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Tariff Pass-Through at the Border and at the Store: Evidence from US Trade Policy†

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We use microdata collected at the border and the store to characterize the price impact of recent US trade policy on importers, exporters, and consumers. At the border, import tariff pass-through is much higher than exchange rate pass-through. Chinese exporters did not lower their dollar prices by much, despite the recent appreciation of the dollar. By contrast, US exporters significantly lowered prices affected by foreign retaliatory tariffs. In US stores, the price impact is more limited, suggesting that retail margins have fallen. Our results imply that, so far, the tariffs' incidence has fallen in large part on US firms. (*JEL* E31, F13, F14, F31, L11)

Since 2018, the United States has initiated a large number of significant changes to its trade policies. Most notably, it has imposed import tariffs ranging from 10 to 50 percent on goods including washing machines, solar panels, aluminum, steel, and roughly $362 billion of goods from China. In response, Canada, China, the European Union, and Mexico have imposed retaliatory tariffs. On a scale not seen since the 1920s, the world's largest economies have passed measures making it far more costly to buy goods from each other.[1]

This paper uses good-level data to assess the impact of these policy changes on US prices. We extend the results in the literature by comparing the degrees of tariff and exchange rate pass-through (ERPT) into border prices and by providing detailed information about the impact on consumer prices. The combination of border and retail prices is crucial to determine the incidence of the tariffs. If foreign exporters reduce their ex-tariff US dollar prices by an amount close to the scale of

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[1] See Amiti, Redding, and Weinstein (2019) and Bown and Kolb (2020) for helpful overviews of the policy setting and timelines of the policy changes made.

the tariffs, the tariffs' incidence will fall primarily on foreign countries. If not, the US importer (who pays the ex-tariff price plus the tariff) faces higher costs to buy the foreign goods, and the response of retail prices is essential to know if that additional cost is ultimately borne by US consumers.

We start by studying US import prices using product-level data from the Bureau of Labor Statistics (BLS). We compare import (ex-tariff) price indices constructed for otherwise equivalent goods that are affected and unaffected by tariffs and, as of the end of February 2020, find essentially no difference, consistent with the results obtained using census unit values in Amiti, Redding, and Weinstein (2019) and Fajgelbaum et al. (2019). Controlling for sectoral inflation rates, our regressions suggest that a 20 percent tariff, for example, would be associated with a 1.1 percent decline in the ex-tariff price and an 18.9 percent increase in the total price paid by the US importer.

Given that these data track the prices of individual goods and are immune to possible changes in the composition of import categories, the BLS microdata are particularly useful for comparing the pass-through rates of tariffs with those of exchange rate shocks. We estimate that the ERPT is 22 percent in the first 12 months, implying that a 20 percent dollar appreciation would only decrease the dollar price of imports by 4.4 percent, far less than the 18.9 percent discussed above for an equivalent-sized tariff.[2] Our estimated asymmetry in the pass-through rates of exchange rates and tariffs is consistent with the results in Fitzgerald and Haller (2018) and may reflect the role of imported intermediate inputs in production and the perceived difference in the persistence of tariffs versus exchange rate changes. It also carries important implications for the consequences of policies such as fiscal devaluations and border adjustment taxes, as discussed in Farhi, Gopinath, and Itskhoki (2014) and Barbiero et al. (2019). Furthermore, it suggests that the depreciation of the Chinese renminbi against the US dollar during the summer of 2019 did little to offset the impact of the tariffs in terms of the prices paid by US importers, implying that the price incidence of the import tariffs falls largely on the United States.[3]

We then turn to BLS export prices, which we use to gauge whether US exporters maintained their prices in the face of retaliatory tariffs impacting their foreign sales. These tariffs were applied by many different governments and vary more than the US import tariffs in terms of their timing, scope, and scale. Simple comparisons of export price indices of affected and unaffected products, however, suggest that affected exporters have dropped their (pre-tariff) prices by about 7 percent in response to retaliatory tariffs that average about 15 percent. We estimate regressions for exports that are equivalent to what we did for imports and find that, controlling for sectoral inflation rates, ex-tariff export prices declined by 32.9 percent of the tariff rate after 1 year.

Why did US exporters choose to drop their prices so much more in the face of retaliatory tariffs than did Chinese exporters in the face of the US import tariffs? We find that the decline in the relative export price of retaliated-upon products is almost entirely driven by US shipments of nondifferentiated and agricultural goods to China.

[2] The low ERPT estimate for the United States is in line with previous estimates such as those in Gopinath, Itskhoki, and Rigobon (2010) and is consistent with the high levels of dollar invoicing for US imports, as discussed in Gopinath et al. (2010).

[3] This result does not imply that China benefits from the policy. Even if Chinese exporters earned the same price and profit margin per unit exported to the United States, the tariffs can reduce the number of units sold.

A far larger share of the affected goods imported by the United States from China are differentiated goods that may be more difficult to source elsewhere in large quantities or may be produced with imported inputs in more complex supply chains.

