (0.001)	0.000 (0.001)	0.001 (0.001)	-0.000 (0.000)	0.000 (0.000)
Adj. R^2		0.000	0.002	0.000	0.000	0.001	0.002
Obs.		761,402	282,159	479,243	484,817	527,119	71,198
Sector FEs?		Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses. ***, **, and * denote statistical significance at the 1, 5, and 10 percent level.

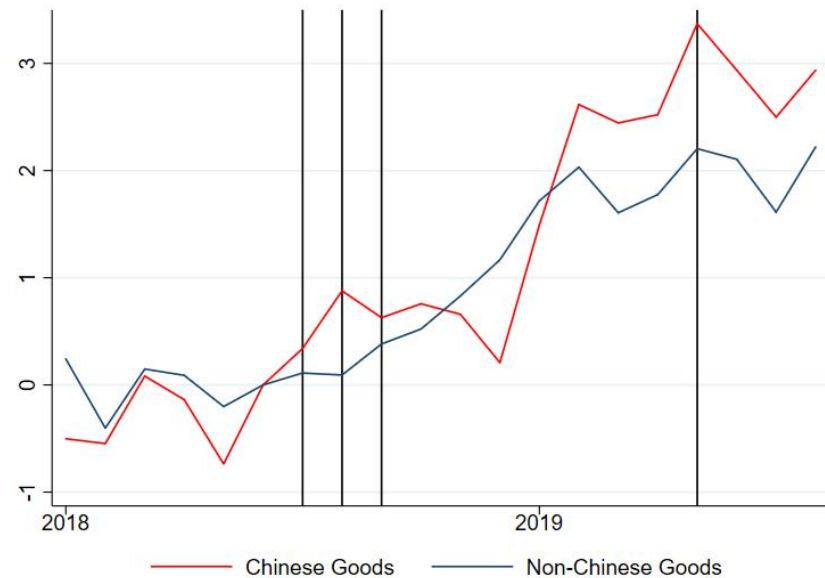
Table 4: Regression Analysis of Retail Prices

- A 20% tariff increase is associated with an increase between 0.8% and 1.4% in the retail price after 12 months
- BOE calculation → 20% tariff increases cost by 18.6%, assuming total costs for imported goods is 50% of marginal cost of the good, retail prices should have risen 9.3% to keep margins constant!

