Beyond Tariffs: How did China's State–Owned Enterprises Shape the US–China Trade War? *

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Abstract

We study the impact of the 2018–2019 trade war between the US and China on US exports, focusing on the role played by a set of overlooked institutional features that characterize the bilateral trade relationship. Our main emphasis is on Chinese state–owned firms. Based on measures constructed from Chinese firm–level customs microdata, we show that the presence of state–owned enterprises (SOEs) in Chinese imports led to a large negative impact on US exports in addition to the effect of tariffs. Abstracting from general equilibrium effects, while tariffs account for a 9% decline in US exports to China, the SOE effect accounts for a 6% decline. This effect was concentrated in the last several months of 2018, point at which a vast majority of products had been already targeted by tariffs. This SOE effect was concentrated among agricultural goods, industrial supplies, and among industries located in US regions with a high share of republican votes. We also find that US exports were rerouted to the rest of the world in response to Chinese tariffs, but not in response to reduced imports by Chinese SOEs. Finally, we examine other institutional features, and show that the prominence of related–party trade and China's processing trade customs regime in certain products led to a substantially milder impact of Chinese tariffs on US exports.

Keywords: Trade war, Trade policy, Tariffs, US Exports, State–Owned Enterprises

JEL classification: F1

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1 Introduction

In a major departure from its long–standing trade policies, in 2018 the US became engaged in an unprecedented trade war with China. In this paper, we document that key institutional features of the US–China bilateral trade relationship, so far overlooked by the literature, shaped the impact of the trade war on US exports.

Our main emphasis is on the role played by Chinese state–owned enterprises (SOEs), which account for about a fifth of Chinese imports from the US.[1] These firms, under government control, could presumably have been used as a trade barrier against US exports in addition to tariffs, as anecdotal evidence has implied.[2] As a suggestive example, Figure 1 plots US exports of crude petroleum oil to China and to the rest of the world. As Bown and Lovely [2020] point out, state–owned enterprises import the bulk of energy products to China, and for this specific product the SOE import share is 100% (measured in 2015). This product did not face retaliatory Chinese tariffs during the trade war, yet the figure shows how US exports to China fell substantially and suddenly (coinciding with the timing of the first broad round of tariffs in mid 2018), and were actually equal to zero in August through October 2018 and January 2019.

To analyze the role of Chinese SOEs formally and systematically, we exploit variation across products in the presence of Chinese state–owned firms as importers from the US, using measures constructed from restricted–use customs data.[3] We find, indeed, that after controlling for the effect of tariffs, US exports fell relatively more during the trade war in products with a high

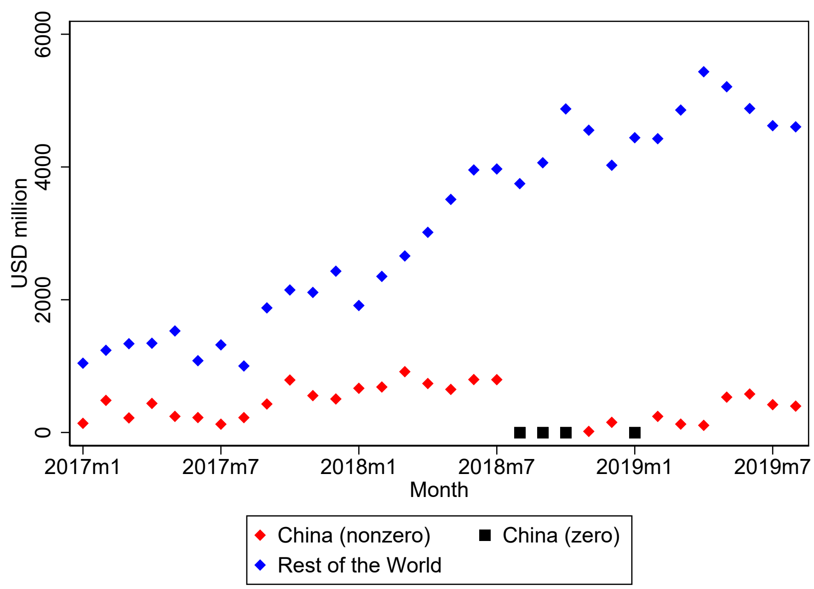
[1] Based on data for 2015, the latest year available, Chinese state–owned firms participate in 22% of all Chinese imports from the US.

[2] For example, press reports indicate that the Chinese government instructed state–owned enterprises to halt purchases of soybeans in the midst of the trade war. See: https://www.cnbc.com/2020/06/01/china-asks-state-firms-to-halt-purchases-of-us-soybeans-pork-sources-say.html

[3] We rely on variation across products in the share of Chinese imports from the US imported by SOEs in 2015 (the latest year available). After the trade war, Chinese authorities have stopped publishing trade by SOE status at the product level, nor has firm–level customs data corresponding to the trade war period been released.

Chinese import share by state–owned enterprises. We calculate that, abstracting from general equilibrium effects, the effect of SOEs led to a 6% decline in US exports to China. In comparison, Chinese tariffs explain a 9% decline. An event–study approach rules out pre-existing trends, and indicates that the decline in US exports in "high–SOE" products was concentrated during the months of September through December of 2018. This interval coincides with a period during which Chinese authorities were "running out" of products to apply tariffs on, and its end coincides with the negotiations that froze the tariff escalation temporarily.[4]

Figure 1: US exports of crude petroleum oil to China and to the rest of the world



Notes: This figure plots US exports of crude petroleum oil (HS 4-digit code 2709) to China and to the rest of the world. For exports to China, months with exports equal to zero are marked in black. This product had a 100% state-owned firm import share in 2015.

This SOE effect was heterogenous across sectors, and was concentrated among agricultural goods and industrial supplies. We also find evidence suggestive of the SOE effect being politically–guided. We construct a measure of the extent to which industries' employment in

[4]By September 2018, China had imposed tariffs on 93.5% of HS10 products imported from the US, accounting for 71.2% of value imported in 2017. After the G20 summit in December 2018, the US and Chinese presidents agreed to halt the escalation of tariff rates (scheduled for January 1 2019) for 90 days.

the US is located in republican–voting areas, and find that the SOE effect is associated to a decline in US exports only among "republican industries". This complements the evidence on tariffs shown by Fajgelbaum et al. [2020] and Fetzer and Schwarz [2021] who find that retaliatory tariffs targeted republican counties.

We study two other institutional features that shaped the impact of Chinese tariffs on US exports. The first one consists of China's processing trade customs regime.[5] About 14% of Chinese imports from the US take advantage of this regime, under which they do not pay tariffs as long as they are used in the production of exported goods. We document that the impact of tariffs on US exports was very mild in products with a high processing trade share. In addition, the bilateral trade relationship is characterized by the presence of related–party trade, which accounts for nearly a quarter of US exports to China and has historical roots in the process of China's market reforms and globalization, during which FDI played a key role. [Tseng and Rodlauer, 2003, Hammer, 2006]. We find that Chinese tariffs had a much smaller effect on US exports in products with a large share of related–party trade. This is consistent with the notion that by avoiding double marginalization, prices under related–party trade are more responsive to shocks, and thus the adjustment of trade volumes is smaller [Neiman, 2010].

Institutional arrangements are not prominent in the theory or the empirical analysis of trade policy. In particular, the use of SOEs as a tool of trade policy has not been demonstrated in this or other contexts. Our findings imply that these institutional aspects should play a more central role in our understanding of the effects of trade policy. This is especially true in the context of developing countries, in which state–owned enterprises are ubiquitous [Kowalski et al., 2013].

[5] China's processing trade customs regime is described and analyzed in detail by Brandt et al. [2021] and Brandt and Morrow [2017].

In the last part of the paper, we examine the ability of the US to "escape the trade war" by rerouting to other destinations exports hit by Chinese tariffs or by the action of Chinese SOEs. Switching markets might be a gradual process, given frictions in finding new buyers or inactivity due to uncertainty about the duration of the trade war. For this reason, we adopt a dynamic specification. Looking at US exports to the rest of the world (i.e. excluding China), and controlling for tariffs at the destination, we find that products facing Chinese tariffs have seen an increase in exports to other destinations. In contrast, we find that US exports in products with a large presence of SOEs in Chinese imports have not seen a significant rerouting to other destinations. Compared to tariffs, the action by SOEs is less visible or transparent from the standpoint of a US exporter. In addition, the duration of actions by SOEs might be more uncertain than in the case of tariffs. In fact, we documented that the reduction in US exports in high–SOE products appears to be concentrated in the last few months of 2018. All this could drive the result that, differently from tariffs, there is no "escaping" the actions of SOEs.

Related Literature Our paper contributes to a growing literature studying the consequences of the US–China trade war. This literature has both quantified the consequences of these policies on US welfare [Fajgelbaum et al., 2020, Amiti et al., 2019] and analyzed its impact on trade flows [Fajgelbaum et al., 2020, Amiti et al., 2019, Cavallo et al., 2021, Handley et al., 2020, Benguria and Saffie, 2019].[6] Regarding the trade war's impact on US exports, Fajgelbaum et al. [2020] and Amiti et al. [2019] analyze US exports to the world as a whole, finding a negative impact of foreign retaliatory tariffs and little impact on export unit values. Cavallo et al. [2021] study tariff pass–through on export prices using data from the Bureau of Labor Statistics' (BLS)

[6] Other work assessing the impact of the 2018–2019 trade war includes Flaaen et al. [2020]'s study of import tariffs on washing machines imposed on various US trading partners between 2012 and 2018; Amiti et al. [2020a]'s analysis of the impact on US investment; Blanchard et al. [2019]'s assessment of the political effects of the trade war on the US; Flaaen and Pierce [2019]'s analysis of its impact on US manufacturing; and Benguria and Saffie [2020]'s study of its impact on US local labor markets.