We then study the extent to which the import price increases were passed through into retail prices. We first consider aggregated categories such as washing machines, handbags, tires, refrigerators, and bicycles and find mixed results. Some sectors exhibit clear price increases due to the tariffs (such as washing machines, consistent with the results in Flaaen, Hortaçsu, and Tintelnot 2019), but others have stable price dynamics despite the tariffs. We note that it is difficult to study the impact of tariffs using such retail price indices because they are at a level of aggregation that combines meaningful shares of goods that are both affected and unaffected by the tariffs.

To get around this problem, we collect millions of online prices from two large multichannel retailers for which we have detailed information on the country of origin and harmonized tariff schedule (HTS) code classifications at the individual product level. Surprisingly, despite observing a stark increase in the overall cost paid by US importers for certain Chinese goods, we detect only a minor increase in the prices set by the two retailers for these goods relative to those unaffected by tariffs. Our estimates imply that a 20 percent tariff is associated with a 0.7 percent increase in the relative retail prices of affected goods. This suggests that retailers are absorbing a significant share of the increase in the cost of affected imports by earning lower profit margins.

Another possibility—discussed in Amiti, Redding, and Weinstein (2019)—is that in response to the tariffs, domestic producers raise their prices to retailers on goods that compete with the imports. Or alternatively, retailers may simply be increasing the prices of goods not directly exposed to the tariffs, compensating with higher margins on these goods. These responses would be consistent with our finding that the retail prices of goods affected by import tariffs have evolved similarly to those for goods unaffected by tariffs. However, they would also imply different price behavior for US and non-US retail prices, and we do not find strong evidence consistent with this prediction. In particular, we compare the pricing behavior of identical goods sold by one of the retailers used in our baseline analysis in both the United States and Canada and complement the analysis with official indices and prices from other large retailers in the online Appendix. We find that, so far, the tariffs only brought about moderately higher retail inflation in the United States compared to Canada.

Instead, we find clearer evidence of other margins of adjustment that may limit retail price increases. First, we use US customs microdata to show that these retailers increased their import shipments from China, significantly expanding their inventories before the tariffs were implemented. This inventory "front-running" may have moderated the extent to which retail profit margins have declined in financial reports. Second, we document that China's share of the tonnage imported by these two retailers dropped from 80 or 90 percent before the tariffs to 60 or 70 percent afterward, implying that at least some pressure was eased by moving supply chains away from China.

Does it matter whether the higher import prices result in lower retailer margins or higher consumer prices? Among many other implications, we argue that it implies this first 18 months of data only reveals the short-run impact of the global tariffs. We speculate that if the tariffs remain in place for much longer, pressure on these retailers will likely rise. We would expect this to result in some future combination of a larger reduction in US ex-tariff import prices or greater pass-through into consumer prices. Our work supports the idea, developed theoretically in Cole and Eckel (2018), that a more complete understanding of the full supply chain, from "at-the-dock" importers through to final retailers, is required to understand the full implications of any trade policy.

I. US Border Prices

We start with our analysis of US import price data collected by the International Pricing Program at the BLS. Prices are collected monthly by survey and used to construct import price indices. As a result, one strength of working with the BLS data relative to the census data is the ability to trace the import price of an identical good over time.[4] Gopinath and Rigobon (2008) provide additional detail on the BLS dataset and its construction.

The data include many observations deemed "unusable" for BLS price indices, generally due to the lack of an actual transaction for a given good in a given month. Our baseline treatment fills forward the most recent usable price in place of unusable or otherwise missing observations. We further weight all analyses using expenditures at the "classification group" level and begin all our analyses in 2005, the year when these weights become available. We drop all price changes that exceed 2.3 log points in magnitude and focus only on market transactions. We conduct the analysis only using prices of trades invoiced in US dollars, a group that represents over 94 percent of US trade occurring over our sample, and also exclude petroleum products. We only use data involving partner countries for which we have data on aggregate prices and exchange rates (our data on these macro variables cover 182 countries).

A. *US Imports from China*

Import tariffs were initially enacted on Chinese goods in three waves during 2018. First, in July, the United States imposed a 25 percent ad valorem tariff on roughly \$34 billion of imports. Second, in August, the 25 percent tariff was extended to cover another \$16 billion in shipments. Third, in September, a 10 percent tariff was applied to roughly \$200 billion in goods. In May of 2019, the tariff on that third wave of goods was increased from 10 to 25 percent. In September of 2019, a 15 percent tariff was imposed on \$112 billion of imports.[5] Since goods in the BLS data can be concorded with harmonized system (HS) codes and we know the provenance of each shipment, we can easily associate each good with the tariff rate that should have been applied to it in each month.

[4] Some weaknesses of the BLS data are that these prices are sampled and purchase quantities are not available at the product level.

[5] Additional tariffs had been announced that would have applied to nearly all of the currently unaffected imports from China. These tariffs were then indefinitely delayed and were not implemented during the period covered by our data. The additional tariff rate on this last tranche of goods that was affected in May of 2019 was reduced to 7.5 percent in mid-February 2019, also outside of the period covered by our data.