China vs Non-China



(a) Price Indices

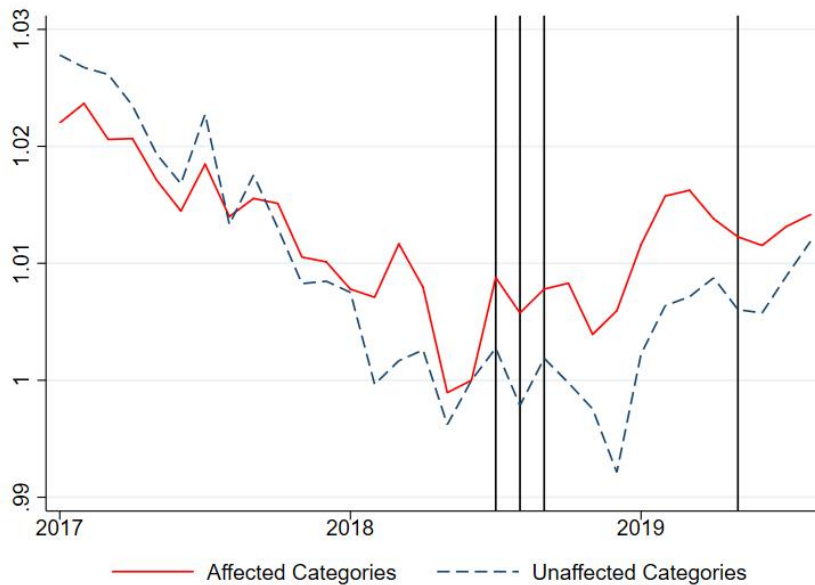


(b) Inflation Rates

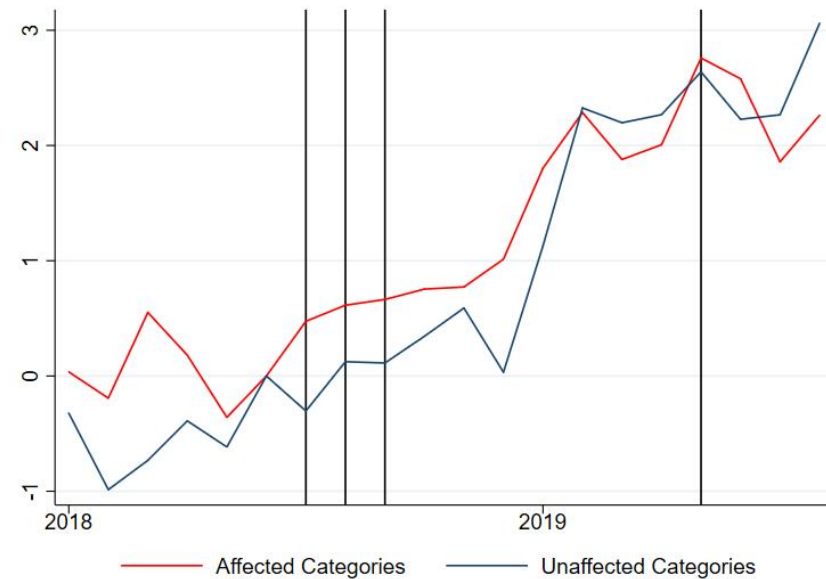
- Measurement error? → not with COO (scraped + provided by retailer 2)
- Similarity is consistent with the washing machine results.

Affected vs Not-Affected Categories

- Affected vs not-affected categories → more surprising



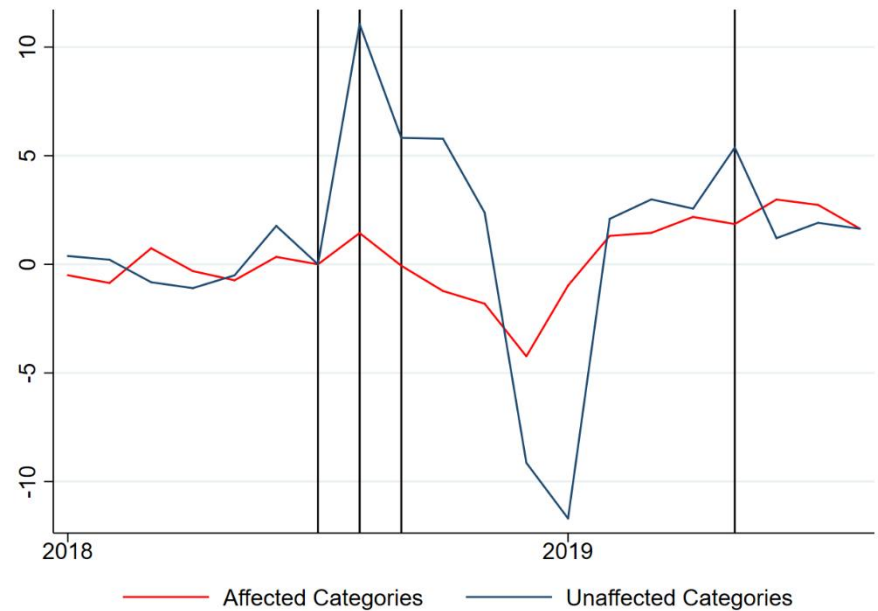
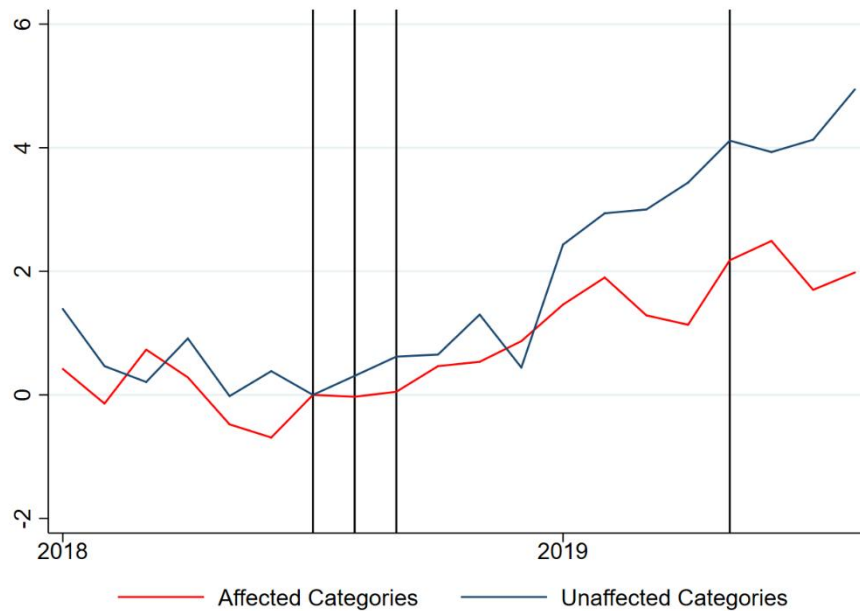
(a) Price Indices