International Price Program, and find an incomplete tariff pass–through, driven by undifferentiated products. Finally, Handley et al. [2020] focus on the impact of US tariffs on US exports to all destinations through input–output linkages.

Building on this literature, the key differentiating factor of our work is the focus on the institutional arrangements that characterize US–China trade. Within this, our main contribution lies in uncovering the role played by state–owned firms, which seem to act as an additional instrument of trade policy and have not been studied as such in the existing literature.

Given the decline in US exports to China in products facing tariffs and SOEs, our second novel contribution to the 2018–2019 trade war literature consists in quantifying the extent to which US exports can be rerouted away from China. These results are important in order to understand the mechanisms behind the loss in US welfare as a result of the trade war, and from a policymaking standpoint.

2 Data Sources and Context

To analyze the impact of the 2018–2019 trade war on US exports, we use a panel of trade flows and tariffs, combined with product–level data from several sources that characterize the institutional features of the US–China trade relationship. We sketch our data sources here and provide further details in Appendix A.1.

We use a monthly panel of US export values, quantities and unit values by HS10 product and destination which spans the period from January 2016 to August 2019. MFN and retaliatory foreign tariffs are obtained from Fajgelbaum et al. [2020]. In addition, we use data from Bown et al. [2019] on reductions in China's MFN tariffs at various points in 2018 and 2019 and the suspension of trade war tariffs on certain products in January 2019. We also consider the increase in trade war tariff rates by China imposed in June 2019.

China's Imports by State–Owned Firms We use confidential firm–level Chinese customs data to create product–level measures of import shares by state–owned firms. The raw data reports imports by firm, source country, and product and distinguishes state–owned firms from the rest. We use the most recent available year, 2015. For each HS4 product, we compute the share of Chinese imports from the US imported by state–owned firms as follows:

$$\text{Share SOE}_p = \frac{\text{Imports SOE}_p}{\text{Total Imports}_p}. \tag{1}$$

We have verified the resulting shares match exactly the tabulations that Bown and Lovely [2020] and Hammer and Jones [2018] report for some specific sectors. Appendix Figure A.2 provides an histogram for this measure across HS4 products showing wide variation in this measure, and Appendix Table A.1 reports summary statistics. Further, Appendix Table A.2 lists the sectors with the highest and lowest SOE shares.

Other Institutional Arrangements: Processing Trade Customs Regime and Related–Party Trade We also construct product–level measures of the share of Chinese imports from the US imported under China's processing trade customs regime. Imports under this regime are not subject to import tariffs, and must be used in the production process of goods that will be exported.[7] Finally, we use the US Census Bureau's related–party trade database to compute product–level shares of US exports to China traded among related parties.[8]

[7] Brandt and Morrow [2017] describe China's processing trade regime in detail. As they point out, in practice there are two slightly different processing trade regimes, which we group together.

[8] Appendix Tables A.3 and A.4 list sectors with the highest and lowest processing trade customs regime and related–party trade shares.

Other data Supplementary data includes elasticities of substitution obtained from Broda et al. [2006] and product categories based on the US Census Bureau's End–Use classification. We also use Chinese import flows by source country, HS8 product and month during the period January 2016–June 2019.

3 The Impact of Tariffs and SOEs on US Exports to China

We now turn to analyzing the impact of the 2018–2019 trade war on US exports to China, emphasizing the role played by three prominent *institutional features*: the role of Chinese state–owned firms, China's processing trade customs regime, and related–party trade.

We start by documenting the overall impact of Chinese retaliatory tariffs on US export values, quantities and prices during the 2018–2019 trade war. To this end, we estimate the following regression through OLS. The literature has already established that retaliatory tariffs were unanticipated and can be treated as as exogenous [Fajgelbaum et al., 2020, Amiti et al., 2019], allowing for a clean identification of their impact.

$$\Delta \log Y_{pt} = \beta_1 \cdot \Delta \log(1 + \tau_{pt}) + \gamma_p + \delta_{st} + \epsilon_{pt} \,. \tag{2}$$

In this expression, p stands for an HS10 product, s for an HS2 sector, and t for each time period (year–month). The dependent variable $\Delta \log Y_{pt}$ is the 12–month log change (between t and $t-12$) in each outcome (export values, quantities or unit values) and $\Delta \log(1+\tau_{pt})$ stands for the 12–month log change of one plus the ad–valorem Chinese statutory tariff rate. These tariffs are the sum of the MFN and the additional retaliatory *trade war* tariff. We include product (HS10) and sector (HS2) $\times$ time fixed effects, and cluster the standard errors at the level of HS6 products. This specification is analogous to that in Amiti et al. [2019], but focusing only on US exports to China.

The results are shown in columns 1 through 3 in panel A in Table 1. A one percent higher tariff is associated to a 0.75 percent decline in the exported value (column 1) and a 0.97 percent decline in the exported quantity (column 2).[9] For unit values ("prices"), the coefficient in column 3 is closer to zero and not statistically significant, which implies a nearly full pass–through onto foreign domestic prices.[10,11]

We also find these estimates mask a large heterogeneity across sectors in the impact of these tariffs. In Appendix Table A.6 we split the sample according to end–use categories. For export values, we find the largest pass–through coefficients among industrial supplies and consumer goods, and a negative but smaller and not statistically significant coefficient for food and agricultural goods and for capital goods.[12]

3.1 How did Institutional Features Shape the Impact of the Trade War on US Exports?

The bilateral relationship between the US and China is characterized by the following institutional features that, as we will show, are essential to understanding the impact of the trade war

[9] Abstracting from general equilibrium effects, the coefficient in column 1 implies that Chinese tariffs account for a 9.3% decline in US exports to China. For this calculation, we use the the mean tariffs (weighted by exported value) in January 2018 and in August 2019, which were 4.7% and 19.4% respectively, such that $e^{-0.747\times(log(1+0.194)-log(1+0.047))} = -9.3\%$

[10] In Appendix Table A.5 we show results point in the same direction when relaxing the sector × time fixed effects, replacing them by time fixed effects, which is the specification used in Amiti et al. [2020a]. In that case, the coefficients for the effect of tariffs on export value and quantity are larger, and closer in magnitude to [Amiti et al., 2020a]'s estimates based on world exports.

[11] The result that foreign retaliatory tariffs do not reduce unit values are consistent with [Fajgelbaum et al., 2020, Amiti et al., 2019]. Cavallo et al. [2021] finds a negative impact of foreign tariffs on US export prices using data from the BLS International Prices Program, which allows them to track prices of narrowly defined products sold by a given firm over time.

[12] For industrial supplies and consumer goods, for which the effect is statistically significant, a one percent higher tariff is associated to a 1.2% and 1.4% decline in the exported value respectively.

on trade flows. A first key institutional feature is the existence of Chinese state–owned firms. In 2015, imports by state–owned firms from the US account for 22% of total imports from the US. These state–owned firms' imports can presumably be directed more easily by the Chinese government. There have been many accounts of the role played by Chinese state–owned firms during the trade war, including for example the case of US soybean exports, in which state–owned firms account for about 25% of total imports (based on 2015 data). We show below that during the trade war, US exports declined more in "high–SOE" products relative to the previous period.

A second institutional feature of the bilateral trade relationship is the presence of related–party trade.[13] A relevant fraction (24%) of US exports occur within related–parties. Finally, the third institutional feature we consider consists of China's processing trade customs regime. A fraction (14%) of China's imports from the US take place under this regime in which imports are duty–free if the goods produced using them are later exported. We show below that the impact of Chinese tariffs on US exports differed substantially based on the prominence of related–party trade or the use of the processing trade regime in different sectors.

We first focus on the role of state–owned firms, which we consider the main contribution of this paper. We then discuss the other institutional features, which, as we show, mitigate the impact of tariffs on trade flows.

Chinese SOEs and US exports State–owned firms might be used as an additional tool by the Chinese government to reduce imports from the US during the trade war. Indeed, we find that in products with a historically high participation of state–owned firms in Chinese imports from the US, US exports fell during the trade war compared to the preceding months.

[13] Historically, foreign owned enterprises and joint ventures played a significant role in the opening of the Chinese economy [Tseng and Rodlauer, 2003, Hammer, 2006].

To show this formally, we augment equation (2) including an interaction term between the product-level share of imports by state–owned firms (SOE share$_p$, defined in equation (1)) and a dummy variable equal to one after the trade war with China starts in April 2018.[14,15]

$$\Delta \log Y_{pt} = \beta_1 \cdot \Delta \log(1 + \tau_{pt}) + \beta_2 \cdot \mathrm{TW}_t \times \cdot \mathrm{SOE\ share}_p + \gamma_p + \delta_{st} + \epsilon_{pt}\,. \tag{3}$$

The results are shown in columns 4 through 6 in panel A in Table 1. In column 4, for export values, the negative coefficient on the interaction term indicates that, after controlling for the effect of Chinese tariffs, US exports fell during the trade war relative to the previous period in products with higher SOE shares. To interpret the magnitude of the coefficient, consider that the average SOE share (weighted by value) in our sample is 0.21. Evaluating the effect of the trade war at this mean SOE share, exports to China fell by 6% (=–0.28 × 0.21) during the trade war due to SOEs. The effect on quantities is similar in magnitude while the effect on prices is not statistically different from zero.

We explore several robustness checks. First, Appendix Table A.7 shows the results are similar if the trade war is assumed to start in March 2018 or January 2018. Second, Appendix Table A.8 shows that the results are robust to clustering by HS4 product. In addition, Appendix Table A.9 shows that the results are not driven by the oil sector. Next, we augment equation (3) allowing for an interaction between the SOE share and the tariff change (see Appendix Table A.10). This interaction term is not statistically significant – so high–SOE products do not

[14] In April 2, 2018, China imposed a first set of tariffs on the US in retaliation against US tariffs on steel and aluminum, which the US had imposed on all trading partners (with a few exceptions) on March 23, 2018. In addition, in April 3rd the US threatened to impose tariffs specifically on China following the release, in March 22nd, of the results of the investigation on China's trade practices related to intellectual property.

