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ABSTRACT

How did the US-China trade war affect global trade? Surprisingly, exports of products taxed by US or China increased from "bystander" countries to the rest of world (excluding US and China). Hence, the trade war created trade opportunities rather than simply shifting trade across destinations. There was large cross-country variation in export growth of tariff-exposed products, explained mostly by country-specific components of tariff elasticities rather than by specialization patterns. Through a standard trade model, the signs of the tariff elasticities identify if a country complements or substitutes the US or China, and the slope of its supply curve. Countries that operate along downward-sloping supplies whose exports substitute (complement) US and China are among the larger (smaller) beneficiaries of the trade war.

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1 Introduction

In 2018 and 2019, the US and China engaged in a trade war, mutually escalating tariffs that ultimately covered approximately $450 billion in trade flows. These policies upended a decades-long trend toward lower global trade barriers and, unsurprisingly, reduced trade between the US and China, with escalated tariffs persisting until today.[1] While the US-China trade war can be seen as a turning point in the globalization era, it has also presented "bystander" countries with the opportunity to grow exports to the world's biggest economies.

Did other countries take over the US and Chinese markets? Did they reallocate exports away from the rest of the world? Affirmative answers would be consistent with substitution elasticities across exporters above one and with standard upward-sloping export supply curves. However, importers in the US and China may perceive products from certain origins as substitutes to Chinese or US varieties, respectively, and others as complements; in parallel, greater demand from the US or China could have raised global exports for bystander countries if supply curves slope downward. In addition, countries specialized in sectors with more elastic supplies may have responded more strongly. The trade war provides an opportunity to inspect the importance of these forces.

We first develop a simple framework to estimate countries' export responses to third-country tariffs. The empirical analysis is guided by a Ricardian-Armington trade model allowing substitution elasticities to be country-pair specific and above or below one; and for country- and sector-specific supply elasticities that may be downward sloping. Our first proposition derives, from a first-order approximation around an arbitrary equilibrium, an estimating equation that shows how a bystander's product-level exports to the US (China) and the rest of the world change with the US (Chinese) tariffs. Our second proposition shows that the estimated tariff elasticities of exports jointly identify: i) whether a country's exports substitute or complement the US or China; and ii) whether it operates along downward- or upward-sloping supply curves.

We implement the empirical analysis on global bilateral HS6-level trade data. We first estimate product-level export responses from exporters other than the US or China assuming common tariff elasticities across countries.[2] The first takeaway is that, on average, bystanders increased their exports to the US, barely changed their exports to China, and *increased* their exports to the rest of the world in products with higher US-China tariffs. So, while the US and China taxed each other, the average country increased its global exports in targeted products relative to untargeted products. Therefore, the trade war created net trade opportunities rather than simply shifting trade across destinations.

This initial approach assumes common tariff elasticities across countries, but these elasticities may vary by exporter, importer, sector, and size of the trade flow, as implied by the model.

[1] See Amiti et al. (2019), Cavallo et al. (2021), Fajgelbaum et al. (2020), Flaaen et al. (2020), Flaaen and Pierce (2019), and Waugh (2019), among others. Fajgelbaum and Khandelwal (2021) review the research that has examined the economic impacts of the trade war.

[2] Consistent with other findings in the literature, we find that the US and China reduced bilateral exports in products with larger tariff increases.

Our main estimation allows for this flexibility. Aggregating the predicted product-level export responses using pre-trade war export shares, we obtain, for each country, the predicted export growth in targeted products compared to non-targeted ones.

This flexible specification reveals a second takeaway: there is substantial cross-country heterogeneity in export growth in targeted products compared to non-targeted products. Moreover, this heterogeneity is largely driven by countries' export responses to the rest of world. Some countries such as Vietnam, Thailand, Korea, and Mexico were among the largest export "winners", in the sense that they better exploited trade opportunities in product markets with declining US or Chinese participation. The average export growth in taxed products across countries is 6.7% with a standard deviation across countries of 6.3% (compared to a standard deviation of just 1.3% implied by a specification with homogeneous tariff elasticities).

These cross-country differences in export growth in targeted products result from i) tariff elasticities that differ by country; and ii) tariff elasticities that differ by sector and size of the trade flow, combined with pre-war specialization patterns across products. Our third key takeaway is that the country-specific component explains the bulk – 82.8% – of the cross-country variation in export growth in targeted products. The combination of pre-war specialization and size-dependent or sector-specific tariff elasticities explains the remaining variation.

Having isolated the country-specific component as the key driver of heterogeneous export growth, we exploit our theoretical proposition to identify supply- and demand- channels. We find a subset of countries where the pattern of country-specific components across destinations suggests downward-sloping supplies. Moreover, many countries responded as complements to US and Chinese production, while others responded as substitutes. Importantly, the interaction of demand and supply heterogeneity in the elasticities matters: due to different patterns of demand substitution, countries operating along downward-sloping supplies can be found among those with the strongest and the weakest export growth. For example, Mexico, Thailand, Colombia, and Ukraine operate along downward sloping supplies; however, the former two are strong beneficiaries of the war because, as revealed by our estimates, they export products that substitute China in the US, while the latter are not because their products complement US or Chinese exports.

Our first result–that the average country increases global exports in products taxed by US or China–suggests an interdependency across export destinations. We rationalize this finding through downward-sloping supply curves at the product level. Morales, Sheu, and Zahler (2019) and Alfaro, Castro-Vincenzi, Fanelli, and Morales (2023) provide firm-level evidence consistent with complementarities via trade costs, such that exporting to a destination lowers the costs of exporting to similar destinations. Almunia, Antràs, Lopez Rodriguez, and Morales (2018) show that Spanish firms export more when the domestic market shrinks. Mau (2017) and Albornoz, Brambilla, and Ornelas (2021) show third-market effects after tariff reforms faced by Chinese and Argentinean firms, respectively. The result is also consistent with reallocations of supply chains. Flaaen et al. (2020) show that, for washing machines, product-specific capital migrates from China to other countries serving as export platform to the US. Our result suggests that export platforms

also increase exports to the rest of the world.

Our subsequent results –substantial cross-country heterogeneity in export growth consistent with country-specific demand and supply elasticities– is surprising given that trade or scale elasticities are typically assumed to vary across sectors rather than across countries. On the demand side, standard gravity models such as Anderson and Van Wincoop (2003) and Eaton and Kortum (2002), and multi-sector models such as Costinot, Donaldson, and Komunjer (2012) or Caliendo and Parro (2015), impose elasticities of substitution between imports from different origins that may be sector-specific but common across country-pairs, with typical estimates revealing substitution greater than one. In contrast, our trade-war responses are consistent with exporter-specific substitution elasticities with US or China that may be above or below one. Therefore, the results are broadly consistent with trade frameworks adopting flexible substitution patterns, such as Adao, Costinot, and Donaldson (2017) and Lind and Ramondo (2018).[3]

On the supply side, identifying scale economies has been a focus of empirical research; see Antweiler and Trefler (2002) and, more recently, Costinot, Donaldson, Kyle, and Williams (2019).[4] In standard applications, these scale elasticities vary by sector but not across countries, providing a rationale for industrial policies (Bartelme, Costinot, Donaldson, and Rodriguez-Clare, 2019; Lashkaripour and Lugovskyy, 2022).[5] We show that, in addition, a country-specific and often downward-sloping component of supply curves plays an important role, providing an additional basis for potentially country-varying optimal subsidies. Computing these subsidies would require the exact parameters values and modeling additional general-equilibrium aspects. These steps would be interesting for future research but lie outside our scope of analysis.

2 Framework

This section presents the framework that guides the empirical analysis.

2.1 Environment

Demand There is a set $\mathcal{I}$ of countries (indexed by i for exporters and n for importers) and a set Ω^j of products (indexed by ω) in sector $j = 1, ..., J$. Each product ω, in turn, is differentiated by origin i; a variety is $i\omega$. We let $p_{i\omega}$ be the price received by competitive producers of product ω

[3] Our empirical results are not inconsistent with general-equilibrium responses under particular input-output structures. For example, increasing exports to the rest of the world could reflect supply chains of some HS6 products becoming more dispersed across countries, as long as product-level input-output matrixes are heavy on the diagonal. Reyes-Heroles et al. (2020) shows that a trade framework with capital accumulation and input-output linkages predicts heterogeneous impacts of trade barriers across countries and sectors depending on factor intensities.

[4] Like Costinot et al. (2019), we do not quantitatively pin down the scale parameters, but rather propose a signs test for whether supplies are downward sloping. They show that the elasticities of exports to domestic and foreign demand reveal the slope of supply relative to the own-price demand elasticity. We show that the elasticity of exports to the country imposing a tariff and to the rest of the world identify the slope signs of supply and of the cross-price demand elasticity with respect to the country imposing tariffs.

[5] Other recent estimates of sector-specific supply elasticities with scale economies using a variety of approaches include Farrokhi and Soderbery (2020), and Breinlich et al. (2021).

in country i. In each country, imported and domestic varieties are aggregated, through a translog aggregator, into a non-traded good used either as input or for consumption. Hence, in destination n, the share of (tariff-inclusive) spending in product $\omega \in \Omega^j$ imported from origin i is:

$$s_{i\omega}^n = a_{i\omega}^n + \sum_{i' \in \mathcal{I}} \sigma_{i'i}^j \ln p_{i'\omega}^n, \tag{1}$$

where $p_{i\omega}^n$ is the tariff-inclusive price in country n.

The parameter $a_{i\omega}^n$ captures an idiosyncratic demand of country n for the variety $i\omega$. The semi-elasticities $\sigma_{i'i}^j$ are common across importing countries and capture the substitutability between products from i and i'. When $\sigma_{i'i}^j > 0$ ($\sigma_{i'i}^j < 0$), varieties i and $i' \neq i$ are substitutes (complements) within sector j, in the sense that an increase in the price of goods from i leads to increase (reduction) in the expenditure share (and quantity) purchased in goods from i'.[6] As we will only observe tariff variation imposed by US or China, we impose a common substitution elasticities within the sector: $\sigma_{ii'}^j = \sigma_{RW}^j$ for $i' \neq i$ and $i, i' \neq US, CH$.

A key feature of this demand system is that Chinese and American goods command country-specific substitution patterns. Goods from a given exporter i can substitute Chinese goods and complement American goods ($\sigma_{i,CH} > 0$ and $\sigma_{i,US} < 0$); while the opposite may be true for goods from another exporter.[7]

Supply Due to trade costs, $\tau_{i\omega}^n$ units of variety $i\omega$ must be shipped to n for one unit to arrive. Also, country n imposes ad-valorem tariffs $t_{i\omega}^n$ on imports of good ω from i. Letting $p_{i\omega} \equiv p_{i\omega}^i$ be the domestic price of variety i and assuming competitive pricing, the tariff-inclusive prices faced by consumers in country n are

$$p_{i\omega}^n = T_{i\omega}^n \tau_{i\omega}^n p_{i\omega} \tag{2}$$

where $T_{i\omega}^n \equiv 1 + t_{i\omega}^n$ is one plus the ad-valorem tariff. Total sales of ω in sector j from country i are:

$$X_{i\omega} \equiv A_{ij} p_{i\omega}^{\frac{1}{b_i^j}} Z_{i\omega}, \tag{3}$$

where b_i^j the inverse supply elasticity defined as the elasticity of price of total sales and $p_{i\omega}$ be the domestic price of variety i. The supply shifters are partitioned into an endogenous country-sector component A_{ij} and an exogenous cost shifter $Z_{i\omega}$. The former captures factor and input prices common across products within a sector. Changes in these costs due to tariffs are absorbed by fixed effects in our estimation. The supply curve is potentially downward sloping ($b_i^j < 0$); Appendix B.1 shows a standard micro-foundation where b_i^j combines returns to scale and an elasticity of factor mobility across products and sectors.[8]

[6] The elasticity of quantity to price is $\frac{\sigma_{i'i}}{s_{i\omega}^n}$. Additivity and symmetry of the substitution matrix require that $\sum_{i=1}^N a_{i\omega}^n = 1$ for all n and ω, as well as $\sigma_{i'i}^j = \sigma_{ii'}^j$ for all i, i', j and $\sum_{i' \in \mathcal{I}} \sigma_{ii'}^j = 0$ for all i, j.