(b) Inflation Rates

Affected vs Not-Affected Categories

- Driven by HS code measurement error?
 - à No..we also find similar results when we use codes codes manually matched by a research assistant or provided by Retailer 2 (from their direct imports)



Spreading the Cost ?

- Are retailers spreading the cost to unaffected goods?
 - Some retailers publicly mention this as a strategy to cope with the tariffs
- If true, it would imply that US prices are rising relative to those in countries that have not imposed additional tariffs on Chinese goods

International Comparisons: Canada

- CPI sectors (affected & unaffected)

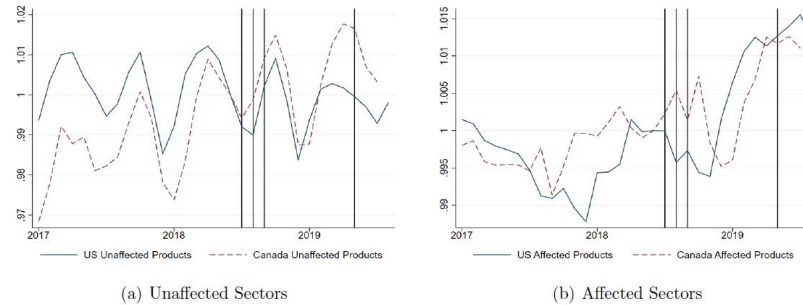


Figure 8: Retail Prices for in US and Canada, Data from CPI

- Identical Goods (2500, Retailer 2)

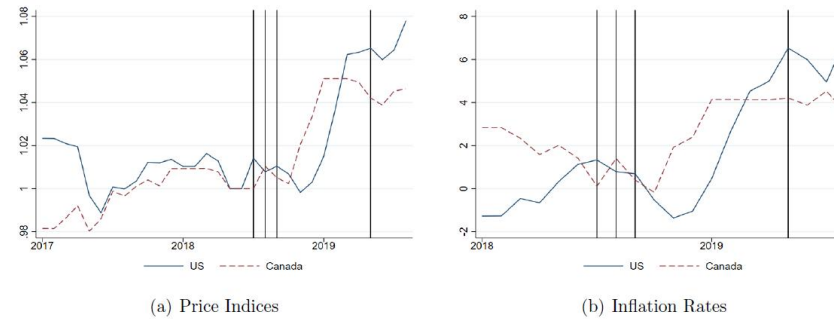


Figure 9: Retail Prices from Retailer 2, US vs. Canada

- Global Retailers (7 retailers)