Figure 1, panel A, plots log price indices—inclusive of tariffs—constructed for seven mutually exclusive groups of US imports.[6] The first two groups include the set of products that are unaffected by the 2018–2019 tariff policy changes, divided into those exported by China and those exported by other countries. The third group includes products with HS codes that are affected but do not face the tariffs because they are not imported from China.[7] The remaining groups capture imports from China that are affected by the different tariff changes. The price indices are normalized to one in June 2018. The plots include three vertical lines in 2018 corresponding to the three waves of tariffs starting that summer. We plot a fourth line in May 2019, when the tariffs on the third wave of goods increased from 10 to 25 percent, and a fifth line in September 2019, when a 15 percent tariff was applied to roughly another \$112 billion in goods.

All seven categories exhibit very similar and mildly deflationary trends for the four years prior to the tariffs.[8] The products never targeted by tariffs continue these trends through 2018, 2019, and into early 2020. By contrast, each affected good category from China saw an immediate jump in its price, inclusive of tariffs, during the month that the policy was implemented. The scale of the jumps is only slightly below the scale of the tariff rates, consistent with the fact that the ex-tariff prices did not exhibit meaningful breaks from their trends. Furthermore, in the online Appendix, we show that there were no significant changes in the patterns of price stickiness following the imposition of these tariffs.

We continue with a regression analysis capable of controlling for multiple factors other than tariffs and the exporter country that might matter for pricing trends. Furthermore, we can use the framework to compare the pass-through to importer prices of the tariffs with an equivalent-sized movement in the exchange rate. Motivated by the model described in the online Appendix, we run a specification with all monthly observations, including periods in which there is no price change. We estimate

$$(1) \qquad \Delta \ln\left(P^{\mathcal{I}}_{i,j,k,t}\right) = \delta^{\mathcal{I}}_k + \phi^{\mathcal{I},\Omega}_{CN} + \phi^{\mathcal{I},-\Omega}_{CN} + \sum_{l=0}^{11} \gamma^{\mathcal{I}}_{CN,l} \Delta \tau_{CN,k,t-l} + \sum_{l=0}^{11} \beta^{\mathcal{I},S}_l \Delta \ln\left(S_{j,t-l}\right) + \sum_{l=0}^{11} \beta^{\mathcal{I},X}_l \Delta \ln\left(X_{j,t-l}\right) + \epsilon_{i,j,k,t},$$

where $P^{\mathcal{I}}_{i,j,k,t}$ is the ex-tariff price of item i imported from country j in sector k at month t and where sectors are defined as the BLS's "primary stratum lower," which is a level of disaggregation that lies between the HS4 and HS6 levels.[9] The fixed effect $\delta^{\mathcal{I}}_k$ therefore captures an average sectoral inflation rate. We let $k \in \Omega$ denote those sectors that are affected by the tariff, so the fixed effects $\phi^{\mathcal{I},\Omega}_{CN}$ and $\phi^{\mathcal{I},-\Omega}_{CN}$ allow

[6] These categories are not collectively exhaustive of all US imports because we exclude a small number of goods that have been recently subjected to other categories of tariffs.

[7] Throughout the paper, we match goods to their six-digit HS codes and assume that the associated tariff is the highest value among the corresponding eight-digit HS codes, which is the level at which the tariff code is written. Though imperfect, this assumption holds exactly for over 95 percent of the six-digit codes.

[8] See Fajgelbaum et al. (2019) for evidence that the US import tariff changes were uncorrelated with supply shocks.

[9] This is the lowest level of aggregation for which the BLS deems indices to be publishable.