[7] Most studies using a translog or almost-ideal demand system assume symmetric substitution elasticities (e.g., Novy 2012, Kee et al. 2008, Fajgelbaum and Khandelwal 2016, and Feenstra and Weinstein 2017).

[8] Other microfoundations include increasing returns with monopolistic competition as in Krugman (1980), reorganization (Caliendo and Rossi-Hansberg, 2012) or division of labor (Chaney and Ossa, 2013). The micro-foundation for factor mobility is standard (e.g., see Burstein et al. 2019 or Galle et al. (2023)).

Equilibrium The price of variety $i\omega$ in importer n is $p^n_{i\omega} = (1+\tau^n_{i\omega})\, t^n_{i\omega} p_{i\omega}$, where $\tau^n_{i\omega}$ is the ad-valorem tariff and $t^n_{i\omega}$ is the trade cost. A world equilibrium is given by prices $\{p_{i\omega}\}$ such that markets clear; i.e., the aggregate sales $X_{i\omega}$ given by (3) must equal aggregate expenditures:

$$X_{i\omega} = \sum_{n\in\mathcal{I}} \frac{s^n_{i\omega}}{T^n_{i\omega}} E^n_\omega. \tag{4}$$

where E^n_ω are country-n expenditures in product ω.

To complete the description of a fully-specified general equilibrium model, we would to determine the country-sector supply shifters A_{ij} and the product-sector demand shifters E^n_ω. However, we do not impose additional restrictions for the empirical analysis. The empirical specifications control for importer-exporter-sector fixed effects and for model-implied measures of the size of the trade flows. As a result, our analysis is consistent with a range of assumptions about internal and international factor reallocation.

2.2 Impact of US-China Tariffs on Bystanders' Exports

The following proposition summarizes how tariff changes imposed by the US or China impact exports to each destination:

Proposition 1. *Around an arbitrary initial equilibrium, to a first order approximation, exports $X^n_{i\omega}$ of product ω from exporter i to importer n change according to:*[9]

$$\begin{aligned}\Delta \ln X^n_{i\omega} =& \beta^n_{1i\omega} \Delta \ln T^{US}_{CH,\omega} + \beta^n_{2i\omega} \Delta \ln T^{CH}_{US,\omega} + \beta^n_{3i\omega} \Delta \ln T^{US}_{i\omega} + \beta^n_{4i\omega} \Delta \ln T^{CH}_{i\omega} \\ &+ \beta^n_{5i\omega} \sum_{j\neq CH,US,i} \Delta \ln T^{US}_{j\omega} + \beta^n_{6i\omega} \sum_{j\neq CH,US,i} \Delta \ln T^{CH}_{j\omega} + \eta^n_{i\omega},\end{aligned} \tag{5}$$

where, letting $E_\omega \equiv \sum_{n'} E^{n'}_\omega$ be world expenditures in product ω,

$$\beta^n_{1i\omega} \equiv \left(1_{n=US} + \frac{E^{US}_\omega}{E_\omega} \frac{\frac{b^j_i \sigma^j_{ii}}{X_{i\omega}/E_\omega}}{1 - \frac{b^j_i \sigma^j_{ii}}{X_{i\omega}/E_\omega}}\right) \frac{\sigma^j_{CHi}}{s^n_{i\omega}}, \tag{6}$$

$\beta^n_{2i\omega}$ to $\beta^n_{6i\omega}$ are given by (B.33)-(B.37) in the Appendix,

$$\eta^n_{i\omega} = \frac{\left(\sum_{n'\in\mathcal{I}} \frac{X^{n'}_{i\omega}}{X_{i\omega}} \hat{E}^{n'}_\omega - \hat{A}_{ij}\right) b^j_i \sigma^j_{ii} + \sum_{i'=US,CH} \sigma^j_{CHi} \hat{p}_{i'\omega} + \sigma^j_{RW} \sum_{i'\neq i} \hat{p}_{i'\omega}}{1 - \frac{\sigma^j_{ii} b^j_i}{X_{i\omega}/E_\omega}} \frac{1}{s^n_{i\omega}} + \hat{E}^n_\omega. \tag{7}$$

Each $\beta^n_{ki\omega}$ in (5) is the tariff elasticity of exports of variety $i\omega$ to importer n, given aggregates that enter in the last term, $\eta^n_{i\omega}$. These aggregates include: expenditure changes by importer and product, cost changes by exporter and sector, and the average prices of competing varieties.

In the empirical analysis we implement equation (5) to estimate the β's using across-product variation in export responses. We include all the terms suggested by (5), but our focus is on the first two coefficients, $\beta^n_{1i\omega}$ and $\beta^n_{2i\omega}$, showing the response of exports from country i to each destination as a function of the tariffs set by the US and China on each other. Equation (6) shows the expression for $\beta^n_{1i\omega}$, the elasticity of variety $i\omega$ exports to destination n in response to US tariffs (with a similar

[9] $\Delta \ln(Y) \equiv \ln(Y') - \ln(Y)$ is the log-difference in Y after the change in tariffs.

expression for $\beta^n_{2i\omega}$, corresponding to Chinese tariffs, in (B.33)). The tariff elasticities may vary by exporter and sector due to heterogeneity in substitution elasticities σ^j_{CHi} or in the product of the scale and own-demand elasticities, $b^j_i\sigma^j_{ii}$. Due to size dependence, the tariff elasticity is also *variety-specific* (decreasing with the export flow's size and increasing with the size of US or China as buyers of the taxed product).

Naturally, higher substitution or scale elasticities imply stronger responses. The next proposition shows that the tariff elasticities of variety $i\omega$ to the US and to the rest of the world (RW) jointly identify the signs of σ^j_{CHi} and $b^j_i\sigma^j_{ii}$.

Proposition 2. *When the US imposes a tariff on China in product ω, then:*

(i) if $\sigma^j_{CHi} > 0$ ($\sigma^j_{CHi} < 0$), exports from i to the US increase (decrease) iff $\frac{b^j_i\sigma^j_{ii}}{X_{i\omega}/E_\omega} \in (-\infty, 1] \cup [\frac{1}{1-E^{US}_\omega/E_\omega}, \infty)$; and

(ii) assuming $\sigma^j_{ii} < 0$: if $\sigma^j_{CHi} > 0$ and exports increase (decrease) from i to the rest of the world, then $b^j_i < 0$ $\left(b^j_i > 0\right)$; while if $\sigma^j_{CHi} < 0$ and exports increase (decrease) from i to the rest of the world, then $b^j_i > 0$ $\left(b^j_i < 0\right)$.

The proposition implies that, when the US taxes China, the responses of a bystander's exports to the US and to the RW reveal both the sign of the substitutability between that country's products and Chinese varieties *and* the sign of the supply curve slope. Table 1 shows the possible cases. A downward-sloping supply ($b^j_i < 0$) is consistent with observing export responses with equal sign to both the US and the rest of the world. Conversely, upward-sloping supply ($b^j_i < 0$) is consistent with observing export responses with opposite sign to the two destinations. While the proposition describes the results using a US tariff on Chinese products, the same logic applies for Chinese tariffs on US imports.

For example, consider the China-substitutes case on the right column. As implied by part (i) of the proposition, this column corresponds to estimating $\beta^{US}_{1i\omega} > 0$ (an increase in variety $i\omega$ exports to US in response to the US tariff on China).[10] As implied by part (ii), given negatively sloped demand, further estimating an increase in exports to countries other than US ($\beta^{RW}_{1i\omega} > 0$) reveals a downward-sloping supply ($b^j_i < 0$). In this case, the gain in scale due to increased US demand leads to an increase in exports to the rest of the world.[11] Conversely, on the right column, a reduction in exports to RW would be consistent with upward-sloping supply, so that higher demand in one destination reallocates sales away from other. By this logic, in the China-complements case of the first column, the downward-sloping supply is revealed by a reduction in exports to RW.

[10] Part (i) holds for a range of values of the parameters, and it is guaranteed to hold as the number of countries grows large or if the US does not command a very large share of the global market of product ω.

[11] As shown in Proposition 2 (ii), this statement holds assuming $\sigma^j_{ii} < 0$. Otherwise, an increase in exports would reveal a pathological case where inverse demand is positively sloped, and even more so than a positively sloped supply.

3 Data and Summary Statistics

We use UN Comtrade data that record bilateral exports in 5203 HS6 products. We aggregate into biennial (24-month) intervals (2014/2015; 2016/17; 2018/19), and refer to each 24-month period by its ending year. We restrict our sample to the top 50 exporting countries, excluding oil exporters. The resulting sample covers 95.9% of global trade (or 70.5% excluding US and China). We analyze exports from each of these countries to three destinations: the United States (US), China (CH), and the aggregate of all destinations except the US and China (RW). We classify products into nine sectors: agriculture, apparel, chemicals, materials, machinery, metals, minerals, transport, and miscellaneous. Figure A.1 reports countries' export shares by sector prior to the trade war.

We consider four sets of tariff changes as part of the US-China trade war: i) imposed by the US on China (the "US tariffs"), denoted as $T^{US}_{CH,\omega}$, where ω denotes an HS6 product code; ii) imposed by China on the US, $T^{CH}_{US,\omega}$ (the "China tariffs"); iii) imposed by the US on each country i other than China, $T^{US}_{i,\omega}$ (e.g., steel tariffs on Mexico); and iv) most-favored-nation (MFN) tariffs imposed by China on all countries but the US, $T^{CH}_{i,\omega}$.Bown et al. (2019) argue that China's MFN tariff cuts were likely influenced by the trade war with the US, so we include them in our analysis. The first three sets of tariffs are taken from Fajgelbaum et al. (2020) and extended through the end of 2019, and the last set is from Bown et al. (2019). We scale tariff changes in proportion to their duration within each 24-month interval. This scaling generates variation in tariff changes across products due to both the timing and magnitude of rate changes.

Figure A.2 illustrates the tariff variation. The US substantially raised tariffs on China, but except for two sectors (machinery and metals) it did not significantly raise tariffs on other partners. Panel B shows that China's tariffs increased across all sectors on the US and decreased for non-US partners. For both the US and China, we observe substantial variation within sectors.

4 Average Export Responses

Figure 1 presents binscatters that examine the exports of the 48 bystander countries to US, CH, and RW against the US-China tariffs. Panel A shows the binscatter of exports to the US against the US tariffs: $\Delta \ln X^{US}_{i\omega} = \alpha + \beta \Delta \ln T^{US}_{CH} + \epsilon^{US}_i$. Panel B shows exports to China against the Chinese tariffs: $\Delta \ln X^{CH}_{i\omega} = \alpha + \beta \Delta \ln T^{CH}_{US} + \epsilon^{CH}_i$. Panels C and D report exports to RW against the US and China tariffs, respectively.[12]

Panel A reveals that, on average, bystanders increased exports to the US in products with high US tariffs on China, with an elasticity of 0.31 (se 0.10). This growth rate is statistically distinct from the pre-war export growth rate from 2015 to 2017 (elasticity -0.19 and se -0.19). Panel B shows that, on average, countries did not reallocate exports into China in response to China's tariffs on the US. Panels C and D show that exports to RW increased with both tariffs, with an elasticity of 0.20 (se 0.08) for the US tariffs (Panel C), and of 0.29 (se 0.08) for the China tariffs (Panel D).

[12]Each binscatter includes exports from every country in our dataset, except for US and China. Figure A.3 confirms, as others have found, that the Chinese tariffs reduced US exports to China, and vice versa.