[15] The identification of the SOE effect during the trade war is based on comparing US exports across products from April 2018 onward relative to the previous months. Since the dependent variable is expressed in 12–month changes, effectively we are comparing the 12–month export growth for all months between January 2017 and March 2018 (for which $\mathrm{TW}_t = 0$) to that for months between April 2018 and August 2019.

Table 1: China's Tariffs, State-Owned Firms and US Exports

PANEL A: CHINA'S TARIFFS AND SOEs: OVERALL IMPACT

	(1) Value	(2) Quantity	(3) Unit Value	(4) Value	(5) Quantity	(6) Unit Value
$\Delta\log(1+\tau_{pt})$	-0.747***	-0.966***	0.140	-0.763***	-0.974***	0.132
	(0.246)	(0.357)	(0.167)	(0.248)	(0.361)	(0.169)
Trade War$_t$ $\times$ SOE share$_p$				-0.284***	-0.274*	-0.069
				(0.102)	(0.156)	(0.089)
Product (HS10) FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector (HS2) × Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	111070	90337	90337	110610	89912	89912

PANEL B: CHINA'S TARIFFS AND SOEs: IMPACT BY SECTORS

	(1) Food and Agric. Goods	(2) Industrial Supplies	(3) Capital Goods	(4) Consumer Goods	(5) High Republican Vote Share	(6) Low Republican Vote Share
$\Delta\log(1+\tau_{pt})$	-0.338	-1.159**	-0.389	-1.460**	-0.529	-0.670**
	(0.473)	(0.495)	(0.330)	(0.588)	(0.340)	(0.266)
Trade War$_t$ $\times$ SOE share$_p$	-0.822*	-0.407**	0.069	-0.277	-0.291**	-0.164
	(0.456)	(0.174)	(0.147)	(0.228)	(0.141)	(0.165)
Product (HS10) FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector (HS2) × Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7199	46787	38223	17668	53123	53002

Notes: Columns 1 through 3 in panel A report the estimation of equation (2). Columns 4 through 6 in panel A and columns 1 through 6 in panel B report the estimation of equation (3). The dependent variable is the 12-month log change (between t and $t-12$) in the exported value, quantity, or unit value. Each observation corresponds to a product (HS10) and time (year–month) combination. The sample consists of US exports to China. All columns include product (HS10) and sector (HS2) × time fixed effects. Standard errors are clustered by HS6 product. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

have a different tariff pass–through– and the interaction of the SOE share with the trade war dummy remains statistically significant. Finally, in Appendix Table A.12 we extend the sample considering exports to all countries. Based on a triple–difference specification, we show that during the trade war US exports to China declined in products with a high presence of Chinese SOEs, relative to US exports to other countries.[16]

State–owned firms could have had a different impact at different points of the trade war, and

[16] Further evidence in favor of the SOE effect comes from the finding that Chinese imports from countries other than the US increase in high–SOE products during the trade war. We show this using Chinese product–level customs data in Appendix A.6.2.

we explore this issue as follows. First, in Appendix Table A.11 we interact the SOE share variable with four dummy variables capturing different stages of the trade war; a first one is equal to one during April–August 2018, a second one equal to one during September–December 2018, and the last two equal to one during January–April and May–August 2019. We find a negative coefficient for the four periods, which implies lower US exports to China in high–SOE products relative to the period before the trade war. The SOE effect, however, is more than two times larger and estimated much more precisely during the September–December 2018 period. The effect is also statistically significant during April–August 2018 and during January–April 2019, but only at the 10% confidence level, and is not statistically significant for May–August 2019. An alternative and more flexible approach consists in interacting the product-level SOE share with time (year-month) dummy variables, and is discussed in Appendix A.6.1. This exercise shows, first, that there were no pre-existing trends in the SOE effect. It also confirms that the stronger negative impact of SOEs on US exports occurs during the last months of 2018. The timing during which exports in products with high–SOE shares decline is interesting, as it coincides with the point in time in which China was "running out" of products on which to impose retaliatory tariffs. While on July and August 2018, China imposed tariffs on an equal volume of trade than the US (approximately $50 billion), in September 2018 the US imposed tariffs on $200 billion, and China retaliated with tariffs on goods representing $60 billion in imports from the US. At that point, 93.5% of Chinese products were targeted by tariffs, accounting for 71.2% of the value imported from the US. This suggests that SOEs were used as a tool for retaliation with more force when imposing tariffs had become more difficult.

We now move on to documenting how this SOE effect was heterogeneous across sectors. In columns 1 through 4 in panel B in Table 1 we split the sample based on end–use categories. We find that the negative impact of SOEs on US exports is driven by the food and agricultural goods sector followed by the industrial supplies sector. Among the former, the −0.822 coefficient implies that exports fell by 17.4% (= −0.822 × 0.21) during the trade war due to SOEs. The coefficients are smaller and not statistically different from zero for capital and consumer goods.

The literature has documented that Chinese retaliatory tariffs might have been politically motivated as they were imposed on industries located in geographic regions with a high share of votes for the republican party, in power during 2018–2019 [Fajgelbaum et al., 2020, Fetzer and Schwarz, 2021]. In the same spirit, we examine whether the decline in US exports in products with a high SOE import share differentially impacted republican–associated industries. To this end, we construct a measure of the share of republican votes in the 2016 presidential election associated to each NAICS 6–digit industry based on the geographic location of industry employment. The construction of this measure is explained in detail in Appendix A.7. Based on this, in columns 5 and 6 in panel B in Table 1 we estimate equation (3) splitting the sample between industries with above– or below–median republican votes. We find evidence that the decline in Chinese imports from the US in high–SOE products appears to be politically–driven. The coefficient is nearly six times larger among the sample of industries with a high share of republican votes, and is statistically significant only within that sample. The magnitude of the coefficient implies a 6.2% (= −0.291 × 0.21) decline in exports among "republican industries" during the trade war due to SOEs.

How Related–Party Trade and China's Processing Trade Customs Regime Mediate the Impact of Tariffs on US Exports We now show how the effect of tariffs on US exports was significantly influenced both by the share of related–party trade and of processing trade in each product. First, we find a lower impact of tariffs on export values in products with higher shares of related–party trade. This is consistent with the notion that by avoiding double marginalization, prices under related–party trade are more responsive to shocks, and thus the adjustment of trade volumes is smaller [Neiman, 2010].[17]

We also find the share of value imported by China under its processing trade regime led to much lower tariff pass–through, which is explained simply by the fact that imports under that regime do not pay import tariffs.[18]. To show this, we extend equation (2) including an interaction term between the 12–month tariff change $\Delta\log(1+\tau_{pt})$ and each of these measures (captured by X_p) which were defined in detail in Section 2.

$$\Delta\log Y_{pt} = \beta_1 \cdot \Delta\log(1+\tau_{pt}) + \beta_2 \cdot \Delta\log(1+\tau_{pt}) \times X_p + \gamma_p + \delta_t + \epsilon_{pt} \tag{4}$$

We also include an interaction between $\Delta\log(1+\tau_{pt})$ and the product's elasticity of substitution, which is a more traditional determinant of tariff pass–through and which we find is not a relevant determinant in this case.

The results are reported in Table 2. In columns 1 through 3 each of the interaction between tariffs and each of these determinants are included separately, while in column 4 all are included jointly. Based on column 4, the total elasticity of export values to prices is –1.66 at the 25th percentile of the related–party share measure and –1.25 at the 75th percentile, and the coefficient on the interaction term is statistically significant.[19] At the same time, this total elasticity is –1.72 at the 25th percentile of the processing trade share and –1.29 at the 75th percentile. [20]

[17]This is consistent with findings in our earlier working paper [Benguria and Saffie, 2019].

[18]This result is consistent with contemporaneous work by Liu [2021], who studies the role of the processing trade regime based on Chinese imports customs data

[19]In this comparison the other variables are evaluated at their means.

[20]In Appendix Table A.14 we include the elasticity of substitution captured by an above or below median dummy variable, given its skewness. We find very similar results.

Table 2: Chinese Tariffs and US Exports: Institutional Determinants of Tariff Pass-through

	(1)	(2)	(3)	(4)
$\Delta\log(1+\tau_{pt})$	-1.574***	-1.380***	-1.303***	-1.836***
	(0.301)	(0.265)	(0.232)	(0.343)
$\Delta\log(1+\tau_{pt}) \times$ Related-party trade share$_p$	1.500**			1.576**
	(0.688)			(0.688)
$\Delta\log(1+\tau_{pt}) \times$ Processing trade share$_p$		1.057**		1.057**
		(0.512)		(0.514)
$\Delta\log(1+\tau_{pt}) \times$ Elast. Subst.$_p$			0.017	0.018
			(0.014)	(0.014)
Product (HS10) FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Observations	110294	109754	110799	108458

Notes: This table reports the estimation of equation (4). The dependent variable is the 12-month log change (between t and $t-12$) in the exported value. Each observation corresponds to a product (HS10) and time (year–month) combination. The sample consists of US exports to China. All columns include product and time fixed effects. Standard errors are clustered by HS6 product. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

4 Escaping the Trade War: Were US Exports Rerouted Away from Chinese Tariffs and SOEs?

Having established the negative impact of Chinese tariffs and SOEs on US exports, an important question that emerges is to what extent US exporters were able to "escape the trade war" by rerouting those exports to other markets. Quantifying the ability of US exporters to reroute exports facing Chinese tariffs and SOEs is important for our understanding of the reasons behind the welfare cost of the trade war for the US.