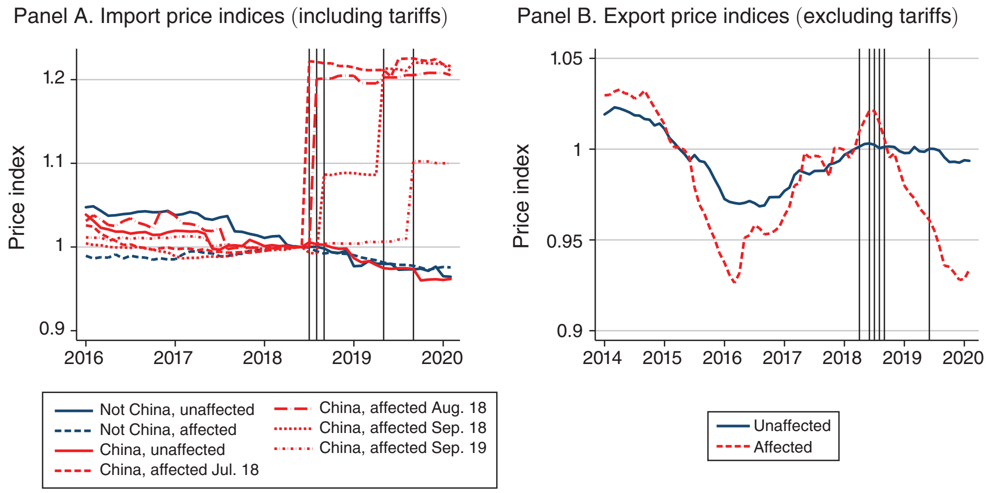

FIGURE 1. US IMPORT AND EXPORT PRICE INDICES

Notes: Figure 1, panel A, shows price indices for US imports inclusive of tariffs. Figure 1, panel B, shows price indices for US exports excluding retaliatory tariffs. Both figures use price data collected by the International Pricing Program at the BLS. Indices in Figure 1, panel A, are normalized to equal 1 in June 2018. The vertical lines in Figure 1, panel A, denote the months when tariffs were introduced or increased: July 2018 (25 percent on \$34 billion), August 2018 (25 percent on \$16 billion), September 2018 (10 percent on \$200 billion), May 2019 (increase the September 2018 wave to 25 percent), and September 2019 (15 percent on \$112 billion). Indices in Figure 1, panel B, are normalized to equal 1 in March 2018. The vertical lines in Figure 1, panel B, denote the months when retaliatory export tariffs were introduced or increased: April 2018 (China initiated tariffs on US products), June 2018 (the European Union, Mexico, and Turkey initiated tariffs), July 2018 (China expanded tariffs and Canada initiated tariffs), August 2018 (China expanded tariffs and Russia initiated tariffs), September 2018 (China expanded tariffs), and June 2019 (India initiated tariffs).

for a constant deviation from those sectoral inflation rates for affected and unaffected goods imported from China, respectively.

The term $\Delta \tau_{CN,k,t-l}$ equals the log gross additional tariff rate that is newly applied in a particular month to imports from China in sector k at time $t-l$ and would equal $0.22 \left(\approx \ln(1.25)\right)$, say, to correspond with the introduction of a 25 percent tariff. The lag structure allows monthly price changes to differentially reflect changes in tariffs that went into effect recently compared with further in the past. To evaluate the cumulative impact of the tariffs one year after they were applied, we report the point estimate and standard error of $\sum_{l=0}^{11} \gamma_{CN,l}^{\mathcal{I}}$. This gives the estimate of the tariff rate pass-through after the current month plus 11 lags. Finally, $S_{j,t-l}$ is the value of country j's currency in US dollars at time $t-l$, and $X_{j,t-l}$ is the producer price index in j at $t-l$.[10] The point estimate of $\sum_{l=0}^{11} \beta_l^{\mathcal{I},S}$ therefore constitutes our estimate of ERPT after one year (i.e., the current month plus 11 lags).[11]

The first three columns in Table 1 report the results using monthly import price data from January 2005 to February 2020. Column 1 reports the cumulative impact of 12 months of tariffs in a specification that includes sectoral fixed effects and

[10] We use consumer price indices (CPIs) when producer price indices are not available. We also linearly interpolate quarterly inflation rates for a few countries that do not publish monthly rates.

[11] Additional results, including a specification using only nonzero price changes, are shown in the online Appendix.

TABLE 1—REGRESSION ANALYSIS OF CHINESE IMPORT TARIFFS USING MONTHLY DATA

		US imports			US exports			US retail
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tariffs 1 year	$\left(\sum_{l=0}^{11}\gamma_l\right)$	−0.057	0.005		−0.329	−0.259		0.035
		(0.023)	(0.025)		(0.089)	(0.089)		(0.020)
Differentiated	$\left(\sum_{l=0}^{11}\gamma_l\right)$			−0.035			−0.087	
				(0.034)			(0.096)	
Undifferentiated	$\left(\sum_{l=0}^{11}\gamma_l\right)$			−0.272			−0.383	
				(0.103)			(0.151)	
ERPT 1 year	$\left(\sum_{l=0}^{11}\beta_l^S\right)$		0.218	0.288		0.195	0.213	
			(0.023)	(0.026)		(0.018)	(0.023)	
PPI PT 1 year	$\left(\sum_{l=0}^{11}\beta_l^X\right)$		0.047	0.091		0.250	0.274	
			(0.033)	(0.037)		(0.038)	(0.045)	
Adjusted R^2		0.002	0.003	0.004	0.001	0.002	0.003	0.001
Observations		835,722	835,722	583,391	446,527	446,527	295,179	1,118,870
Sector fixed effects		Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Fixed effects $\left(\phi_{CN}^{\Omega}\right)$ and $\left(\phi_{CN}^{-\Omega}\right)$ are included in all regressions, but we do not report the coefficients in the table because they are not economically significant in all cases. Robust standard errors shown in parentheses.

the China-specific fixed effects ϕ. The estimated coefficient of -0.057 means, for example, that a 10 percent tariff would be associated with a 0.6 percent lower ex-tariff price and a 9.4 percent higher overall price faced by the importer. Column 2 estimates the tariff impact using a specification that also controls for exchange rates and the foreign producer price index. The tariff response drops to a value that is statistically indistinguishable from zero, while the ERPT estimate shows that when the dollar depreciates by about 10 percent, import prices rise by about 2.18 percent.

These results suggest that ex-tariff prices do not behave differently for goods affected by trade policy compared to those that were not affected, implying the tariffs exhibited nearly complete pass-through into the total import cost and that the incidence of the tariffs lies largely with the United States. Furthermore, as a practical matter, our findings suggest that the recent depreciation of the Chinese renminbi did not offset the impact of the tariffs for US importers. In the online Appendix, we show similar results when focusing on the US steel import tariffs that affected multiple countries.