These results suggest that the trade war created net trade opportunities on average rather than merely prompting reallocations: joint exports to US and China in tariff-exposed products increased, and so did exports to the rest of the world. However, this average response masks large heterogeneity across countries. For example, the average country is revealed to neither complement nor substitute China, but this null average response may hide that some countries substitute and others complement China. We examine heterogeneity next.[13]

5 Heterogeneous Tariff Responses

To explore heterogeneity in tariff elasticities, we implement a specification motivated by (5). We now discuss a few aspects of the implementation.

First, the tariff elasticities $\beta^n_{zi\omega}$ in (5) vary by importer, exporter, and measures of variety size. We flexibly capture this dependence by imposing:

$$\beta^n_{zi\omega} = \beta^n_{zi} + \beta^n_{zj(\omega)} + \Gamma^n_z SIZE_{zi\omega} \qquad z = 1, 2, 3, 4 \tag{8}$$

where $SIZE_{zi\omega}$ is a set of theory-driven set of observables that determine the tariff elasticity.[14] So, for each of the 4 tariffs ($z = 1, .., 4$), variation in tariff elasticities across exporters i is captured by β^n_{zi}; variation across sectors j is captured by $\beta^n_{zj(\omega)}$ (where $j(\omega)$ is the sector of product ω); and variation across varieties is driven by $SIZE_{zi\omega}$.

Second, the regressions include exporter-sector-destination fixed effects (α^n_{ij}) and direct controls for size, $SIZE_{zi\omega}$, to control for $\eta^n_{i\omega}$ defined in (7).[15]

Third, we set β^n_{5i} and β^n_{6i} in equation (5) to zero. While theoretically justified, the tariff summation terms that identify these coefficients are highly correlated with the underlying bilateral tariffs from which they are constructed.[16]

The identifying assumption underlying this empirical strategy is that, within country-sectors, potential export growth across products would have been the same in the absence of the trade war tariffs. We assess the plausibility of this parallel trends assumption by testing for differential trends in export growth in the years prior to the trade war. Figure 1 shows that bystander countries' pre-war export growth is largely uncorrelated with the future changes in tariffs. To further mitigate

[13] Figure A.4 shows that the patterns, including the sharp response to RW, are robust to controlling for country-by-sector fixed effects. We also find that the patterns are robust to including all four tariffs and lagged export growth.

[14] For $\beta^n_{1\omega}$, condition (6) from Proposition 1 indicates that these (pre-war) variables are: $\frac{E^{US}_\omega}{E_\omega}$ (the share US expenditures in global expenditures in product ω), $\frac{X_{i\omega}}{E_\omega}$ (the share of exporter i sales in global expenditures in product ω), and $s^n_{i\omega}$(the share of variety $i\omega$ in destination n expenditures). Conditions (B.33) to (B.37) in the Appendix show the corresponding variables for the remaining regressions. We proxy global expenditures with global imports.

[15] Conditional on the importer, exporter, and sector fixed effects,$\eta^n_{i\omega}$ vanishes assuming i) weak substitution across from RW ($\sigma_{RW} \to 0$); ii) small differences in US and Chinese price changes within sector($\hat{p}_{i\omega} \approx \hat{p}_{i\omega'}$ for $\omega, \omega' \in \Omega^j$ for $i = CH, US$); and iii) Cobb-Douglas preferences across products.

[16] This is because China changed tariffs on an MFN basis to third countries, so the $\sum_{i' \neq CH,US,i} \Delta \ln T^{CH}_{i',\omega}$ term is $\Delta \ln T^{CH}_{i,\omega}$ times the number of exporters (excluding US, China, and exporter i) in product ω. The correlation between $\sum_{i' \neq CH,US,i} \Delta \ln T^{CH}_{i',\omega}$ and $\Delta \ln T^{CH}_{i,\omega}$ is 0.997. A similar issue arises for the corresponding US term because when the US changed tariff rates on third countries, it often did so by a similar amount across trade partners.

concerns of pre-existing trends, we include lagged export growth.

The resulting specification is run separately to each destination, $n = US, CH, RW$:

$$\begin{aligned}\Delta \ln X^n_{i\omega} =& \beta^n_{1i\omega}\Delta \ln T^{US}_{CH,\omega} + \beta^n_{2i\omega}\Delta \ln T^{CH}_{US,\omega} + \beta^n_{3i\omega}\Delta \ln T^{US}_{i,\omega} + \beta^n_{4i\omega}\Delta \ln T^{CH}_{i,\omega} \\ &+ \alpha^n_{ij} + \Omega^n SIZE_{i\omega} + \pi^n \Delta \ln X^n_{i\omega,t-1} + \epsilon^n_{i\omega},\end{aligned} \tag{9}$$

where $\beta^n_{zi\omega}$ for $z = 1, .., 4$ is defined in (8).

Having estimated the $\beta^n_{zi\omega}$, we predict the growth of variety $i\omega$ to the world (relative to non-targeted varieties) using the four trade-war tariffs:

$$\widehat{\Delta \ln X^{WD}_i} = \sum_{\omega} \sum_{n=US,CH,RW} \lambda^n_{i\omega} \left(\widehat{\beta^n_{1i\omega}}\Delta \ln T^{US}_{CH,\omega} + \widehat{\beta^n_{2i\omega}}\Delta \ln T^{CH}_{US,\omega} + \widehat{\beta^n_{3i\omega}} \ln T^{US}_{i,\omega} + \widehat{\beta^n_{4i\omega}}\Delta \ln T^{CH}_{i,\omega} \right), \tag{10}$$

where $\lambda^n_{i\omega}$ is the share of variety $i\omega$ to country n in total exports of country i. The $\lambda^n_{i\omega}$ shares are defined as the (pre-war) export values for continuing products divided by total country exports.

5.1 Heterogeneous Export Growth in Targeted Products

The analysis reveals two key takeaways: i) substantial cross-country heterogeneity in export growth in targeted products compared to non-targeted products; and ii) a central role for the country-specific component of the tariff elasticities, rather than any other component, in explaining of this heterogeneity.

Figure 2 plots the export growth defined in (10) across countries.[17] By export growth, we specifically mean the growth of products taxed by US or China relative to other products within each exporter, importer, and sector. Hence, the figure indicates the countries that better exploited global export opportunities in products targeted by the trade-war tariffs.

On average, countries' exports in targeted products increase by 6.7%, with a standard deviation just as large at 6.3%. For example, the increases in exports of targeted relative to untargeted products in Thailand and Mexico are 14.5% (se 4.9%) and 10.9% (se 6.4%), respectively, while Ukraine's exports fall 12.1% (se 8.7%) and Canada's export growth is just 2.1% (se 5.4%).[18]

Through the lens of our model, the heterogeneity is expected. By construction of (10), it may be due to the country-specific demand or supply parameters, or due to differences in specialization across products with different tariff changes or with different supply elasticities elasticities. We find that the bulk of the cross-country variation in Figure 2 comes from the country-specific component of the tariff elasticities (the β^n_{zi} in (8)), and not from specialization ($\lambda^n_{i\omega}$), sectoral tariff elasticities ($\beta^n_{zj(\omega)}$), or size-specific tariff elasticities (Γ^n_z).

[17] We report bootstrapped confidence intervals for $\Delta \widehat{\ln X^{WD}_i}$. We construct bootstrapped standard errors to each aggregate response by cluster bootstrapping specifications (9). We sample with replacement within products, estimate the specifications in (9), construct the aggregate predicted exports to the each estimation using (10), and repeat 50 times.

[18] We correlate $\Delta \widehat{\ln X^{WD}_i}$ with i's characteristics: size, distance to the US and China; the share of exports covered by "deep" trade agreements (Mattoo et al., 2020); and 2017 FDI stock (Financial Times FDI Markets Database and Refinitiv). These descriptive relationships suggest that greater predicted exports for countries that are larger, further from the US, and with more exports covered by trade agreements. This is consistent with Alfaro et al. (2023), who find that trade agreements result in cross-country export complementarities for firms.

To see this, Figure 3 re-computes the export growth in (10) for different configurations of these components and plots each case against the case with full heterogeneity from Figure 2. First, assuming a homogenous tariff elasticity ($\widehat{\beta^n_{zi\omega}} = \widehat{\beta^n_z}$ in (9)), the variation only comes from $\lambda^n_{i\omega}$ pre-war specialization patterns. The grey series reveals virtually no variation across countries and the standard deviation is just 1.3%. Next, the red series re-computes export growth only allowing for sectoral heterogeneity: $\widehat{\beta^n_{zi\omega}} = \widehat{\beta^n_{zj(\omega)}}$; the standard deviation is now 2.2%, and the correlation with the full heterogeneity case is just 0.50. Similarly, the green series next constructs predicted growth using only the estimated size component, $\widehat{\beta^n_{zi\omega}} = \widehat{\Gamma^n_z} SIZE_{zi\omega}$, which also yields a low correlation of -0.01 with the full heterogeneity benchmark. Finally, the blue series allows for just the country component, $\widehat{\beta^n_{zi\omega}} = \widehat{\beta^n_i}$. The standard deviation across countries' response is now 5.5%, and the correlation with the benchmark rises to 0.95.

A formal decomposition of relative export growth into the three components reveals that country-specific responses explain 82.8% of the variation, while the sector and size component explains 17.3% and -0.2%, respectively.

The importance of the country-specific component of tariff elasticities, even after allowing the estimated elasticities to vary by sector and size of the trade flow, is surprising given that trade or scale elasticities are typically assumed to vary across sectors rather than across countries. We explore this point next.

5.2 Supply and Demand Forces

Table 1 provides a taxonomy to understand the underlying demand and supply forces driving countries' exports from the trade war. We construct an empirical analog to the table by aggregating the variety-level tariff elasticities to the country level:

$$\widehat{\beta^n_{i\omega}} = \sum_{\omega} \lambda^n_{Xi\omega} \widehat{\beta^n_{zi\omega}} \tag{11}$$

Panel A of Figure 4 shows the export elasticities to the US and RW in response to the US tariff ($\widehat{\beta^{US}_{1i}}, \widehat{\beta^{RW}_{1i}}$), revealing the substitutability/complementarity with Chinese varieties and the slope of supply curves. Panel B reports ($\widehat{\beta^{CH}_{2i}}, \widehat{\beta^{RW}_{2i}}$), revealing substitutability/complementarity with American varieties and upward/downward sloping supplies.

The figure shows that there is considerable variation across countries in the underlying supply and demand forces that drive export responses in Figure 2. To highlight a few examples, consider first the set of countries that lie in the same quadrant in both panels (highlighted in blue). Ukraine and Colombia lie in the SW quadrants, indicating that they exports varieties that complement Chinese and American varieties, and that their exports operate along downward sloping supply curves. These patterns provide a rationale for why Ukraine's and Colombia's global exports fell in response to the trade war, as illustrated in Figure 2: the tariffs reduced exports to the US and China (because they are complements); and because of the downward-sloped supply, the lower scale led exports to RW to decline. In contrast, Thailand, Taiwan, UK, Bulgaria and Finland are the

countries whose export responses lay in the NE quadrant of both panels. This reveals that their exports substitute for the US and China. As they operate on downward supplies, the expansion into the US and China led to expanding exports to RW, and to an increase in global exports of targeted products, as confirmed by Figure 2.

For countries that lie in different quadrants of Panels A and B, it is not possible to immediately sign the direction of their global export changes since it depends on the importance of the US and Chinese destinations in their export basket. However, the figure does reveal the underlying forces to each market. Countries that lie in the NE and SW quadrants (in red) of both panels operate along downward supplies. Mexico, Malaysia, and the Czech Republic lie in the NE quadrant in Panel A and the SW quadrant of Panel B. These countries export varieties that substitute China and complement the US, and operate along downward supplies. The countries highlighted in green lie in the NE and SW quadrants of both panels, suggesting that they operate along upward supplies.