To address this question, we use a dynamic specification given that the adjustment can take place gradually over time. Extending Amiti et al. [2020b], we estimate the following regression:[21]

$$\log \mathrm{Y}_{cpt} = \sum_{k=--\underline{T}}^{\overline{T}} \beta_k \left(I_{cpk} \times \ln\left(\frac{1+\tau_{cpk}}{1+\tau_{cp0}}\right)\right) + \sum_{k=--\underline{T}}^{\overline{T}} \gamma_k \left(I_{pk}^{CHN} \times \ln\left(\frac{1+\tau_{pk}^{CHN}}{1+\tau_{p0}^{CHN}}\right) \times \mathrm{S}_{p0}^{CHN}\right)$$
$$+ \sum_{k=--\underline{T}}^{\overline{T}} \varphi_k \left(TW_k \times \text{SOE share}_{p0} \times \mathrm{S}_{p0}^{CHN}\right) + \eta_{cp} + \delta_{cst} + \epsilon_{cpt}\,. \tag{5}$$

In this equation, Y_{cpt} stands for US exports of HS10 product p to destination c at time t. The sample consists of exports to non–China destinations and each observation corresponds to a country–product (HS10)–time (year–month) combination.[22] The first term on the right–hand side captures the effect of tariffs in each destination. I_{cpk} is a treatment month indicator variable equal to one in the first month a tariff is raised and zero otherwise. This indicator is multiplied by the term $\ln\left(\frac{1+\tau_{cpk}}{1+\tau_{cp0}}\right)$ which captures the magnitude of the tariff increase, such that τ_{cpk} is the increased value of the tariff and τ_{cp0} is its previous value. The second term on the right–hand side captures the effect of Chinese tariffs. I_{pk}^{CHN} is a treatment month indicator variable equal to one in the first month a Chinese tariff on a given product is raised and zero otherwise. This is multiplied by $\ln\left(\frac{1+\tau_{pk}^{CHN}}{1+\tau_{p0}^{CHN}}\right)$ which measures the size of the Chinese tariff increase, such that τ_{pk} is the increased value of the tariff and τ_{p0} is its previous value. In addition, we multiply this term by the share of US exports in each HS10 product sold to China (as a fraction of total exports per product), S_{p0}^{CHN}. This share is measured prior to the trade war, in 2017. The reason for including this share S_{p0}^{CHN} is that the impact of Chinese tariffs on US exports to the rest of the world should be larger for products in which China represents a larger fraction of US exports.[23] The third term on the right–hand side captures the effect of

[21] Amiti et al. [2020b] estimate a regression including the first term on the right–hand side of equation (5) to analyze the effect of US import tariffs on US imports.

[22] We exclude from the sample US exports to Hong–Kong given its role as *entrepôt* of exports to China [Feenstra and Hanson, 2004], although this makes no difference for our results.

[23] In the limit, if the US does not export a product to China, Chinese tariffs should not have an impact on

Chinese SOEs, interacting the trade war dummy (equal to one for April 2018 onwards) with the SOE share in Chinese imports from the US in each product (computed in 2015), and with the share of US exports in each HS10 product sold to China (as a fraction of total exports per product), S_{p0}^{CHN}. We include country × product and country × sector (HS2) × time fixed effects. Standard errors are clustered by HS6 product. We include 8 leads and 12 lags in each of the right–hand side terms ($\underline{T} = 8$ and $\overline{T} = 12$).

First, Figure 2a plots the set of coefficients β_k capturing the dynamic impact of the rest of the world tariffs on US exports. There are no signs of pre-existing trends, and the negative impact of these retaliatory tariffs starts on impact and increases over time. After 4 months, the magnitude of the coefficients is such that a ten percent increase in rest of the world retaliatory tariffs is associated to a 5 percent decline in US exports to the rest of the world.

Figure 2b plots the coefficients γ_k which measure the dynamic impact of Chinese tariffs on exports to the rest of the world. We find a gradual rerouting of exports facing Chinese tariffs to other destinations: US exports to the rest of the world have increased relatively more in products targeted by Chinese retaliatory tariffs. For example, at month 4, the coefficient is such that a ten percent increase in Chinese tariffs is associated to a 1.2 percent increase in exports to the rest of the world.[24] This finding, new to the literature, implies that impact of the trade war on US exports is less than it would appear only from the effect of tariffs on exports to retaliating countries.

Figure 2c plots the coefficients φ_k. These measure the relative impact of the trade war on exports to the rest of the world in products with a high participation of Chinese SOEs. Unlike

exports to the rest of the world.

[24]The increase in exports to the rest of the world in response to a ten percent increase in Chinese tariffs is equal to $10\% \times 0.06 \times 1.95$, where 1.95 is the estimated γ coefficient corresponding to the third lag, and 0.06 is the mean US share in Chinese imports, S_{p0}^{CHN}.

the case of tariffs, we do not find signs of rerouting. Recall we documented in Section 3.1 a particularly large decline in US exports to China in high–SOE products not at the start of the trade war, but toward the last third of 2018. A relative increase in exports to the rest of the world in high–SOE products is not seen even during this period. What could explain then the difference between the response to Chinese tariffs and Chinese SOEs? We conjecture that this could be due to the short and uncertain duration of SOEs' actions, and their lack of salience.

Finally, we ask whether there were geographic markets more likely to absorb US exports targeted by Chinese tariffs and SOEs. In Appendix Figure A.4 we report estimates for the coefficients γ_k estimating (5) separately for the largest markets for US exports, and find a rerouting toward East Asia and Europe, but not toward North America or Latin America.[25] In Appendix Figure A.5, in contrast, we show that the lack of rerouting in sectors with a large presence of Chinese SOEs was common across most geographic markets. The exception is North America, toward which we see an increase in exports concentrated in the first months of 2019.[26]

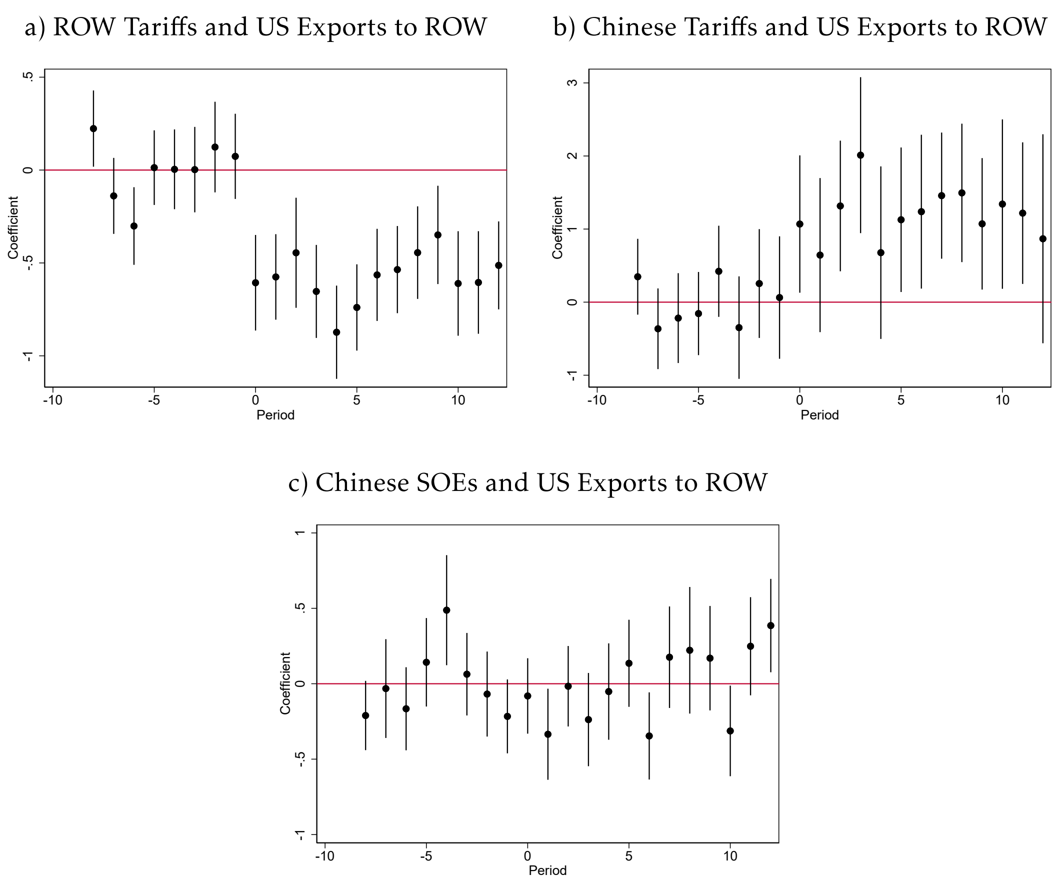
5 Conclusions

We have analyzed the impact of the US–China trade war on US exports, focusing on *institutional* features that characterize the bilateral trade relationship. Our main emphasis is on the role of state–owned enterprises, which account for more than a fifth of Chinese imports from the US. We have found evidence that, in addition to the effect of retaliatory tariffs, once the trade war began US exports declined substantially more in products with a high participation of state–owned enterprises. Our results imply that – ignoring general equilibrium effects – US

[25] Note that Mexico is included in North America, not Latin America.

[26] The fact that Chinese tariffs are associated to increased US exports to East Asia and Europe, while Chinese SOEs could be associated to increased exports to North America, could be due to differences in the product composition of exports targeted by Chinese tariffs and SOEs.

Figure 2: Chinese Tariffs, SOEs, and Exports Rerouting



Notes: This figure plots the coefficients obtained from the estimation of equation (5). Vertical bars represent 90% confidence intervals.

exports to China declined by 6% during the trade war due to Chinese SOEs. This SOE effect was concentrated primarily toward the end of 2018, and among agricultural goods and industrial supplies. We have also found evidence that the SOE effect was stronger among industries located in republican–voting US counties, suggesting a political motivation just like the literature has found for tariffs [Fajgelbaum et al., 2020, Fetzer and Schwarz, 2021]. Our work is the first to provide evidence on the use of state–owned enterprises as tools of trade policy, in *any* context. Further, it complements the emerging literature on the US–China trade war, which has been centered exclusively on the role of tariffs.