Column 3 explores heterogeneity in the tariff pass-through rates across differentiated and undifferentiated goods, identified using the Rauch (1999) classification. Differentiated goods, for which substitutes are likely more difficult to locate, had no statistically significant decline in their pre-tariff export prices to the United States. The ex-tariff price of undifferentiated goods, such as agricultural goods or commodities, by contrast dropped by more than 25 percent of the tariff rate. These undifferentiated goods, however, account for less than 10 percent of affected US imports. As a result, their influence on the coefficients for overall imports is limited.

B. *US Exports*

In response to the US trade policies enacted in 2018, many countries imposed retaliatory measures on the United States. We now use data collected from sources gathered on the International Trade Administration website to study the stability of ex-tariff prices set by US exporters to foreign destinations. Interestingly, unlike the case of foreign exporters, we do find evidence that US exporters have on average significantly reduced their prices in response to foreign tariffs. This suggests that the retaliatory tariffs have meaningful incidence in the United States.

Figure 1, panel B, plots the ex-tariff prices of US exports. The vertical lines correspond to the dates on which different countries either initiated or increased their retaliatory tariffs.[12] Of course, the affected goods are different types of goods and exhibit greater price volatility even before the trade wars began. Nonetheless, the post-tariff period represents the first time when the price indices for the two types of goods move so differently, with the prices of unaffected goods highly stable and the prices of affected goods dropping by about 7 percent.

To elaborate on these findings, columns 4 and 5 in Table 1 report the results from estimating equation (1) on exports. We exclude the China-specific fixed effects because the sample includes exports to many other countries. Column 4 shows that there is about a 33 percent pass-through of the retaliatory tariff into ex-tariff US export prices after 12 months. That is, a 10 percent tariff imposed on US exports reduces US ex-tariff export prices by about 3.3 percent, while the cumulative one-year ERPT estimates are close to 20 percent.[13]

Why did US exporters drop their prices so much more when faced with foreign tariffs than foreign exporters did when faced with US tariffs? The answer is that undifferentiated goods represent more than half of US exports affected by the trade policies, much larger than their share of affected US imports. Column 6 parallels the exercise reported in column 3 and splits the export data into prices of differentiated and undifferentiated goods. Consistent with the results for imports, whereas the ex-tariff price of exports of differentiated goods did not change in a statistically significant way (and with a point estimate of only 8.7 percent), these prices dropped by a statistically significant 38 percent for undifferentiated goods. As elaborated in the online Appendix, these undifferentiated goods, many of which are agricultural products, are in an accounting sense driving the decline in US export prices in response to the retaliatory tariff.

II. US Retail Prices

Having established the behavior of US import prices, we now ask how the tariffs impacted prices further downstream in the US economy, such as by retailers to final consumers. Overall, while we find some evidence that the tariffs have passed through into higher retail prices, the effects are clearly more muted than what we demonstrated for total import prices, implying that—at least so far—retailers have

[12] China was the first to initiate retaliatory tariffs in April 2018 and expanded them in July, August, and September. The European Union, Mexico, and Turkey initiated retaliatory tariffs in June 2018, followed by Canada in July 2018, Russia in August 2018, and India in June 2019.

[13] Retaliation from China accounts for about three-quarters of our observations. In the online Appendix, we separately estimate the effect of the retaliatory tariffs for US goods exported to China and elsewhere. Whereas shipments to countries other than China show no statistically significant decline in the ex-tariff export price, the effect is strong for exports to China, with an estimated one-year ex-tariff export price decline of about 45 percent.

absorbed much of the higher costs associated with the tariffs by earning lower margins on their sales.

A. *Data from the Largest US Retailers*

We start our retail-level analyses by studying daily prices for washing machines, handbags, tires, refrigerators, and bicycles, all product categories that were significantly impacted by the tariffs.[14] We obtain the data from the private firm PriceStats as well as from the Billion Prices Project (BPP), which collected them by scraping, at a daily frequency, the online web pages of over 30 large multichannel retailers in the United States. See Cavallo and Rigobon (2016) and Cavallo (2017) for a full description of these and closely related data.

Figure 2 shows price indices and inflation rates for these five types of goods, with both normalized on the date of the first tariff increase. The plot includes two vertical lines corresponding to the dates of tariff changes. All these goods, except for washing machines, were affected by the third round of Chinese tariffs.

In the case of washing machine prices, the impact of tariffs is clear-cut, with high and rapid pass-through to retail prices. These results are consistent with Flaaen, Hortaçsu, and Tintelnot (2019). In the online Appendix, we find similar results with the sectoral "laundry equipment" CPI provided by the BLS and show that the basic pricing patterns look the same for US brands, which likely are not directly affected by the tariffs, and for imported brands, which likely are affected. But how representative is this sector? Should we expect the same response in other sectors with large shares of products that are affected by the tariffs?[15]

Unlike washing machines, none of the other goods exhibited sharp price increases relative to trend, even nine months after the first tariffs were imposed. By the time the tariffs were increased to 25 percent, however, handbags, tires, and bicycles were experiencing unusually rapid price increases.