Finally, the grey countries flip the diagonal between panels. Their responses suggest a downward-sloping export supply in response to one tariff and an upward-sloping export supply to the other. Our model would require an additional source of heterogeneity to accommodate these cases. Supply elasticities operating at bilateral level, as in Lind and Ramondo (2018), or bilateral complementarities through trade costs, as in Alfaro et al. (2023), are possible explanations.

The downward sloping supplies could reflect that some countries identified the trade war early as an opportunity and invested in new plants, trade infrastructure, or facilitation, with these investments benefiting exports to all destinations. Or that some countries were already well integrated in the global trading system and could take advantage of the new exporting opportunities across multiple sectors. Our data do not allow us to measure these potential explanations, but we view this as an area for future research.

6 Conclusion

The US-China trade war was seen as a major turning point in the globalization era. Our results do not support this view, at least for the time horizon we analyze: we find that several countries increased global exports in products with higher US-China tariffs, relative to non-taxed products.

We also find cross-country heterogeneity in this export growth in targeted products, and that a country-specific component of the tariff elasticities explains the bulk of the variation. Through the lens of a standard trade model, the export responses suggest negatively-sloped supply curves for several countries as well as differences across countries in terms of whether their exports substitute or complement China. These results contrast with trade models where trade or scale elasticities are typically assumed to vary across sectors rather than across countries.

While product-level global trade data can uncover broad reallocation patterns, firm-level data can unpack the factors driving the country-specific elasticities —whether they consist of increasing returns to scale, trade-war-induced investments in new plants, or participation in trade agreements. We anticipate further research on these mechanisms as the data becomes available.

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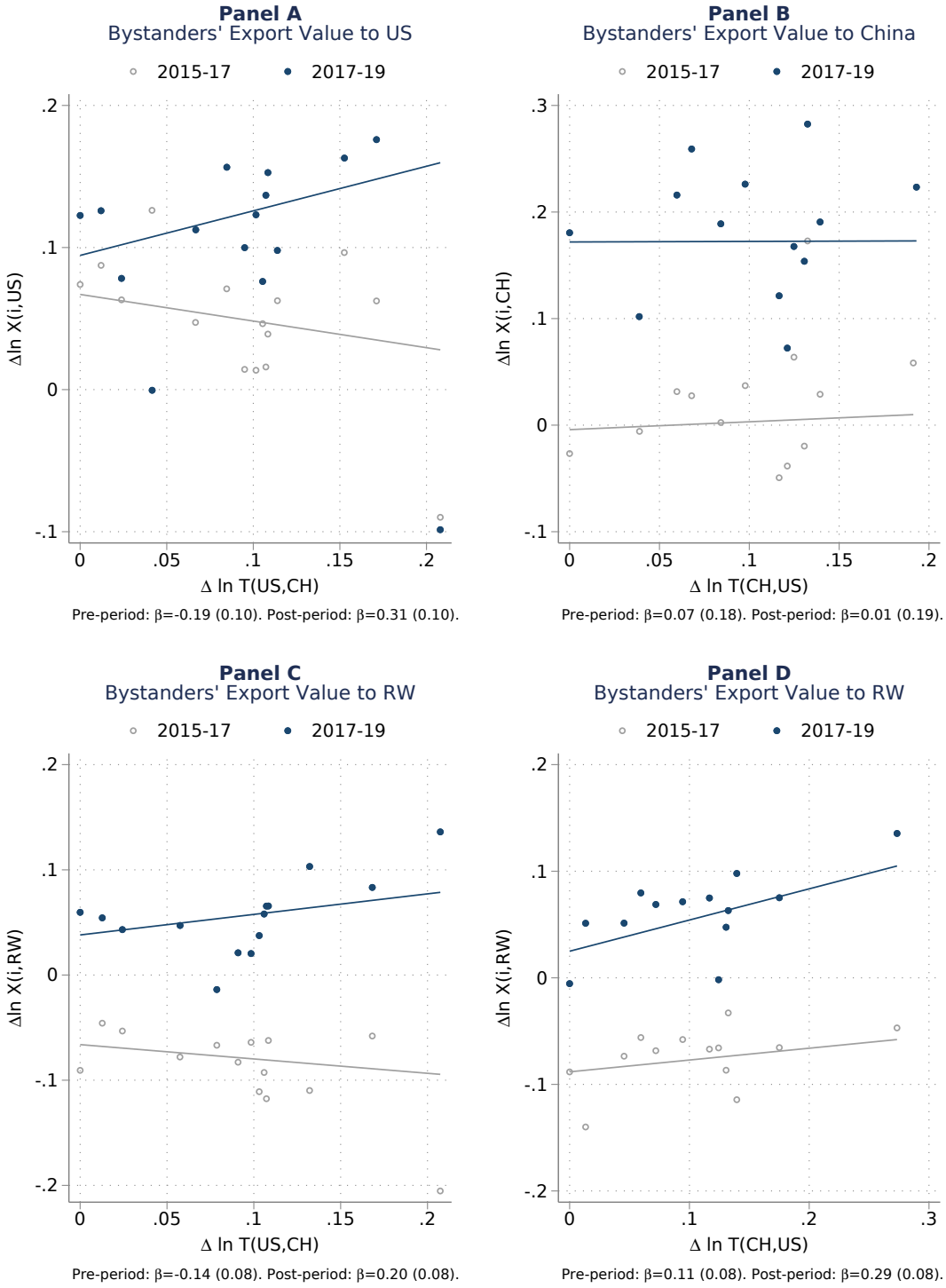
TABLE 1: PARAMETER REGIONS IMPLIED BY EXPORT RESPONSES TO US TARIFFS ON CHINA

		Country i's Export Response to US	
		Decrease	Increase
Country $i's$ Export Response to RW	Increase	China Complement Upward-Sloping Supply $\sigma_{CHi} < 0; b_i > 0$	China Substitute Downward-Sloping Supply $\sigma_{CHi} > 0; b_i < 0$
	Decrease	China Complement Downward- Sloping Supply $\sigma_{CHi} < 0; b_i < 0$	China Substitute Upward-Sloping Supply $\sigma_{CHi} > 0; b_i > 0$

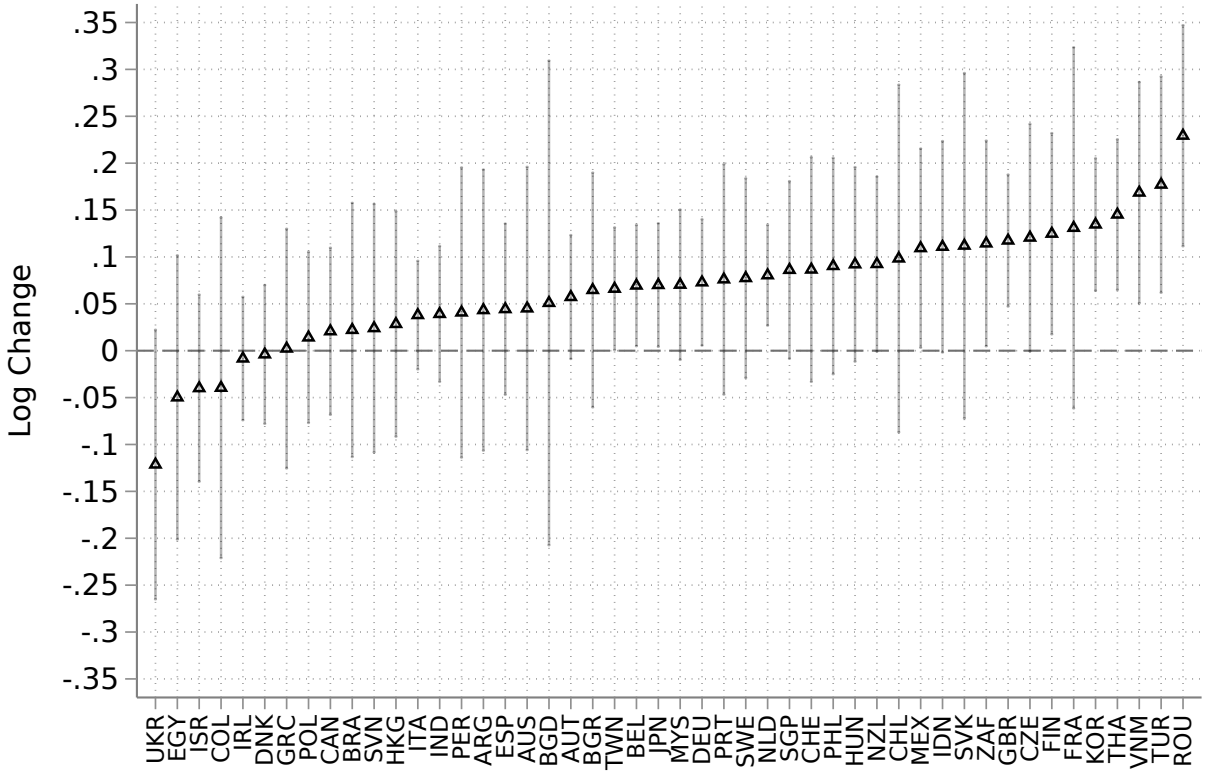
Notes: Table shows the parameter regions implied by the export response of country to the US and to the rest of the world (RW) when the US increases tariffs on China. A similar taxonomy applies for China's tariffs on the US, in which case the responses would reveal substitutability with the US (σ_{USi} instead of σ_{CHi}).

FIGURE 1: TRADE WAR TARIFFS AND EXPORT GROWTH



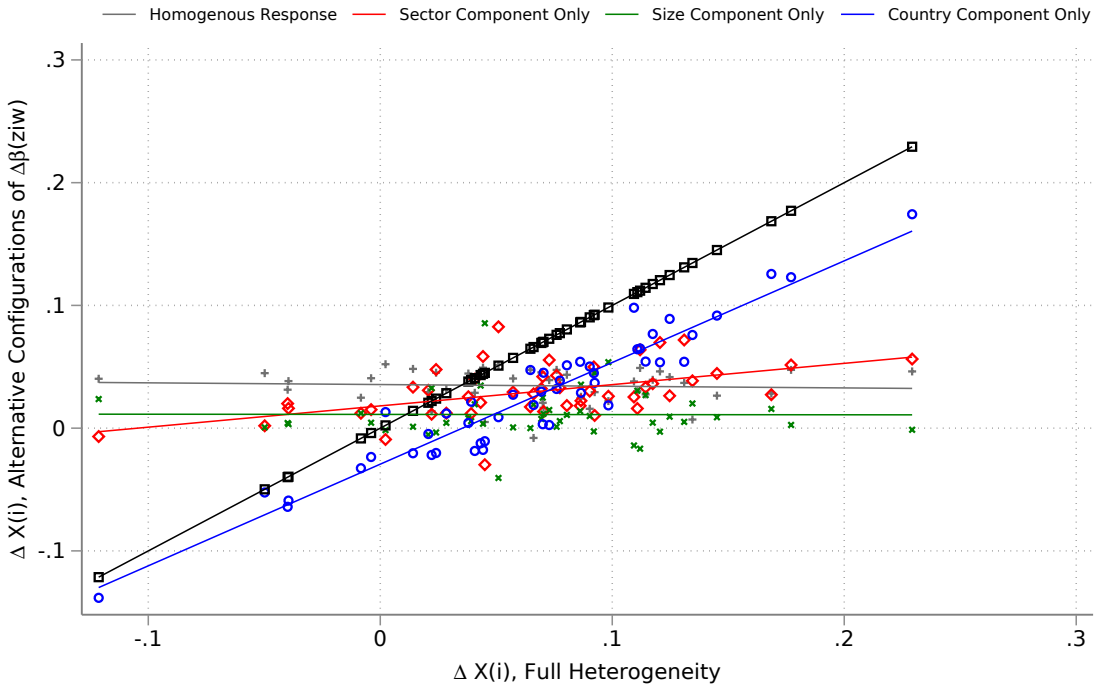
Notes: The panels show binscatter plots of bystanders' export growth (on the y-axes) against changes in tariffs due to the trade war (on the x-axes). Panel A is the regression: $\Delta \ln X_{i\omega}^{US} = \alpha + \beta \Delta \ln T_{CH}^{US} + \epsilon_{i\omega}^{US}$. Panel B is the regression: $\Delta \ln X_{i\omega}^{CH} = \alpha + \beta \Delta \ln T_{US}^{CH} + \epsilon_{i\omega}^{CH}$. Panel C is the regression: $\Delta \ln X_{i\omega}^{RW} = \alpha + \beta \Delta \ln T_{US}^{US} + \epsilon_{i\omega}^{RW}$. Panel D is the regression: $\Delta \ln X_{i\omega}^{RW} = \alpha + \beta \Delta \ln T_{CH}^{CH} + \epsilon_{i\omega}^{RW}$. Also reported are regressions with exports prior to the trade war from 2015-17. Below each panel are OLS coefficients (standard errors clustered by product).