Given the large impact of the SOE effect, we ask whether US exports to China were able to "escape it" by rerouting exports to other destinations. We have shown that while US exports facing Chinese tariffs were gradually rerouted toward other markets, this was not the case for exports facing the reduced demand by Chinese SOEs.

Finally, we have examined two other prominent institutional features: related–party trade and China's processing trade customs regime. We have established how these two elements shape the impact of Chinese tariffs on US exports, which has been substantially lower among products with a high share of related–party trade or products which rely on China's processing trade customs regime.

To conclude, we conjecture that these institutional features that shaped the impact of the US–China trade war could also be determinant in other contexts, especially those involving developing countries or economies with a large participation of the public sector in international trade.

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A Appendix

A.1 Data Description

In this section we provide further details about the data used.

Trade flows and tariffs Trade data are obtained from the US Census Bureau "US Exports of Merchandise" publication. Retaliatory trade war tariffs are added to prevailing *most favored nation* (MFN) tariffs. Following Fajgelbaum et al. [2020], tariffs are assigned to the nearest month based on the date they are applied. While in most cases tariffs are reported at the HS 8–digit level, we follow the literature in measuring tariffs at the HS 6–digit level, which is the most disaggregate level that is comparable internationally. Retaliatory tariffs by China include the waves of April 2nd 2018, July 6th 2018, August 23rd 2018, September 24th 2018 and June 1st 2019. Other retaliating countries or regions include Canada (July 1st 2018), Mexico (June 5th 2018), the European Union (June 22nd 2018), Russia (August 6th 2018), Turkey (June 21st 2018) and India (June 16th 2019). Bown and Kolb [2019] provide a useful timeline of these policies.

Imports under China's processing trade customs regime These data are publicly available from China's Customs Agency and we use data for 2017, the latest year before the start of the trade war. We compute the share of imports under the processing trade customs regime by HS6 product.

Related–party trade We use data on related–party trade from 2017, reported for NAICS 6-digit industries. We use a concordance between US HS 10–digit codes and NAICS 6–digit codes provided directly by the US Census Bureau to add this measure to our exports panel. Ideally, one would use data on exports split into trade among related parties and arms–length trade during the trade war period. These data, however, are published at an annual frequency, whereas the analysis in this paper is monthly given the frequency of tariff changes.

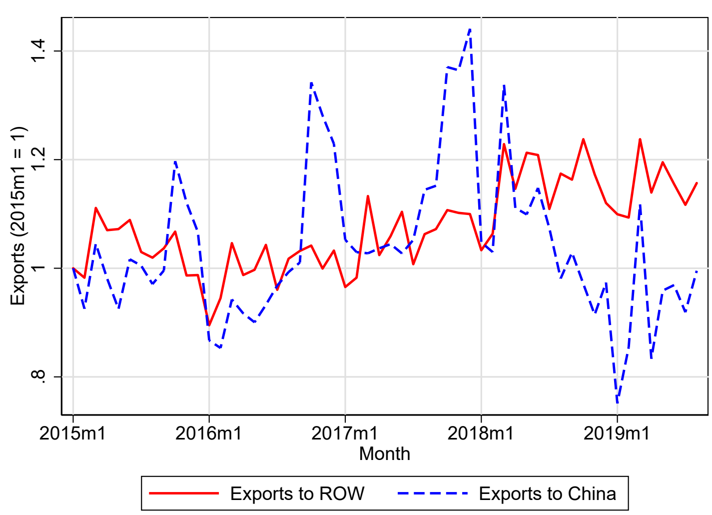
End–use classification The End–Use classification divides products into food and agricultural goods, industrial supplies, capital goods, and consumer goods. Originally, automobiles are a separate category. We assign passenger cars (end–use code 300) to consumer goods; trucks, buses and special purpose vehicles (301) to capital goods; and parts, engines, bodies, and chassis (302) to industrial supplies. The largest categories in exports to China are capital goods (accounting for 37.1% of total exports in 2017) followed by industrial supplies (34.9%), food and agricultural goods (14.1%), and consumer goods (13.5%).

Chinese product–level customs data These data are public and are obtained from the Chinese Customs Authority.

A.2 Trends in US Exports

US exports to China have seen a sharp fall during 2018 and the first months of 2019. Appendix Figure A.1 plots exports to China and the rest of the world at a monthly frequency from January 2015 to August 2019. Exports to the rest of the world increased by 8.7% comparing 2017 against the period January 2018 to August 2019 on a monthly basis, while exports to China fell by 12.2% in the same period.[27] These patterns vary substantially across sectors. Grouping sectors by the Census Bureau's end–use categories, and comparing 2017 against Jan. 2018–August 2019 on a monthly basis, the largest decline occurs in the food and agricultural sector, with a 48.3% drop in exports to China, while exports to the rest of the world increased by 6.1%. Exports of consumer goods and industrial supplies to China also fall substantially, by 15.5% and 14.8%, while exports in these categories to the rest of the world increase by 4.7% and 16.0%. Exports of capital goods to China fare better, as they increase by 5.1%, while exports to the rest of the world increased by 4.5%.

Figure A.1: Exports to China and to the Rest of the World

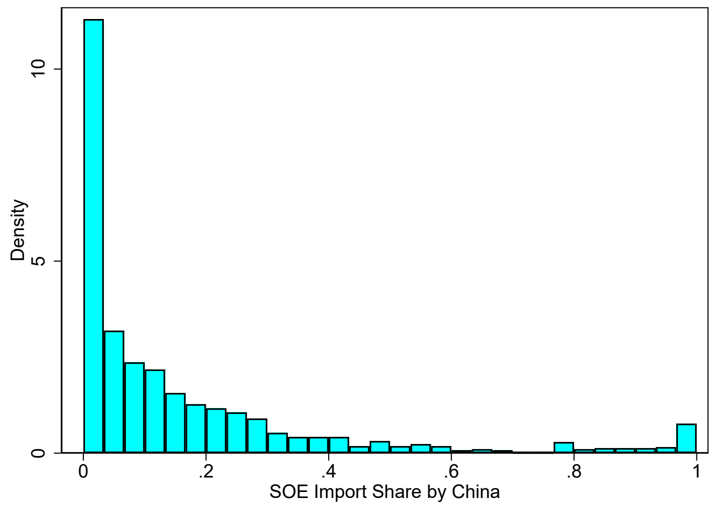


Notes: This figure plots US exports to China and to the rest of the world, normalized to 1 in January 2015.

[27]In contrast, US exports to China had increased more than exports to the rest of the world between 2016 and 2017 (12.3% vs 6.0%).

A.3 China's State-Owned Firms and US Exports: Descriptive Statistics

Figure A.2: Histogram of Import Share by State-Owned Enterprises Across HS4 Sectors for Chinese Imports from the US



Notes: This figure plots an histogram of the distribution across HS4 sectors of the share of Chinese imports from the US imported by SOEs in 2015, as defined in equation (1).

Table A.1: Summary Statistics of SOE share

	Mean	St. Dev	p10	p25	p50	p75	p90
SOE share	0.166	0.235	0	0.008	0.075	0.219	0.466

Notes: This table reports summary statistics of the distribution across HS4 sectors of the share of Chinese imports from the US imported by SOEs in 2015, as defined in equation (1).

Table A.2: List of HS2 Sectors with Highest and Lowest SOE Share of Chinese Imports from the US

Rank	HS2	HS2 Name	SOE share
Panel A: Highest SOE share			
1	24	Tobacco and manufactured tobacco substitutes	0.98
2	31	Fertilisers	0.90
3	49	Printed books, newspapers, pictures and other products	0.70
4	55	Man-made staple fibres	0.69
5	86	Railway/tramway locomotives, etc.	0.67
6	22	Beverages, spirits and vinegar	0.56
7	10	Cereals	0.52
8	88	Aircraft, spacecraft, and parts thereof	0.52
9	75	Nickel and articles thereof	0.51
10	23	Residues and waste from the food industry; etc.	0.51
Panel B: Lowest SOE share			
1	45	Cork and articles of cork	0.00
2	98	UN Special Code	0.00
3	46	Manufactures of straw, esparto and other plaiting	0.00
4	79	Zinc and articles thereof	0.00
5	64	Footwear, gaiters and the like; parts of such articles	0.00
6	14	Vegetable plaiting materials; vegetable products nes	0.00
7	66	Umbrellas, walking-sticks, seat-sticks, whips, etc.	0.01
8	16	Preparations of meat, fish, etc.	0.01
9	80	Tin and articles thereof	0.01
10	2	Meat and edible meat offal	0.02

Notes: This table reports the share of Chinese imports from the US in 2015 imported by SOEs, computed at the HS2 sector level.

A.4 Related-Party Trade and Processing Trade Customs Regime: Descriptive Statistics

Table A.3: List of HS2 Sectors with Highest and Lowest Processing Trade Share of Chinese Imports from the US

Rank	HS2	HS2 Name	Processing Trade share
PANEL A: HIGHEST PROCESSING TRADE SHARE			
1	46	Manufactures of straw, esparto and other plaiting	0.86
2	67	Prepared feathers and down; etc.	0.82
3	64	Footwear, gaiters and the like; parts of such articles	0.81
4	79	Zinc and articles thereof	0.72
5	58	Special woven fabrics, etc.	0.64
6	85	Electrical machinery and equipment, etc.	0.61
7	60	Knitted or crocheted fabrics	0.53
8	5	Products of animal origin, nes.	0.51
9	76	Aluminium and articles thereof	0.47
10	52	Cotton	0.46
PANEL B: LOWEST PROCESSING TRADE SHARE			
1	2	Meat and edible meat offal	0.00
2	4	Dairy products, etc.	0.00
3	97	Works of art, collectors' pieces and antiques	0.00
4	93	Arms and ammunition; etc.	0.00
5	98	UN Special Code	0.00
6	66	Umbrellas, walking-sticks, seat-sticks, whips, etc.	0.00
7	24	Tobacco and manufactured tobacco substitutes	0.00
8	6	Live tree and other plants; etc.	0.00
9	1	Live animals	0.00
10	31	Fertilisers	0.00

Notes: This table reports the share of Chinese imports from the US in 2017 imported under China's processing trade customs regime, computed at the HS2 sector level.