This simple visual evidence suggests that tariff pass-through is heterogeneous across goods. To try to reach more precise conclusions, we now move to a retail dataset that contains the country of origin and trade classification for individual goods, allowing us to know precisely which goods are affected by the tariffs.

B. *Two Retailers with Country of Origin Information*

We now turn to data collected daily from two large US retailers, both in the top ten in the United States in terms of revenues. For "retailer 1," our data entirely reflects what could be obtained from scraping its website, including a description of each product as well as its country of origin. For "retailer 2," we combine pricing data scraped online with the country of origin and a text product description that the retailer directly provided to us.

[14] We chose these products because they are relatively easy to identify in lists of harmonized codes affected by the tariffs. We study 700 washing machines from 16 retailers, 300 handbags from 12 retailers, 400 tires from 7 retailers, 5,000 refrigerators from 18 retailers, and 200 bicycles from 11 retailers.

[15] Among other differences in the tariffs relevant to these sectors, the washing machine tariffs applied to nearly all imports, regardless of provenance.

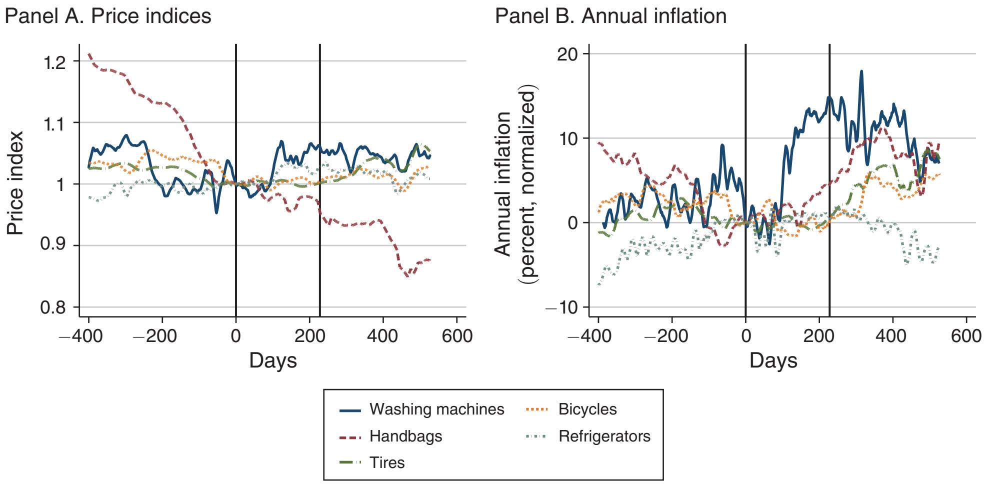

FIGURE 2. RETAIL PRICE IMPACT FOR SELECTED CONSUMER GOODS

Notes: Figure 2 compares price indices for washing machines and four other goods categories affected by the Chinese tariffs. The x-axis shows the number of days since the tariffs were imposed on each good category: January 22, 2018, for washing machines and September 24, 2018, for all other goods. All price indices are normalized to 1 on day 0. The vertical line on day 228 marks the time when the tariff rates for the non-washing machine categories were increased from 10 percent to 25 percent, as reported by Bown and Kolb (2020).

Given these data, the key challenge is to associate each product with an HS code so we can determine which are in categories affected by each wave of tariffs placed on China. We do this with a service provided by 3CE Technologies, a private company that specializes in automated commodity classifications for trade purposes.[16] In some cases, the algorithm can generate a mapping directly from the product description without any additional information. In other cases, we asked a group of research assistants to respond manually to the additional questions required by the 3CE algorithm to help refine its match, such as whether a product is made of wood or plastic. Roughly three-quarters of the total products then were classified automatically, with the remainder being done manually.

Our data includes more than 90,000 products covering nearly 2,000 different six-digit HS categories. Roughly two-thirds of the products, about 60,000, are imported from one of more than 80 countries. About 44,000 products are imported from China, with 36,000 of those—or 38 percent of the total—in categories affected by the tariffs.[17]

We start by plotting the daily retail price indices separately for those products imported from China that were affected by the tariffs, products imported from China that were unaffected, products not imported from China but in categories that were affected, and products not imported from China and in categories that were unaffected. Looking at the inflation rates in Figure 3, panel A, it is difficult to discern any

[16] 3CE provides similar online classification tools for the US Census (https://uscensus.prod.3ceonline.com/).
[17] Additional details about the data are provided in the online Appendix. We cannot calculate the share of sales accounted for by the 38 percent of goods that are affected by tariffs because we do not have data on quantities or revenues.