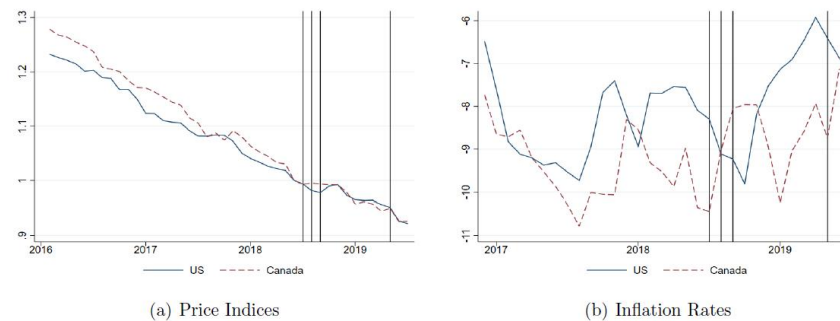


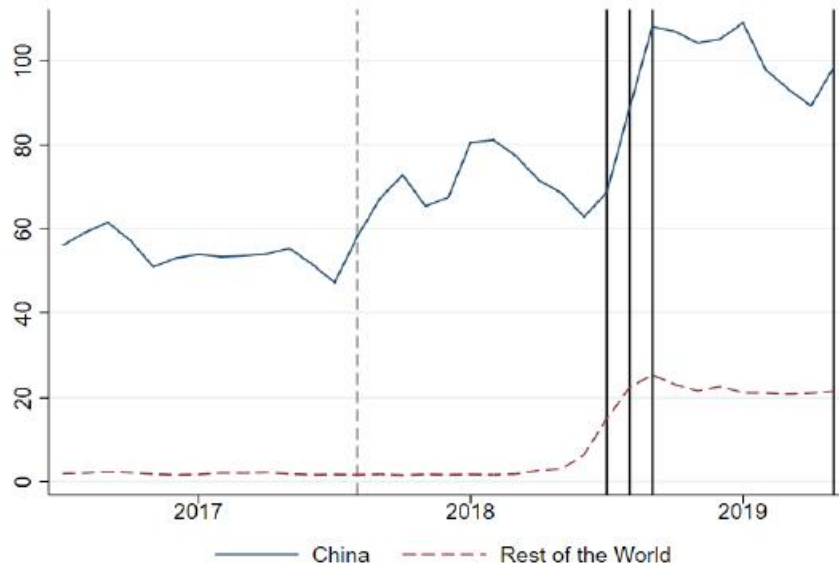
Figure 10: Retail Prices in US and Canada, Multiple Retailers

Affected vs Not-Affected Categories

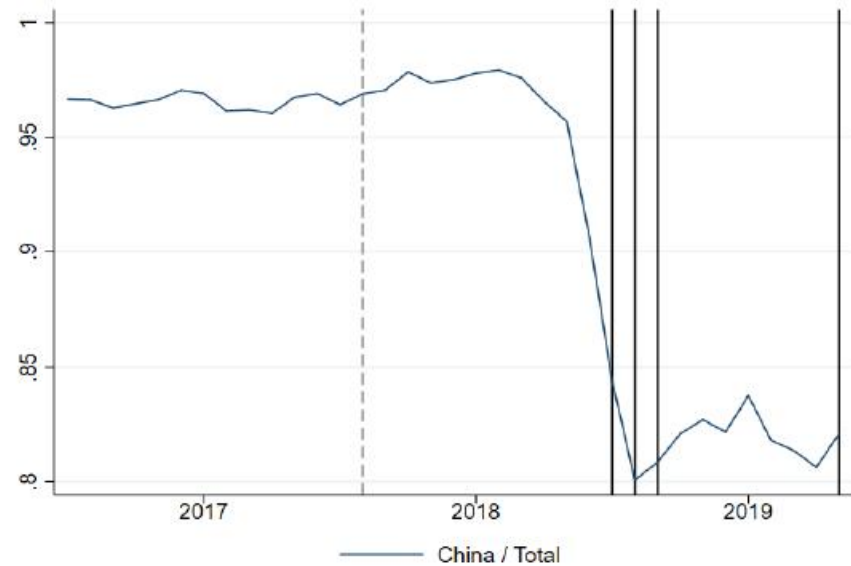
- Are retailers spreading the cost to unaffected goods?
 - Some retailers publicly mention this as a strategy to cope with the tariffs
- If true, this implies that US prices are rising relative to those in countries that have not imposed additional tariffs on Chinese goods , e.g. Canada
- No evidence when we compare prices in the US vs Canada
 - Some indirect effect of tariffs?
 - US retailers are reducing their margins

Other Adjustment Margins

- Front-loading of inventories → US retailers use first-in first-out accounting



(a) Tons Imported



(b) Share of Tons Imported from China

Figure 11: Front-Running and Trade Diversion, Two Retailers

- Trade diversion
→ Small increase, then stable → only `quick-wins`?

Summary of Findings

- Tariff burden falls mostly on the US
 - Full import tariff passthrough
 - Chinese exporters are not reducing their prices à US importers bear the full cost of the tariff
 - Tariff passthrough much greater than exchange rate passthrough à so RMB depreciation is not helping much
 - US exporters are reducing prices à undifferentiated products
- Partial response at the retail level
 - Some goods prices increased, others did not
 - Importer/retailers reducing markups
 - Similar effects for affected and not-affected categories
 - spreading the cost or indirect effect of tariffs
 - Significant front-loading and little trade diversion

Final thoughts

- Our results reflect the short-term impact of these tariffs (1 year)
- As the trade war escalates, the shock is perceived to be more permanent, reducing the willingness of US firms to bear the cost alone
 - More pressure on Chinese exporters to reduce USD prices
 - More trade diversion possible
 - RMB depreciation helps
 - More retail passthrough
 - No more front-loading
 - Shrinking margins likely temporary