Table A.4: List of HS2 Sectors with Highest and Lowest Related-Party Trade Share of Chinese Imports from the US

Rank	HS2	HS2 Name	Related-Party Trade share
Panel A: Highest Related-Party Trade share			
1	57	Carpets and other textile floor coverings	0.71
2	30	Pharmaceutical products	0.65
3	31	Fertilisers	0.63
4	87	Vehicles o/t railw/tramw roll-stock, pts & acc	0.59
5	50	Silk	0.51
6	65	Headgear and parts thereof	0.49
7	85	Electrical machinery and equipment, etc.	0.47
8	37	Photographic or cinematographic goods	0.45
9	68	Art of stone, plaster, cement, asbestos, etc.	0.44
10	51	Wool, fine/coarse animal hair, etc.	0.44
Panel B: Lowest Related-Party Trade share			
1	1	Live animals	0.00
2	43	Furskins and artificial fur; etc.	0.00
3	98	UN Special Code	0.00
4	2	Meat and edible meat offal	0.00
5	5	Products of animal origin, nes.	0.01
6	41	Raw hides and skins, etc.	0.01
7	97	Works of art, collectors' pieces and antiques	0.01
8	16	Preparations of meat, fish, etc.	0.01
9	14	Vegetable plaiting materials; etc.	0.01
10	46	Manufactures of straw, esparto and other plaiting	0.01

Notes: This table reports the share of Chinese imports from the US in 2016 classified as related-party trade, computed at the HS2 sector level.

A.5 Chinese Tariffs and US Exports: Additional Results

This section reports additional results regarding the effect of Chinese tariffs on US exports. These results are described in the main text, but we also provide a brief outline here.

- Appndix Table A.5 estimates equation (2) with an alternative set of fixed effects. In this case the sample is restricted to t = Jan. 2018 onward to be able to compare our results to the literature.
- Appndix Table A.6 estimates equation (2) splitting the sample into four mutually-exclusive groups based on end-use categories.

Table A.5: The Impact of Chinese Tariffs on US Exports: Alternative Fixed Effects

	Value (1)	Quantity (2)	Unit Value (3)
$\Delta\log(1+\tau_{pt})$	-1.249***	-1.632***	0.162
	(0.222)	(0.269)	(0.128)
Product (HS10) FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Observations	69202	56315	56315

Notes: This table reports the estimation of equation (2). The dependent variable is the 12-month log change (between t and $t-12$) in the exported value, quantity, or unit value. Each observation corresponds to a product (HS10) and time (year–month) combination. The sample consists of US exports to China and is restricted to t = Jan. 2018 onward. All columns include product (HS10) and sector (HS2) × time fixed effects. Standard errors are clustered by HS6 product. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

Table A.6: The Impact of Chinese Tariffs on US Exports by End-Use Sectors

	(1) Food and Agricultural Goods	(2) Industrial Supplies	(3) Capital Goods	(4) Consumer Goods
$\Delta\log(1+\tau_{pt})$	-0.446	-1.164**	-0.384	-1.381**
	(0.479)	(0.491)	(0.330)	(0.585)
Product (HS10) FE	Yes	Yes	Yes	Yes
Sector (HS2) × Time FE	Yes	Yes	Yes	Yes
Observations	7303	47112	38232	17676

Notes: This table reports the estimation of equation (2). The dependent variable is the 12-month log change (between t and $t-12$) in the exported value. Each observation corresponds to a product (HS10) and time (year–month) combination. The sample consists of US exports to China. All columns include product (HS10) and sector (HS2) × time fixed effects. Standard errors are clustered by HS6 product. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

A.6 China's State-Owned Firms and US Exports: Additional Results and Robustness Checks

This appendix presents additional results and robustness checks regarding the effect of Chinese SOEs on US exports. These results are described in the main text, but we also provide a brief outline here.

- In Appendix Table A.7 we revisit our baseline regression for the effect of SOEs on US exports (equation (3)) showing the results are robust to assuming the trade war with China starts in March 2018 or January 2018 instead of April 2018.

- In Appendix Table A.8 we revisit our baseline regression for the effect of SOEs on US exports (equation (3)) clustering standard errors by HS4 product.

- In Appendix Table A.9 we revisit our baseline regression for the effect of SOEs on US exports (equation (3)) but exclude oil and related products (HS2 = 27) from the sample.

- In Appendix Table A.10 we revisit our baseline regression for the effect of SOEs on US exports but allow for an interaction of the SOE share with the change in tariffs. We augment equation (3) and estimate the following equation:

$$\Delta \log \mathrm{Y}_{pt} = \beta_1 \cdot \Delta \log(1+\tau_{pt}) + \beta_2 \cdot \mathrm{TW}_t \cdot \mathrm{SOE\ share}_p + \beta_3 \cdot \Delta \log(1+\tau_{pt}) \cdot \mathrm{SOE\ share}_p + \gamma_p + \delta_{st} + \epsilon_{pt}\ . \tag{A.1}$$

- In Appendix Table A.11, we revisit our baseline regression for the effect of SOEs on US exports (equation (3)) but allow for a different effect of SOEs on US exports for each of the following periods: April-August 2018, September-December 2018, Jan.-April 2019 and May-Aug. 2019.

- In Appendix Table A.12 we revisit our baseline regression for the effect of SOEs on US exports but consider US exports to all countries and show that US exports to China declined in sectors with a high SOE share relative to US exports to other countries. For this purpose, we augment equation (3) and estimate the following equation:

$$\Delta \log \mathrm{Y}_{cpt} = \beta_1 \cdot \Delta \log(1+\tau_{cpt}) + \beta_2 \cdot \mathrm{TW}_t \times \mathrm{SOE\ share}_p \times \mathrm{China}_c + \gamma_{cp} + \delta_{pt} + \eta_{cst} + \epsilon_{cpt}\ , \tag{A.2}$$

  where c stands for a destination country and China_c is equal to one for exports to China and zero otherwise.

Table A.7: China's State-Owned Firms and US Exports: Alternative Timing

	(1)	(2)	(3)
Trade War From:	Jan. 2018	March 2018	April 2018
$\Delta\log(1+\tau_{pt})$	-0.759***	-0.760***	-0.763***
	(0.248)	(0.248)	(0.248)
Trade War$_t$ × SOE share$_p$	-0.179*	-0.236**	-0.284***
	(0.108)	(0.103)	(0.102)
Product (HS10) FE	Yes	Yes	Yes
Sector (HS2) × Time FE	Yes	Yes	Yes
Observations	110610	110610	110610

Notes: This table reports the estimation of equation (3). The dependent variable is the 12-month log change (between t and $t-12$) in the exported value. Each observation corresponds to a product (HS10) and time (year–month) combination. In columns 1 and 2, TW_t is equal to one starting in January and March 2018 respectively. In column 3, TW_t is equal to one starting in April 2018 (as in the main text). All columns include product and sector (HS2) × time fixed effects. Standard errors are clustered by HS6 product. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

Table A.8: China's State-Owned Firms and US Exports: Alternative Clustering

	(1)	(2)	(3)
	Value	Quantity	Unit Value
$\Delta\log(1+\tau_{pt})$	-0.763***	-0.974***	0.132
	(0.252)	(0.361)	(0.173)
Trade War$_t$ × SOE share$_p$	-0.284***	-0.274	-0.069
	(0.104)	(0.170)	(0.099)
Product (HS10) FE	Yes	Yes	Yes
Sector (HS2) × Time FE	Yes	Yes	Yes
Observations	110610	89912	89912

Notes: This table reports the estimation of equation (3). The dependent variable is the 12-month log change (between t and $t-12$) in the exported value, quantity, or unit value. Each observation corresponds to a product (HS10) and time (year–month) combination. The sample consists of US exports to China. All columns include product (HS10) and sector (HS2) × time fixed effects. Standard errors are clustered by HS4 product. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

Table A.9: China's State-Owned Firms and US Exports: Excluding Oil

	(1) Value	(2) Quantity	(3) Unit Value
$\Delta\log(1+\tau_{pt})$	-0.804***	-1.015***	0.118
	(0.247)	(0.361)	(0.170)
Trade $\text{War}_t \times \text{SOE share}_p$	-0.278***	-0.287*	-0.051
	(0.102)	(0.158)	(0.091)
Product (HS10) FE	Yes	Yes	Yes
Sector (HS2) × Time FE	Yes	Yes	Yes
Observations	109567	88869	88869

Notes: This table reports the estimation of equation (3). The dependent variable is the 12-month log change (between t and $t-12$) in the exported value, quantity, or unit value. Each observation corresponds to a product (HS10) and time (year–month) combination. The sample consists of US exports to China, and excludes oil and related products (HS2 code 27). All columns include product (HS10) and sector (HS2) × time fixed effects. Standard errors are clustered by HS6 product. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

Table A.10: China's State-Owned Firms and US Exports: Including Interaction of SOE share with Change in Tariffs