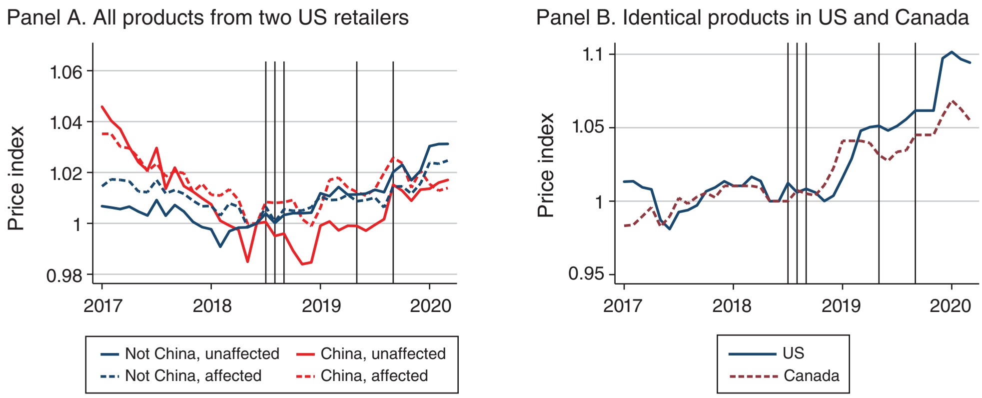

FIGURE 3. RETAIL PRICE INDEX RESPONSE TO CHINESE IMPORT TARIFFS

Notes: Figure 3, panel A, shows price indices using price data collected from the websites of two large US retailers. Country of origin details for each of the goods are either collected from the same websites or provided by the retailers. All individual goods are classified into import HS categories using either the product descriptions or information provided by the retailers. Figure 3, panel B, compares the price indices for the same goods sold by a large retailer in both the US and Canada. The goods in both countries were matched using model numbers. The vertical lines denote the months when tariffs were introduced or increased: July 2018 (25 percent on \$34 billion), August 2018 (25 percent on \$16 billion), September 2018 (10 percent on \$200 billion), May 2019 (increase the September 2018 wave to 25 percent), and September 2019 (15 percent on \$112 billion).

quantitatively important price differences brought about by the tariffs. The inflation rates in all groups behave similarly.

We then estimate a monthly regression specification similar to equation (1). We regress the change in retail prices on current and lagged tariff changes plus fixed effects, allowing for different price trends per sector and additionally different trends for the total sets of Chinese products that are and are not affected by the tariffs, where now the sectors k are defined as three-digit COICOP codes and where we no longer include information on producer prices nor exchange rates. The results, reported in column 7 of Table 1, imply that in response to a 10 percent tariff, the price of a typical affected import from China has only increased by about 0.35 percent relative to unaffected products in the same sector after 1 year.[18]

One might reasonably worry that measurement error in the sectoral classification algorithm is limiting our ability to identify larger differences in the retail price dynamics between products affected and unaffected by the tariffs. Incorrectly classifying affected products as belonging to HS codes that are not affected by the tariffs, or the reverse, would by construction bias the analysis by making the groups more similar. To look for evidence of this, in the online Appendix we consider two subsets of our data that are the least likely to contain sectoral classification errors. As expected, the regression coefficients rise, but their magnitude is still low, with a

[18] As elaborated in the online Appendix, we find some evidence for nonlinearities in the response to the imposition of tariffs. Splitting retail goods into those affected by tariffs of each size, we find that the price response to the 25 percent rate far exceeded that to the 10 percent rate. We do not emphasize this result, however, as the measurement must be made with only eight months of data and likely conflates compositional differences in the types of goods targeted by each tariff wave. The online Appendix contains tables that report the distribution of affected types of retail goods affected by each tariff wave as well as the associated pass-through rate for that type.

10 percent tariff increase associated with prices that are between 0.8 percent to 1.6 percent higher.[19]

An alternative possibility is that retailers increased their margins on unaffected goods to partially offset the margin reduction on affected goods, muting any changes in their overall margins. Indeed, some large US retailers have publicly stated that they are "spreading price increases" across good categories in response to the tariffs (Kapner and Nassauer 2019). This would stabilize the relative prices of affected and unaffected products within narrowly defined sectors and could explain the similar inflation patterns across goods shown in Figure 3, panel A, after the imposition of the tariffs. However, if this were the case, we would also expect to see the prices in affected US sectors rise relative to the prices in countries that did not impose tariffs on these goods. To find evidence, we therefore compare the prices for identical goods sold by retailer 2 in the United States and Canada. We identify 2,436 products that are sold by retailer 2 in both locations and plot the price indices separately for each country, using only the retail prices for those common goods in Figure 3, panel B.

These price indices do not suggest any particularly unusual dynamics in the US prices for these goods relative to the Canadian goods over the period that the tariffs were imposed.[20] In the online Appendix, we find similar results when using CPIs for affected and unaffected sectors in both countries as well as price indices for the same categories in six additional multinational retailers. We therefore conclude that retailer profit margins must be absorbing a significant amount of the adjustment to the US import tariffs.

C. *Other Adjustment Margins: Front-Running and Trade Diversion*

Given the nearly complete pass-through of tariffs to the prices of US imports from China and the relatively modest impact of those goods on consumer prices, retailer profit margins likely declined. In this subsection, we demonstrate two other margins along which retailers adjusted in response to the tariffs. First, we demonstrate that after the tariffs were announced, our two US retailers increased their volume of imports from China, perhaps in efforts to front-run the tariffs and build inventories of key products impacted by the tariffs before prices went up. Second, we show that while they imported almost entirely from China before the tariffs, they started diverting some of their orders to other countries once the tariffs were put in place.