FIGURE 2: RELATIVE EXPORT GROWTH IN TARGETED PRODUCTS ACROSS COUNTRIES



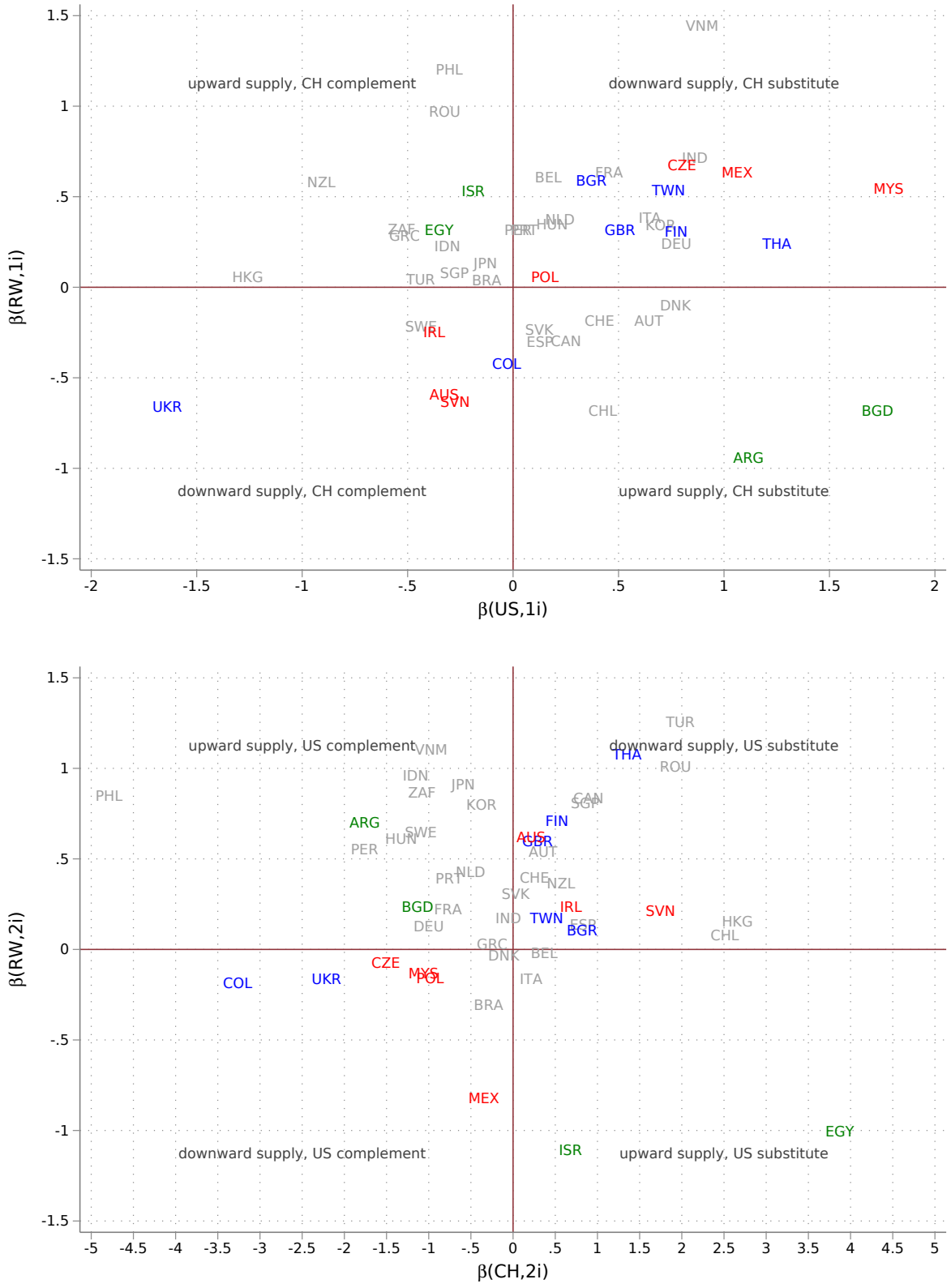
Notes: The figure plots changes in predicted exports to the world. Bootstrapped error bars denote 90% confidence intervals. These bands are constructed by implementing (9) on 50 bootstrap samples and calculating countries' predicted exports from (10).

FIGURE 3: DECOMPOSING RELATIVE EXPORTS BY HETEROGENOUS RESPONSE TYPE



Notes: Figure reports alternative predicted exports to WD from (10) derived under alternative configurations of the tariff responses. The first series (grey) constructs predicted exports assuming a homogenous response to the tariffs across countries. The next three series emphasize each of the three components of the full heterogenous response: sectoral ($\widehat{\beta^n_{zi\omega}} = \widehat{\beta^n_{zj(\omega)}}$), size ($\widehat{\beta^n_{zi\omega}} = \widehat{\Gamma^n_z} SIZE_{zi\omega}$), and country ($\widehat{\beta^n_{zi\omega}} = \widehat{\beta^n_i}$). The 45-degree line (black) is the benchmark full heterogeneity series.

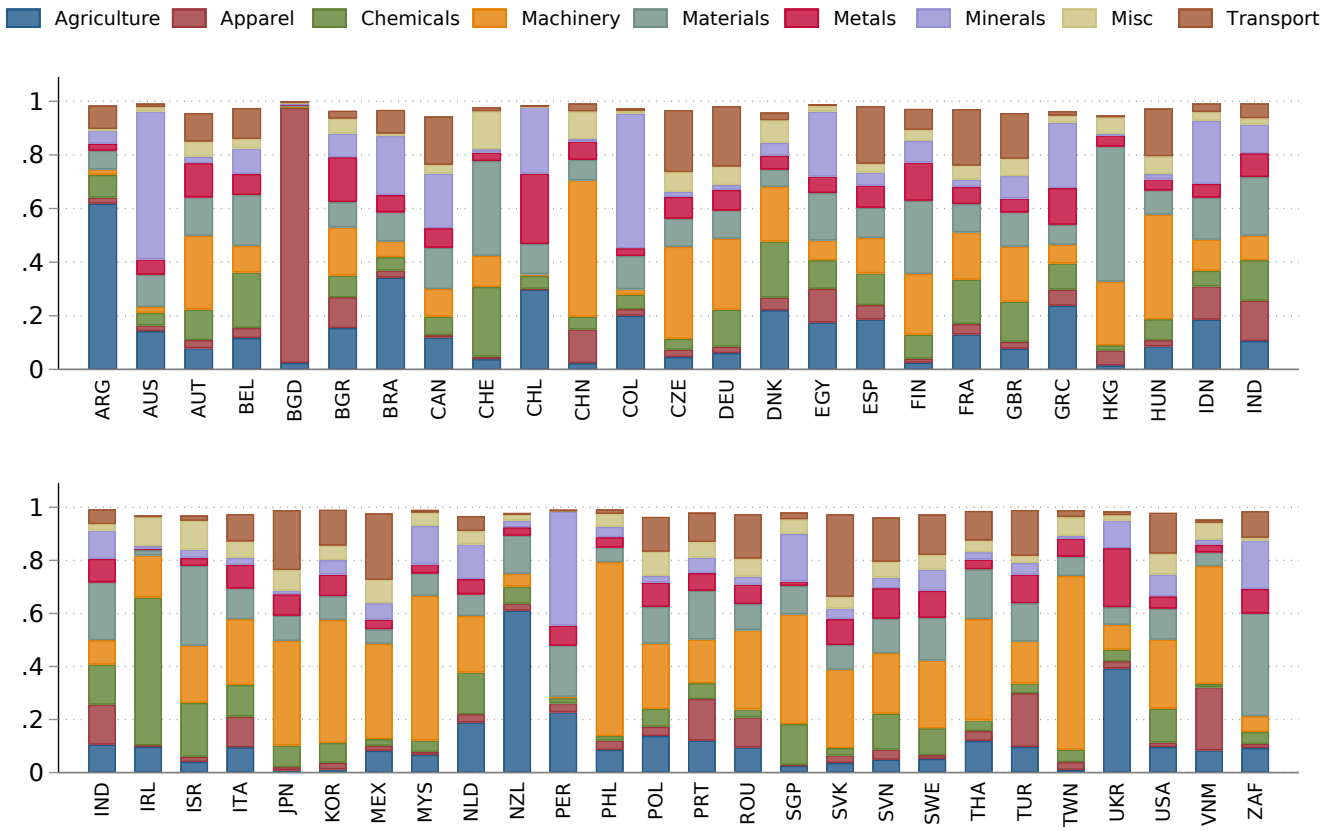
FIGURE 4: SUPPLY AND DEMAND FORCES



Notes: The figure plots the tariff responses to the US-China tariffs, $\widehat{\beta^n_{i\omega}} = \sum_\omega \lambda^n_{Xi\omega}\widehat{\beta^n_{zi\omega}}$ using the taxonomy in Table 1. Panel A plots $(\widehat{\beta^{US}_{1i}}, \widehat{\beta^{RW}_{1i}})$. Panel B plots $(\widehat{\beta^{CH}_{2i}}, \widehat{\beta^{RW}_{2i}})$. Countries noted in blue operate in the same quadrant in both figures. Countries in red operate along downward-sloping supplies in both figures. Countries in green operate along upward-sloping supplies in both figures.