	Value (1)	Quantity (2)	Unit Value (3)
$\Delta\log(1+\tau_{pt})$	-1.489***	-1.359**	-0.360
	(0.461)	(0.550)	(0.261)
$\Delta\log(1+\tau_{pt}) \times \text{SOE share}_p$	-0.160	-1.413	0.445
	(1.312)	(1.795)	(0.875)
Trade $\text{War}_t \times \text{SOE share}_p$	-0.252**	-0.173	-0.109
	(0.111)	(0.160)	(0.099)
Product (HS10) FE	Yes	Yes	Yes
Sector (HS2) × Time FE	Yes	Yes	Yes
Observations	57511	46958	46958

Notes: This table reports the estimation of equation (3). The dependent variable is the 12-month log change (between t and $t-12$) in the exported value, quantity, or unit value. Each observation corresponds to a product (HS10) and time (year–month) combination. The sample consists of US exports to China. All columns include product (HS10) and sector (HS2) × time fixed effects, with sectors defined at the HS2 level. Standard errors are clustered by HS6 product. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

Table A.11: China's State-Owned Firms and US Exports: Splitting the Trade War Dummy by Subperiods

	(1) Value	(2) Quantity	(3) Unit Value
$\Delta\log(1+\tau_{pt})$	-0.764***	-0.982***	0.140
	(0.248)	(0.362)	(0.170)
Trade War (April 2018 - Aug. 2018)$_t \times$ SOE share$_p$	-0.181*	-0.130	-0.092
	(0.109)	(0.169)	(0.108)
Trade War (Sep. 2018 - Dec. 2018)$_t \times$ SOE share$_p$	-0.520***	-0.582***	-0.021
	(0.143)	(0.211)	(0.119)
Trade War (Jan. 2019 - April 2019)$_t \times$ SOE share$_p$	-0.248*	-0.149	-0.197
	(0.142)	(0.221)	(0.128)
Trade War (May 2019 - Aug. 2019)$_t \times$ SOE share$_p$	-0.212	-0.277	0.044
	(0.150)	(0.235)	(0.129)
Product (HS10) FE	Yes	Yes	Yes
Sector (HS2) × Time FE	Yes	Yes	Yes
Observations	110610	89912	89912

Notes: This table reports the estimation of equation (3). The dependent variable is the 12-month log change (between t and $t-12$) in the exported value, quantity, or unit value. The sample consists of US exports to China. Each observation corresponds to a product (HS10) and time (year–month) combination. The sample consists of US exports to China. All columns include product and time fixed effects. Standard errors are clustered by HS6 product. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

Table A.12: China's State-Owned Firms and US Exports: Entire World Sample

	(1) Value	(2) Quantity	(3) Unit Value
$\Delta\log(1+\tau_{cpt})$	-0.737***	-0.600***	-0.243***
	(0.145)	(0.198)	(0.092)
Trade War$_t \times$ China$_c \times$ SOE share$_p$	-0.259**	-0.216	-0.077
	(0.117)	(0.167)	(0.094)
Country × Product (HS10) FE	Yes	Yes	Yes
Product (HS10) × Time	Yes	Yes	Yes
Country × Sector (HS2) × Time FE	Yes	Yes	Yes
Observations	1831261	1397825	1397825

Notes: This table reports the estimation of equation (A.2). The dependent variable is the 12-month log change (between t and $t-12$) in the exported value, quantity, or unit value. Each observation corresponds to a country-product (HS10) and time (year–month) combination. The sample consists of US exports to all destinations. All columns include country × product (HS10), product (HS10) × time and country × sector (HS2) × time fixed effects. Standard errors are clustered by HS6 product. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

A.6.1 China's State-Owned Firms and US Exports: Dynamic Framework

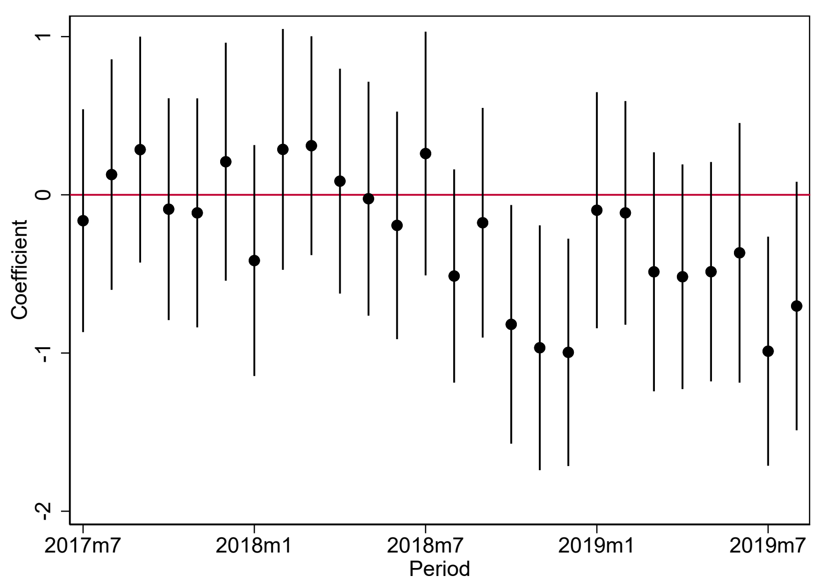
We complement the analysis in the main text of the effect of China's SOEs on US exports augmenting equation (3) to include the interaction between the SOE share in each product and time (year–month) dummy variables as shown in equation (A.3). This allows us to rule out pre-existing trends and to describe the dynamics of this SOE effect.

$$\Delta \log \, Y_{pt} = \beta_1 \cdot \Delta \log(1+\tau_{pt}) + \beta_2 \cdot \Delta \log(1+\tau_{pt}) \times \text{SOE share}_p + \sum_{k=\underline{T}}^{\overline{T}} \gamma_k \times \mathbb{1}[k=t] \times \text{SOE share}_p + \gamma_p + \delta_{st} + \epsilon_{pt} \,. \tag{A.3}$$

As in Table 1 in the main text, the sample consists of exports to China between $\underline{T}$ =January 2017 and $\overline{T}$ =August 2019, each observation corresponds to a HS10 product p and time (year–month) t combination, and standard errors are clustered by HS6 product. The dependent variable is the 12-month log change (between t and $t-12$) in the exported value. We also include the interaction between the tariff change and the SOE share as a regressor, although results are similar excluding this term.

The results are shown in Appendix Figure A.3 and discussed in Section 3.1 in the main text.

Figure A.3: US exports and Chinese SOEs



Notes: This figure plots the coefficients obtained from the estimation of equation (A.3). Vertical bars represent 90% confidence intervals.

A.6.2 SOEs and Chinese imports from ROWs

Using data on Chinese imports by source country, product (HS8), and month obtained from the Chinese customs agency, we show that China increased its imports from the rest of the world (i.e. all countries excluding the US) during the trade war in sectors with a high SOE share (defined in eq. (1)) of Chinese imports from the US.[28]

We estimate the following triple–difference regression in a sample consisting of imports from all countries except the US. In this equation, TW_t is a dummy equal to one after the onset of the trade war (from April 2018 onwards) and zero otherwise. US import share$_p$ is the share of imports from the US out of total Chinese imports in each HS8 product, measured in 2017. This term is included because the need to replace imports by SOEs from other sources is proportional to the share imported from the US. We include fixed effects by country × product and country × time (year–month). We cluster standard errors by HS6 product.

$$\begin{aligned}\Delta\log \mathrm{Y}_{cpt} &= \beta_1 \cdot \mathrm{TW}_t \cdot \text{SOE share}_p + \beta_2 \cdot \mathrm{TW}_t \cdot \text{US import share}_p \\ &\quad + \beta_3 \cdot \mathrm{TW}_t \cdot \text{SOE share}_p \cdot \text{US import share}_p + \gamma_{cp} + \nu_{ct} + \epsilon_{cpt} \,. \end{aligned} \tag{A.4}$$

The results are shown in Appendix Table A.13. For conciseness, only the coefficients on the triple interaction term are shown. In column 1, we find a positive coefficient on the triple interaction which is almost but not statistically significant at conventional levels. It indicates that there is a differential effect of the SOE share on sectors with high vs. low US import shares during the trade war.[29]

In column 2 we divide the trade war dummy into three different dummies, equal to one during April to August 2018, September to December 2018, and January to June 2019 respectively. We see a positive coefficient in the second and third periods. The coefficient is larger and statistically significant only for September to December 2018. This implies that during the same period in which we see a *decline* in US exports to China in sectors with a higher SOE share (see Appendix Table A.11 and Appendix Figure A.3), here we find an *increase* in Chinese imports from the rest of the world. Thus, this is further evidence in favor of the SOE effect found using US exports data in the main text.

[28] These data cover the period January 2016 to June 2019.

[29] To evaluate the magnitude of this effect, consider the elasticity $\frac{d\Delta\log \mathrm{Y}_{cpt}}{d\mathrm{TW}_t}$ elasticity evaluated at the mean US import share and at the 25th and 75th percentiles of the SOE share (which takes values 0.014 and 0.039 respectively).

Table A.13: China's State-Owned Firms and Chinese Imports from ROW

	(1)	(2)
Trade War$_t$ $\times$ US import share$_p$ $\times$ SOE share$_p$	0.298	
	(0.182)	
Trade War (April 2018 - Aug. 2018)$_t$ $\times$ US import share$_p$ $\times$ SOE share$_p$		-0.038
		(0.247)
Trade War (Sep. 2018 - Dec. 2018)$_t$ $\times$ US import share$_p$ $\times$ SOE share$_p$		0.458*
		(0.257)
Trade War (Jan. 2019 - June. 2019)$_t$ $\times$ US import share$_p$ $\times$ SOE share$_p$		0.340
		(0.223)
Country $\times$ Product (HS8) FE	Yes	Yes
Country $\times$ Time FE	Yes	Yes
Observations	1577439	1559198

Notes: This table reports the estimation of equation (A.4). Only the coefficients on the triple interaction term are shown, and the other coefficients are not statistically significant. The dependent variable is the 12-month log change (between t and $t-12$) in the imported value. Each observation corresponds to a country, product (HS8) and time (year–month) combination. The sample consists of China's imports from all countries except the US. All columns include country $\times$ product and country $\times$ time fixed effects. Standard errors are clustered by HS6 product. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

A.7 Definition of Industry-level Share of Republican Votes

We construct a measure of the share of republican votes associated to each NAICS 6-digit industry based on the geographic location of employment of each industry. We focus on the 2016 presidential election and use county-level electoral results and country by industry employment data to infer an approximate share of employment in each industry that is associated with Republican votes.