In order to study the importing behavior of our two retailers, we make use of data provided by Datamyne, a private vendor of trade intelligence that collects maritime bills of lading.[21] We add together the tonnage imported each month by these companies and plot in Figure 4, panel A, a three-month moving average of the tonnage ordered from China and from the rest of the world. The solid blue line, showing tonnage (in thousands) imported from China, is around 70,000 tons and remains relatively flat from the third quarter of 2016 through the second quarter of 2017 but

[19] See Table A8 in the online Appendix.

[20] The exchange rate between the United States and Canada barely moved in this period.

[21] We can query keywords in the data and identify our two retailers by searching for bills of lading containing their names in any field.

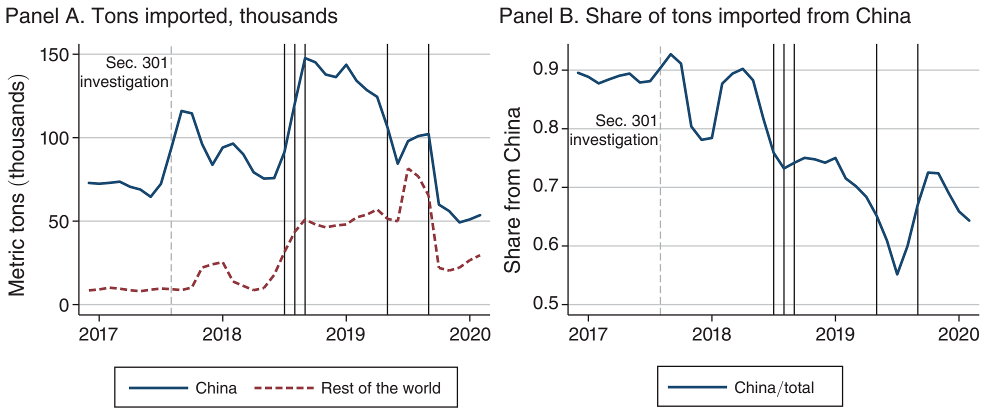

Figure 4. Front-Running and Trade Diversion by Two Major US Retailers

Notes: Figure 4, panel A, shows the total metric tons imported by two large US retailers identified in bill of lading data collected by Datamyne. The vertical lines denote the months when tariffs were introduced or increased: July 2018 (25 percent on $34 billion), August 2018 (25 percent on $16 billion), September 2018 (10 percent on $200 billion), May 2019 (increase the September 2018 wave to 25 percent), and September 2019 (15 percent on $112 billion). Figure 4, panel B, shows the share of total metric tons imported from China.

appears to jump in August 2017, the date indicated with the dashed vertical line. The vertical line is dashed rather than solid to indicate that the US Trade Representative was directed at that date to determine whether to initiate a section 301 investigation against China (and shortly thereafter did initiate the investigation). Imports appear to have increased rapidly at that point, presumably as firms wished to import supplies prior to the actual imposition of any tariffs. When tariffs were in fact announced, imports jumped further, before declining thereafter. Many of these goods were likely affected by the 10 percent tariff rate, and the importers may have wanted to stockpile them before the announced 25 percent tariffs on those same goods were instituted.

Figure 4, panel A, also shows that when the tariffs were introduced, these retailers first started importing nontrivial quantities from countries other than China. From a near-zero level, the red dashed line rises to 50,000 tons per month. As summarized in Figure 4, panel B, China's share of these firms' total imports was about 80–90 percent prior to the tariffs, then declined to about 60–70 percent since the late summer of 2018. Interestingly, this change took place quickly after the tariffs were imposed in mid-2018, but the level of trade diversion has not increased since early 2019. This suggests that it might take longer for these firms to make larger changes to their supply chains.

III. Conclusion

A rich literature theoretically characterizes the motivations behind enacting tariff policies and the potential implications they carry. Relatively little is known, however, about how economies in practice respond to tariffs, particularly when these trade policies involve large countries that have the potential to influence prices. Will the response of exporters be symmetric across countries and types of goods? How quickly will prices adjust? Will prices at the store adjust similarly to prices at the border? To answer these questions, we collect and analyze microdata on prices and characterize the reaction of importers, retailers, and exporters to US trade policy since 2018.

We find that tariffs passed through almost fully to US import prices, implying that much of the tariffs' incidence rests with the United States. In these same data, we find far lower rates of pass-through from exchange rate shocks into import prices, suggesting that the depreciation of the Chinese renminbi against the US dollar during the summer of 2019 did little to offset the impact of the tariffs. Furthermore, we show how the response of US exporters to foreign retaliatory tariffs was not symmetric. Foreign tariffs targeted undifferentiated goods exported by the United States, and US exporters significantly reduced their ex-tariff export prices on these goods, particularly on shipments to China. Finally, despite the rapid increase in the total cost of importing goods, we find more mixed evidence regarding retail price increases, which suggests that many US retailers reduced the profit margin on their sales of the affected goods.

Should we expect these same patterns to hold for the medium or longer term if the recently installed tariffs remain in place? We offer some evidence that importers to some extent front-ran the recent changes in trade policy and document an incipient trade diversion away from China. These nonprice margins of adjustment suggest that, so far, we may have only seen the short-run response to tariffs.

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