A Appendix Figures and Tables

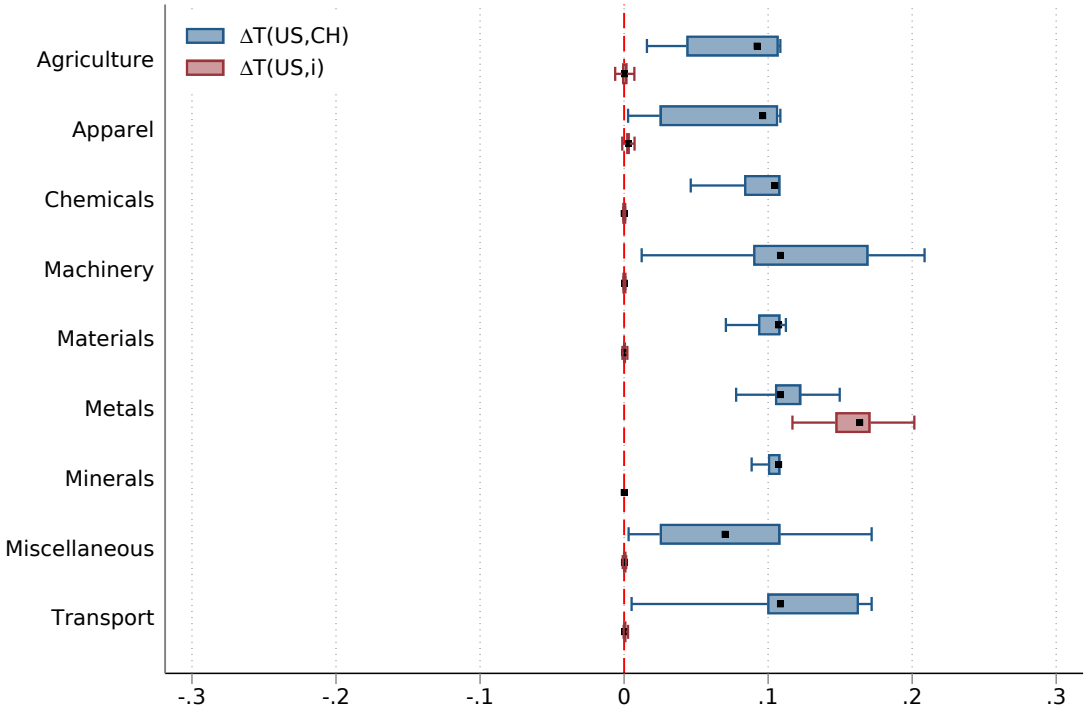
FIGURE A.1: PRE-WAR EXPORT BASKETS



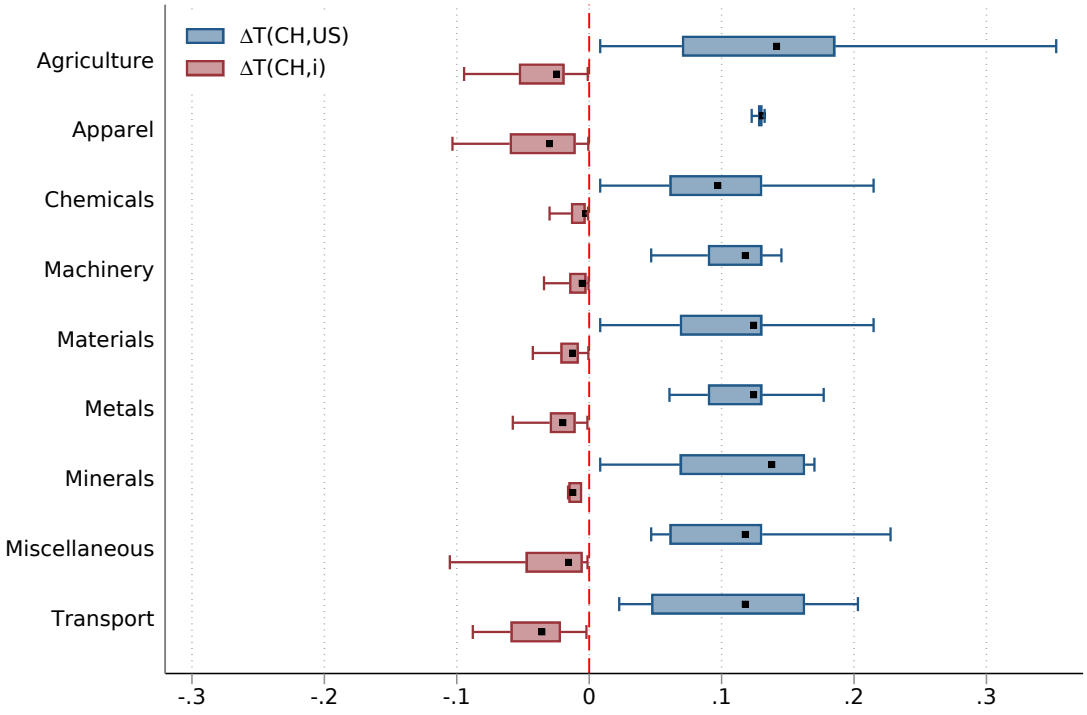
Notes: Figure reports countries' pre-war export shares by sector. Agriculture includes products in HS code chapters 1-24; Apparel includes chapters 41-43 and 50-67; Chemicals includes chapters 28-38; Machinery includes chapters 84-85; Materials includes chapters 39-40, 44-49, and 68-71; Metals includes chapters 72-83; Minerals includes chapters 25-27; Transport includes chapters 86-89; and Miscellaneous includes chapters 90-99.

FIGURE A.2: TARIFF CHANGES

Panel A: US Tariff Changes

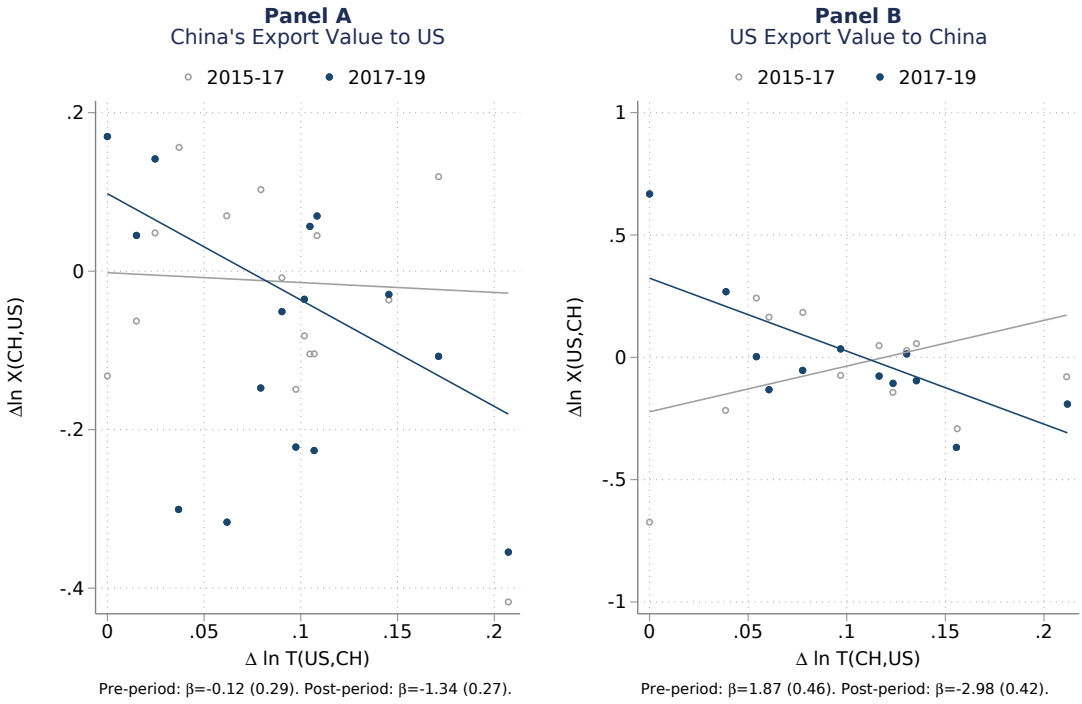


Panel B: China Tariff Changes



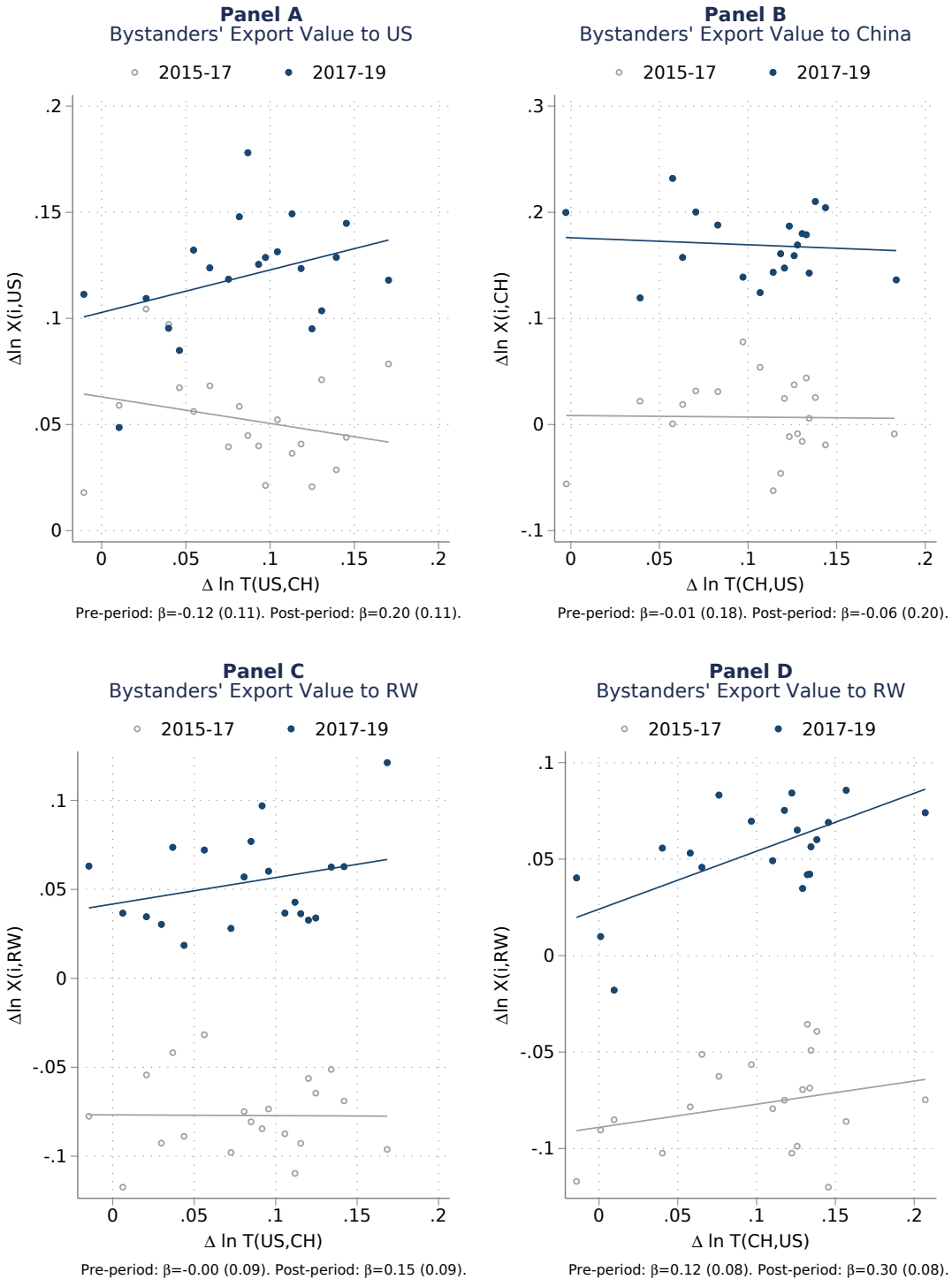
Notes: Figure reports the set of tariff changes imposed by the US (Panel A) and China (Panel B), by sector. The tariff changes are scaled by total time in effect over the two year window. For example, if the US raised tariffs on a product from China in September 2018 by 10%, the scaled tariff change over the two year window would be 6.66% $= (16/24) * 10\%$. If the tariff of a product went up 25% in September 2019, the scaled tariff change would be 4.16% $(= (4/24) * 25\%)$. The black dots indicate the median tariff increase, the boxes denote the 25th and 75th percentiles, and whiskers show the 10th and 90th percentiles.

FIGURE A.3: TRADE WAR TARIFFS AND EXPORT CHANGES FOR USA AND CHN



Notes: The panels show binscatter plots of USA and China's export change (on the y-axes) against changes in tariffs due to the trade war (on the x-axes), Panel A is the regression: $\Delta \ln X^{US}_{CHN,\omega} = \alpha + \beta \Delta \ln T^{US}_{CH} + \epsilon^{US}_{CHN,\omega}$. Panel B is the regression: $\Delta \ln X^{CH}_{USA,\omega} = \alpha + \beta \Delta \ln T^{CH}_{US} + \epsilon^{CH}_{USA,\omega}$. Also reported are regressions with exports prior to the trade war from 2015-17. Below each panel are OLS coefficients.