Let L_{jc} be employment in industry j in county c, and Share Votes Rep.$_c$ (Share Votes Dem.$_c$) be the share of Republican (Democrat) voters in the county.[30] The share of votes for Republicans in industry j is:[31]

$$\text{Share Votes Rep.}_j = \frac{\sum_c L_{jc} \cdot \text{Share Votes Rep.}_c}{\sum_c L_{jc} \cdot \text{Share Votes Rep.}_c + \sum_c L_{jc} \cdot \text{Share Votes Dem.}_c}. \tag{A.5}$$

The employment data to construct these measure is obtained from the year 2017 County Business Patterns dataset, and reported by NAICS 6-digit industry. This is complemented with BEA data for agricultural industries missing from CBP. The election data is obtained from the MIT Election Data + Science Lab.[32]

The industries with the largest share of votes for republicans are “325194 Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing” (83.7%), “212111 Bituminous Coal and Lignite Surface Mining” (81.3%) and “212391 Potash, Soda, and Borate Mineral Mining” (79.0%).

The industries with the lowest share of votes for republicans are “315240 Women’s, Girls’, and Infants’ Cut and Sew Apparel Manufacturing” (24.8%), “336415 Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing” (24.7%) and “316992 Women’s Handbag and Purse Manufacturing” (23.2%).

[30] We exclude the small amount of third-party votes.

[31] For example, if employment in automobile manufacturing is concentrated 100% in Detroit, and Detroit votes 30% Republican and 70% Democrat, then the share of votes for Republicans would be 30% for the auto industry.

[32] These data are available at https://electionlab.mit.edu/.

A.8 Related-Party Trade and Processing Trade Customs Regime: Additional Results

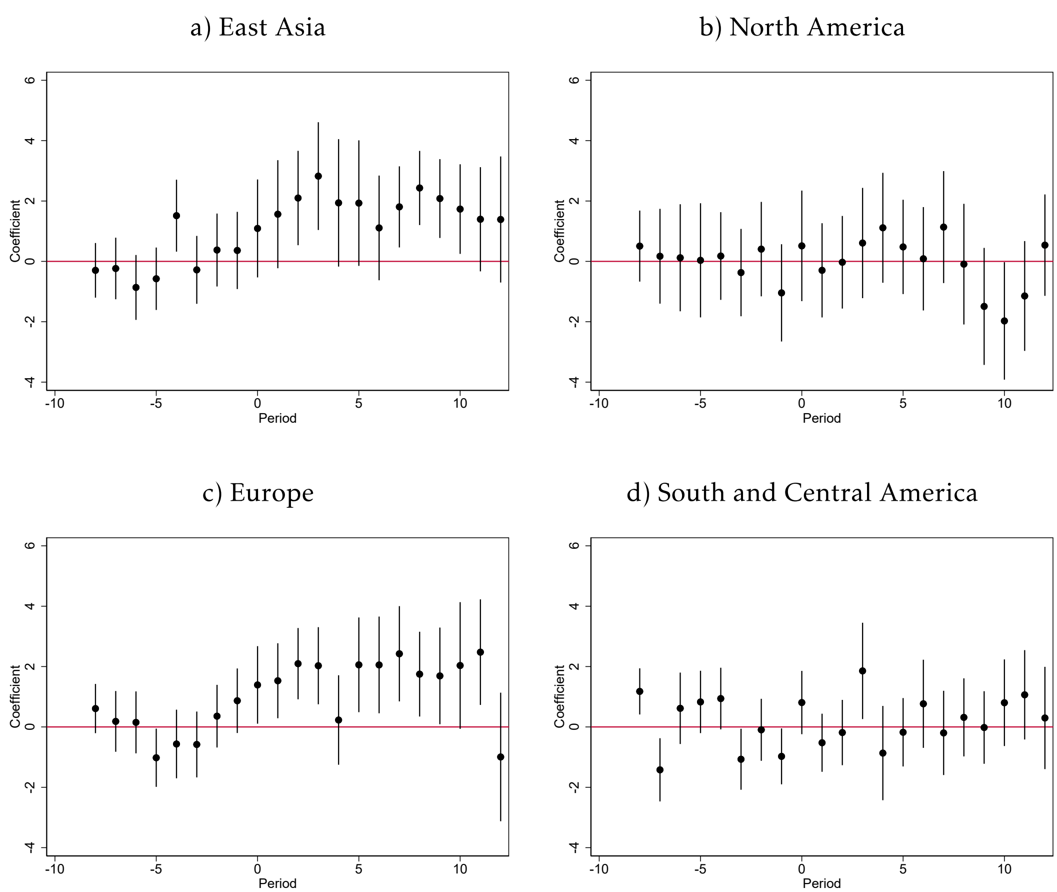
Table A.14: Chinese Tariffs and US Exports: Institutional Determinants of Tariff Pass-through

	(1)	(2)	(3)	
$\Delta\log(1+\tau_{cpt})$	-1.574***	-1.380***	-1.332***	-1.827***
	(0.301)	(0.265)	(0.232)	(0.321)
$\Delta\log(1+\tau_{cpt}) \times$ Related-party trade share$_p$	1.500**			1.528**
	(0.688)			(0.686)
$\Delta\log(1+\tau_{cpt}) \times$ Processing trade share$_p$		1.057**		1.064**
		(0.512)		(0.534)
$\Delta\log(1+\tau_{cpt}) \times$ Above median Elast. of Subs.$_p$			0.250	0.230
			(0.259)	(0.253)
Product (HS10) FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Observations	110294	109754	108458	108458

Notes: This table reports the estimation of equation (4). The dependent variable is the 12-month log change (between t and $t-12$) in the exported value. Each observation corresponds to a product (HS10) and time (year–month) combination. The sample consists of US exports to China. All columns include product and time fixed effects. Standard errors are clustered by HS6 product. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

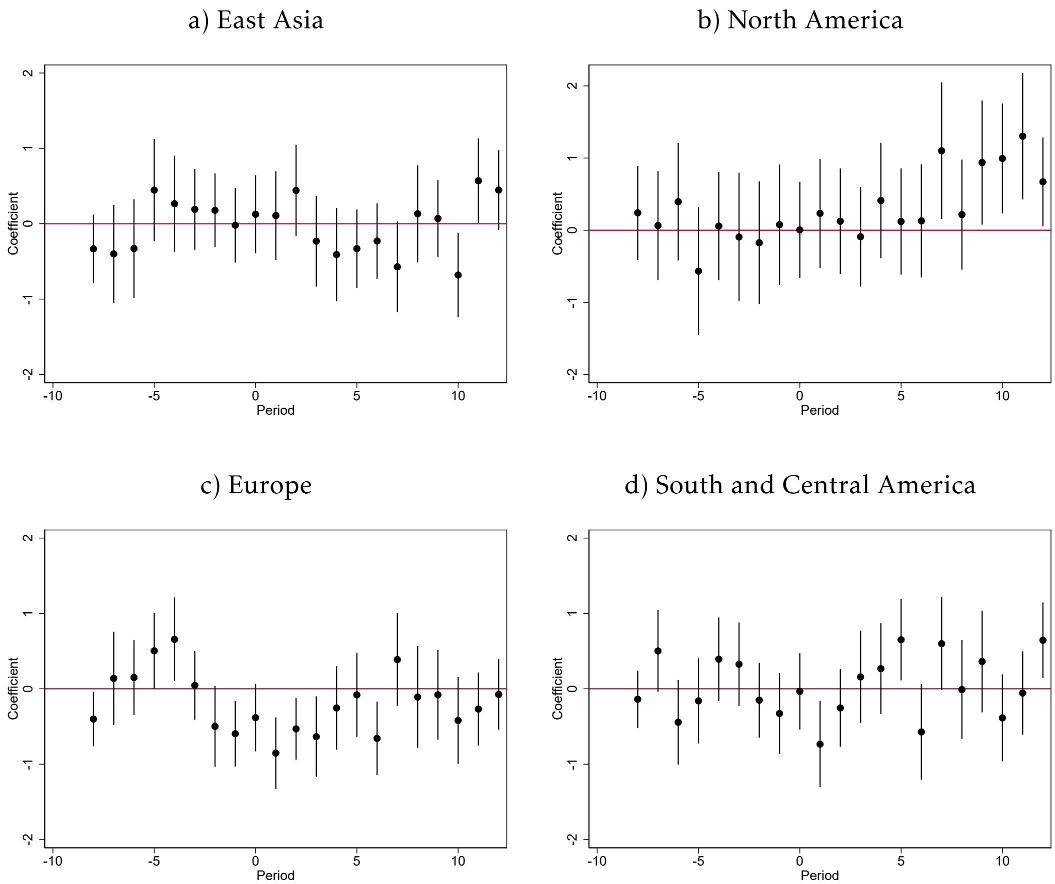
A.9 Escaping the Trade War: Were US Exports Rerouted Away from Chinese Tariffs and SOEs? Additional Results

Figure A.4: Chinese Tariffs and Exports Rerouting: Breakdown by Destinations



Notes: This figure plots the coefficients γ_k obtained from the estimation of equation (5). Vertical bars represent 90% confidence intervals.

Figure A.5: Chinese SOEs and Exports Rerouting: Breakdown by Destinations



Notes: This figure plots the coefficients φ_k obtained from the estimation of equation (5). Vertical bars represent 90% confidence intervals.