FIGURE A.4: TRADE WAR TARIFFS AND EXPORT CHANGES, WITH FIXED EFFECTS



Notes: The panels show binscatter plots of bystanders' export growth (on the y-axes) against changes in tariffs due to the trade war (on the x-axes), controlling for country-by-sector fixed effects. Panel A is the regression: $\Delta \ln X_{i\omega}^{US} = \alpha_{i,j(\omega)}^{US} + \beta \Delta \ln T_{CH}^{US} + \epsilon_{i\omega}^{US}$. Panel B is the regression: $\Delta \ln X_{i\omega}^{CH} = \alpha_{i,j(\omega)}^{CH} + \beta \Delta \ln T_{US}^{CH} + \epsilon_{i\omega}^{CH}$. Panel C is the regression: $\Delta \ln X_{i\omega}^{RW} = \alpha_{i,j(\omega)}^{RW} + \beta \Delta \ln T_{CH}^{US} + \epsilon_{i\omega}^{RW}$. Panel D is the regression: $\Delta \ln X_{i\omega}^{RW} = \alpha \alpha_{i,j(\omega)}^{RW} + \beta \Delta \ln T_{US}^{CH} + \epsilon_{i\omega}^{RW}$. Also reported are regressions with exports prior to the trade war from 2015-17. Below each panel are OLS coefficients (standard errors clustered by product).

B Model Appendix

B.1 Microfoundation of the Supply Side

We present a microfoundation for the supply curve in (3). We assume that, in country i and sector j, a quantity K_{Ti}^{j} of a bundle of inputs and primary factors is used to produce tradeable goods in sector j This sector-specific input supply could be determined endogenously through domestic or international mobility or be taken as given under the assumption of no factor mobility; however, we do not need to take a stand for our empirical analysis.

This factor supply consists of a continuum of heterogeneous units, with each unit k having productivity $z_{i\omega}^{0}e_{\omega}^{k}$. The term $z_{i\omega}^{0}$ is common to all inputs in ω. It depends on an exogenous country-product specific component of productivity $Z_{i\omega}$ and, through scale economies, on the amount of inputs $K_{i\omega}$ allocated to the product:

$$z_{i\omega}^{0} = Z_{i\omega}K_{i\omega}^{\gamma_{i}^{j}}, \tag{B.12}$$

where γ_{i}^{j} is a country-sector specific scale elasticity. In turn, the term e_{ω}^{k} is specific to each unit with CDF from an iid Frechet distribution:

$$\Pr\left(e_{\omega}^{k} < x\right) = \exp\left(-x^{-\varepsilon_{i}^{j}}\right), \tag{B.13}$$

where the parameter ε_{i}^{j} is also country-specific and determines factor mobility across products in response to changes in factor returns.

Each unit of factors k in sector j chooses a product ω in that sector and, conditional on the product, a bundle of intermediate inputs x with sector-specific intensity α_{j}^{I} and unit cost c_{ij}^{I}, to maximize its returns π_{i}^{k}:

$$\pi_{i}^{k} \equiv \max_{\omega}\max_{x}\left(p_{i\omega}z_{i\omega}^{0}e_{\omega}^{k}\right)^{1-\alpha_{j}^{I}}x^{\alpha_{j}^{I}} - c_{ij}^{I}x, \tag{B.14}$$

where $p_{i\omega}$ is the price received by producers of ω in country i. The input bundle used by each product combines output from other sectors. For our empirical analysis, we impose that $c_{ij\omega}^{I}$ does not vary across products within a sector, but may vary across sectors. This corresponds to the standard assumption of sector-level input-output matrixes. Maximizing out inputs x, the problem in (B.14) is equivalent to:

$$\pi_{i}^{k} \equiv \max_{\omega} p_{i\omega}z_{i\omega}e_{\omega}^{k}, \tag{B.15}$$

where $z_{i\omega} \equiv \left(c_{ij}^{I}/\alpha_{j}^{I}\right)^{\frac{\alpha_{j}^{I}}{\alpha_{j}^{I}-1}}z_{i\omega}^{0}$ captures productivity and input costs of product ω. From the solution to (B.15), the supply of inputs to product ω in sector j of country i is

$$K_{i\omega} = K_{Ti}^{j}\left(\frac{p_{i\omega}z_{i\omega}}{r_{Ti}^{j}}\right)^{\varepsilon_{i}^{j}}, \tag{B.16}$$

where r_{Ti}^{j} are the average factor returns in sector j of country i. The distributional assumption in (B.13) implies that the average factor return by product is equalized across products within a sector, and therefore the total sales $X_{i\omega}$ vary within a sector only with the size of each product:

$X_{i\omega} = r^j_{Ti} K_{i\omega}$. Combining this property with (B.12) and (B.16) we obtain (3) in the text, where the inverse supply elasticity (defined as the elasticity of price of total sales) is

$$b^j_i = \frac{1}{\varepsilon^j_i} - \gamma^j_i, \tag{B.17}$$

the supply shifter is

$$A_{ij} \equiv \left(c^I_{ij}/\alpha^I_j\right)^{\frac{\alpha^I_j}{\alpha^I_j - 1}} \left(K^j_{Ti}\right)^{\frac{1}{b^j_i \varepsilon^j_i}} \left(r^j_{Tij}\right)^{1 - \frac{1}{b^j_i}}, \tag{B.18}$$

and the exogenous component of productivity is $Z_{i\omega} = \left(Z^0_{i\omega}\right)^{\frac{1}{b^j_i}}$. The supply curve is upward-sloping as long as scale economies are not too strong ($\gamma^j_i \varepsilon^j_i < 1$). The average returns to inputs in the sector r^j_{Ti} must be such that the factor market clears within each sector, $\sum_{\omega \in \Omega^j} K_{i\omega} = K^j_{Ti}$, implying:

$$r^j_{Ti} = \left(\sum_{\omega \in \Omega^j} \left(p_{i\omega} z_{i\omega}\right)^{\varepsilon^j_i} \right)^{\frac{1}{\varepsilon^j_i}}. \tag{B.19}$$

Combining (B.12), (B.16), and (B.19), we obtain a function r^j_{Ti} as an implicit function of the goods prices $\{p_{i\omega}\}_{\omega \in \Omega^j}$ and the aggregate factor supply K^j_{Ti} in sector j.

B.2 Proof of Proposition 1

As a preliminary step, we derive some equilibrium equations in changes. In what follows, let $\hat{X} \equiv \frac{\Delta X}{X}$ denote the infinitesimal change in the log of variable X, where $\Delta X = X' - X$ is the difference in the value of X between a counterfactual and an initial equilibrium. Given tariff shocks $\left\{\hat{T}^n_{i\omega}\right\}$, to a first order approximation, the equilibrium consists of changes in tradeable prices $\{\hat{p}_{i\omega}\}$ such that

i) from (3), price changes are given by

$$\hat{p}_{i\omega} = b^j_i \hat{X}_{i\omega} - b^j_i \hat{A}_{ij}; \tag{B.20}$$

ii) from (4), the changes in total sales are consistent with goods market clearing,

$$\hat{X}_{i\omega} = \sum_{n \in \mathcal{I}} \lambda^n_{i\omega} \left(\hat{s}^n_{i\omega} + \hat{E}^n_\omega - \hat{T}^n_{i\omega}\right), \tag{B.21}$$

where $\lambda^n_{i\omega} \equiv \frac{X^n_{i\omega}}{X_{i\omega}}$ is the share of sales to n in total sales of product ω from i, and where from (1) and (2), the changes in expenditure shares are

$$\hat{s}^n_{i\omega} = \frac{1}{s^n_{i\omega}} \sum_{i' \in \mathcal{I}} \sigma^j_{i'i} \left(\hat{T}^n_{i'\omega} + \hat{p}_{i'\omega}\right). \tag{B.22}$$

Take exporter $i \neq US, CH$ and suppose that the US and China impose tariffs on each other and on other countries. From the market clearing condition (B.21) and the definition of expenditure

shares (B.22), the total sales of ω from i change around an initial equilibrium according to

$$\begin{aligned}\hat{X}_{i\omega} =& \tilde{\lambda}^{CH}_{i\omega}\sigma^j_{USi}\hat{T}^{CH}_{US,\omega} + \tilde{\lambda}^{US}_{i\omega}\sigma^j_{CHi}\hat{T}^{US}_{CH,\omega} \\ &+ \sigma^j_{ii}\hat{p}_{i\omega}\sum_{n\in\mathcal{I}}\tilde{\lambda}^n_{i\omega} \\ &+ \hat{T}^{\text{other}}_{i\omega} + \sum_{n\in\mathcal{I}}\sum_{i'\neq i}\tilde{\lambda}^n_{i\omega}\sigma^j_{i'i}\hat{p}_{i'\omega} + \sum_{n\in\mathcal{I}}\lambda^n_{i\omega}\hat{E}^n_\omega,\end{aligned} \tag{B.23}$$

where $\tilde{\lambda}^n_{i\omega}$ is the ratio between country n expenditures and country i sales of product ω,

$$\tilde{\lambda}^n_{i\omega} \equiv \frac{\lambda^n_{i\omega}}{s^n_{i\omega}} = \frac{E^n_\omega}{X_{i\omega}}. \tag{B.24}$$

The two terms in the first line of (B.23) capture the direct impact of US and Chinese tariffs country i's exports these two markets. For example, the first of these terms says that a bigger Chinese tariff on the US reallocates Chinese demand to country i if country i and the US are substitutes ($\sigma_{USi} > 0$); in percentage, this reallocation is larger the bigger is Chinese expenditure in product ω (a larger E^{CH}_ω) or the smaller are the initial sales of ω from i (a smaller $X_{i\omega}$). The second line of (B.23) is the change in sales due to the change in variety $i\omega$'s price. Finally, in the third line of (B.23), $\hat{T}^{\text{other}}_{i\omega}$ captures the impact on country i of US and China tariffs imposed on countries other than each other,

$$\hat{T}^{\text{other}}_{i\omega} = \sum_{n=US,CH}\left(\sigma^j_{ii}\tilde{\lambda}^n_{i\omega} - \lambda^n_{i\omega}\right)\hat{T}^n_{i\omega} + \sigma^j_{RW}\sum_{i'\neq CH,US,i}\left(\tilde{\lambda}^{CH}_{i\omega}\hat{T}^{CH}_{i'\omega} + \tilde{\lambda}^{US}_{i\omega}\hat{T}^{US}_{i'\omega}\right), \tag{B.25}$$

where we have imposed the restriction that $\sigma^j_{RW} = \sigma^j_{i'i}$ for $i', i \neq US, CH$ and $i' \neq i$. The remaining terms in the third line capture changes in prices of other varieties and in aggregate expenditures.

Combining (B.23) with the inverse supply (B.20) and solving for $\hat{p}_{i\omega}$ we obtain the price change of variety $i\omega$:

$$\begin{aligned}\hat{p}_{i\omega} =& \frac{b^j_i}{1 - b^j_i\sigma^j_{ii}\sum_{n\in\mathcal{I}}\tilde{\lambda}^n_{i\omega}}\left(\tilde{\lambda}^{US}_{i\omega}\sigma^j_{CHi}\hat{T}^{US}_{CH,\omega} + \tilde{\lambda}^{CH}_{i\omega}\sigma^j_{USi}\hat{T}^{CH}_{US,\omega} + \hat{T}^{\text{other}}_{i\omega} + \sum_{n\in\mathcal{I}}\sum_{i'\neq i}\tilde{\lambda}^n_{i\omega}\sigma^j_{i'i}\hat{p}_{i'\omega} + \sum_{n\in\mathcal{I}}\lambda^n_{i\omega}\hat{E}^n_\omega\right) \\ &- \frac{b^j_i\hat{A}_{ij}}{1 - b^j_i\sigma^j_{ii}\sum_n\tilde{\lambda}^n_{i\omega}}.\end{aligned} \tag{B.26}$$

Consider now the change in sales from i to a specific destination n:

$$\hat{X}^n_{i\omega} = \hat{E}^n_\omega + \hat{s}^n_{i\omega} - \hat{T}^n_{i\omega}. \tag{B.27}$$

Combining (B.27), (B.22), and (B.26) with this expression we obtain:

$$\begin{aligned}\hat{X}^n_{i\omega} =& \left(1_{n=US} + \frac{b^j_i\sigma^j_{ii}\tilde{\lambda}^{US}_{i\omega}}{1 - b^j_i\sigma^j_{ii}\sum_{n'\in\mathcal{I}}\tilde{\lambda}^{n'}_{i\omega}}\right)\frac{\sigma^j_{CHi}}{s^n_{i\omega}}\hat{T}^{US}_{CH,\omega} + 1_{n=US}\left(\left(\frac{\sigma^j_{ii}}{s^{US}_{i\omega}} - 1\right)\hat{T}^{US}_{i\omega} + \frac{\sigma^j_{RW}}{s^{US}_{i\omega}}\sum_{i'\neq i,CH,US}\hat{T}^{US}_{i'\omega}\right) \\ &+ \left(1_{n=CH} + \frac{b^j_i\sigma^j_{ii}\tilde{\lambda}^{CH}_{i\omega}}{1 - b^j_i\sigma^j_{ii}\sum_{n'\in\mathcal{I}}\tilde{\lambda}^{n'}_{i\omega}}\right)\frac{\sigma^j_{USi}}{s^n_{i\omega}}\hat{T}^{CH}_{US,\omega} + 1_{n=CH}\left(\left(\frac{\sigma^j_{ii}}{s^{CH}_{i\omega}} - 1\right)\hat{T}^{CH}_{i\omega} + \frac{\sigma^j_{RW}}{s^{CH}_{i\omega}}\sum_{i'\neq i,CH,US}\hat{T}^{CH}_{i'\omega}\right) \\ &+ \frac{1}{s^n_{i\omega}}\frac{b^j_i\sigma^j_{ii}}{1 - b^j_i\sigma^j_{ii}\sum_{n'\in\mathcal{I}}\tilde{\lambda}^{n'}_{i\omega}}\hat{T}^{\text{other}}_{i\omega} + \eta^n_{i\omega}\end{aligned} \tag{B.28}$$

where

$$\eta^n_{i\omega} \equiv -\frac{1}{s^n_{i\omega}}\frac{b^j_i\sigma^j_{ii}\hat{A}_{ij}}{1-b^j_i\sigma^j_{ii}\sum_n\tilde{\lambda}^n_{i\omega}} + \frac{1}{s^n_{i\omega}}\frac{b^j_i\sigma^j_{ii}}{1-b^j_i\sigma^j_{ii}\sum_n\tilde{\lambda}^n_{i\omega}}\left(\sum_{n\in\mathcal{I}}\sum_{i'\neq i}\tilde{\lambda}^n_{i\omega}\sigma^j_{i'i}\hat{p}_{i'\omega} + \sum_{n\in\mathcal{I}}\lambda^n_{i\omega}\hat{E}^n_\omega\right) + \frac{1}{s^n_{i\omega}}\sum_{i'\neq i}\sigma^j_{i'i}\hat{p}_{i'\omega} + \hat{E}^n_\omega. \tag{B.29}$$

Using (B.25) and (B.29) and rearranging terms in (B.28) we obtain

$$\hat{X}^n_{i\omega} = \underbrace{\left(1_{n=US} + \frac{b^j_i\sigma^j_{ii}\tilde{\lambda}^{US}_{i\omega}}{1-b^j_i\sigma^j_{ii}\sum_{n'\in\mathcal{I}}\tilde{\lambda}^{n'}_{i\omega}}\right)\frac{\sigma^j_{CHi}}{s^n_{i\omega}}}_{\beta^n_{1i\omega}}\hat{T}^{US}_{CH,\omega} + \underbrace{\left(1_{n=CH} + \frac{b^j_i\sigma^j_{ii}\tilde{\lambda}^{CH}_{i\omega}}{1-b^j_i\sigma^j_{ii}\sum_{n'\in\mathcal{I}}\tilde{\lambda}^{n'}_{i\omega}}\right)\frac{\sigma^j_{USi}}{s^n_{i\omega}}}_{\beta^n_{2i\omega}}\hat{T}^{CH}_{US,\omega}$$
$$+ \sum_{n'=US,CH}\left(1_{n=n'}\left(\frac{\sigma^j_{ii}}{s^{n'}_{i\omega}}-1\right) + \frac{b^j_i\sigma^j_{ii}\tilde{\lambda}^{n'}_{i\omega}}{1-b^j_i\sigma^j_{ii}\sum_{m\in\mathcal{I}}\tilde{\lambda}^m_{i\omega}}\frac{\sigma^j_{ii}-s^{n'}_{i\omega}}{s^n_{i\omega}}\right)\hat{T}^{n'}_{i\omega}$$
$$+ \sum_{n'=US,CH}\left(1_{n=n'} + \frac{b^j_i\sigma^j_{ii}\tilde{\lambda}^{n'}_{i\omega}}{1-b^j_i\sigma^j_{ii}\sum_{m\in\mathcal{I}}\tilde{\lambda}^m_{i\omega}}\right)\frac{\sigma^j_{RW}}{s^n_{i\omega}}\sum_{j\neq CH,US,i}\hat{T}^{n'}_{j\omega}$$
$$+ \eta^n_{i\omega}, \tag{B.30}$$

while the last term in $\eta^n_{i\omega}$ can be re-written:

$$\eta^n_{i\omega} = -\frac{1}{s^n_{i\omega}}\frac{b^j_i\sigma^j_{ii}\hat{A}_{ij}}{1-b^j_i\sigma^j_{ii}\sum_n\tilde{\lambda}^n_{i\omega}} + \frac{1}{s^n_{i\omega}}\frac{b^j_i\sigma^j_{ii}\sum_{n'\in\mathcal{I}}\lambda^{n'}_{i\omega}\hat{E}^{n'}_\omega}{1-b^j_i\sigma^j_{ii}\sum_n\tilde{\lambda}^n_{i\omega}} + \hat{E}^n_\omega + \left(\frac{b^j_i\sigma^j_{ii}\sum_{n'\in\mathcal{I}}\tilde{\lambda}^{n'}_{i\omega}}{1-b^j_i\sigma^j_{ii}\sum_{n'}\tilde{\lambda}^{n'}_{i\omega}}+1\right)\frac{1}{s^n_{i\omega}}\sum_{i'\neq i}\sigma^j_{i'i}\hat{p}_{i'\omega} \tag{B.31}$$

Circling back to our previous definition of $\tilde{\lambda}^n_{i\omega}$ in (B.24) and the fact that $s^n_{i\omega} \equiv \frac{T^n_{i\omega}X^n_{i\omega}}{E^n_\omega}$, we can write (B.30) as (5),where

$$\beta^n_{1i\omega} = \left(1_{n=US} + \frac{E^{US}_\omega}{E_\omega}\frac{\frac{b^j_i\sigma^j_{ii}}{X_{i\omega}/E_\omega}}{1-\frac{b^j_i\sigma^j_{ii}}{X_{i\omega}/E_\omega}}\right)\frac{\sigma^j_{CHi}}{s^n_{i\omega}}, \tag{B.32}$$

$$\beta^n_{2i\omega} = \left(1_{n=CH} + \frac{E^{CH}_\omega}{E_\omega}\frac{\frac{b^j_i\sigma^j_{ii}}{X_{i\omega}/E_\omega}}{1-\frac{b^j_i\sigma^j_{ii}}{X_{i\omega}/E_\omega}}\right)\frac{\sigma^j_{USi}}{s^n_{i\omega}}, \tag{B.33}$$

$$\beta^n_{3i\omega} = 1_{n=US}\left(\frac{\sigma^j_{ii}}{s^{US}_{i\omega}}-1\right) + \frac{E^{US}_\omega}{E_\omega}\frac{\frac{b^j_i\left(\sigma^j_{ii}-s^{US}_{i\omega}\right)}{X_{i\omega}/E_\omega}}{1-\frac{b^j_i\sigma^j_{ii}}{X_{i\omega}/E_\omega}}\frac{\sigma^j_{ii}}{s^n_{i\omega}}, \tag{B.34}$$

$$\beta_{4i\omega}^{n} = 1_{n=CH}\left(\frac{\sigma_{ii}^{j}}{s_{i\omega}^{CH}} - 1\right) + \frac{E_{\omega}^{CH}}{E_{\omega}} \frac{\frac{b_i^j\left(\sigma_{ii}^{j} - s_{i\omega}^{CH}\right)}{X_{i\omega}/E_{\omega}}}{1 - \frac{b_i^j \sigma_{ii}^{j}}{X_{i\omega}/E_{\omega}}} \frac{\sigma_{ii}^{j}}{s_{i\omega}^{n}}, \tag{B.35}$$

$$\beta_{5i\omega}^{n} = \beta_{1i\omega}^{n} \frac{\sigma_{RW}^{j}}{\sigma_{CHi}^{j}}, \tag{B.36}$$

$$\beta_{6i\omega}^{n} = \beta_{2i\omega}^{n} \frac{\sigma_{RW}^{j}}{\sigma_{CHi}^{j}}, \tag{B.37}$$

and where $\eta_{i\omega}^{n}$ is given by (7).

B.3 Proof of Proposition 2

Focus on (6). Using $X_{i\omega}^{n} = \frac{E_{\omega}^{n} s_{i\omega}^{n}}{T_{i\omega}^{n}}$ we can write $\beta_{1i\omega}^{n} \equiv \left(1_{n=US} + \frac{b_i^j \sigma_{ii}^{j} E_{\omega}^{US}}{X_{i\omega} - b_i^j \sigma_{ii}^{j} E_{\omega}}\right) \frac{\sigma_{CHi}^{j}}{s_{i\omega}^{n}}$.To the US, $\beta_{1i\omega}^{US} \equiv \left(\frac{1 - \left(1 - \frac{E_{\omega}^{US}}{E_{\omega}}\right) \frac{b_i^j \sigma_{ii}^{j}}{X_{i\omega}/E_{W}}}{1 - \frac{b_i^j \sigma_{ii}^{j}}{X_{i\omega}/E_{\omega}}}\right) \frac{\sigma_{CHi}^{j}}{s_{i\omega}^{n}}$. Hence, if $\sigma_{CHi}^{j} > 0$ then $\beta_{1i\omega}^{US} > 0$ if $\min\left(\frac{b_i^j \sigma_{ii}^{j}}{X_{i\omega}/E_{\omega}}\right) < 1$ or if $1 < \left(1 - E_{\omega}^{US}/E_{\omega}\right) \frac{b_i^j \sigma_{ii}^{j}}{X_{i\omega}/E_{\omega}}$, i.e. iff $\frac{b_i^j \sigma_{ii}^{j}}{X_{i\omega}/E_{\omega}} \in (-\infty, 1] \cup [\frac{1}{1 - E_{\omega}^{US}/E_{\omega}}, \infty)$, and $\beta_{1i\omega}^{US} < 0$ otherwise. Similarly, to RW, $\beta_{1i\omega}^{RW} \equiv \left(\frac{\frac{b_i^j \sigma_{ii}^{j}}{X_{i\omega}/E_{\omega}}}{1 - \frac{b_i^j \sigma_{ii}^{j}}{X_{i\omega}/E_{\omega}}}\right) \frac{E_{\omega}^{US}}{E_{\omega}} \frac{\sigma_{CHi}^{j}}{s_{i\omega}^{n}}$. Hence, conditional on $\sigma_{CHi}^{j} > 0$, $\beta_{1i\omega}^{RW} < 0$ if $\frac{b_i^j \sigma_{ii}^{j}}{X_{i\omega}/E_{\omega}} < 0$ or $\frac{b_i^j \sigma_{ii}^{j}}{X_{i\omega}/E_{\omega}}$; hence, $\beta_{1i\omega}^{RW} > 0$ whenever $\frac{b_i^j \sigma_{ii}^{j}}{X_{i\omega}/E_{\omega}} \in (0, 1)$, and $\beta_{1i\omega}^{RW} < 0$ otherwise.