Elasticities of Related-party Trade

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Introduction

Motivation

Question. How do Multinationals (MNEs) respond differently to short-run tariff shocks?

- What do we expect from MNE?
  - ⊛ Two *opposite* forces for MNEs' import demand upon trade shocks:
    - **(−)** : higher trade costs and/or trade diversion
    - **(+)** : intrafirm rigidity (e.g. contracts) and/or adjustment costs
- Yet, the effects are not quite clear at this moment
- A puzzle of MNEs' trade patterns and shock response!

Contribution

- **How?** It turns out the puzzle is tractable via exploring **related-party import elasticity** (σ).
- Exogeneous Tariff shock: the 2017-18 Trump tariffs
- The **contributions** are threefold:
  ① **(Channel).** Refine the short-run shock responses "trade elasticity" by related-party channel (σ_{MNE}) and arms-length channel (σ_{NMNE}).

  ② **(Related-party elasticity).** Estimated $\sigma_{MNE} \in [-1.578, -1.955]$ and is *more elastic* than NMNEs' ($|\sigma_{NMNE}| < |\sigma_{MNE}|$).

  ③ **(Implication).** MNE importers being *more responsive* to $\Delta\tau$ than NMNEs may reflect the "profit-shifting" process.

Literature Review

- **Key literatures**: Amiti et al. (2019) (Trump 2017-18 tariffs, elasticity and welfare) & Cox (2023) (Bush 2003-04 Steel tariffs shocks and persistent response)
- This related-party elasticity exercise finds the connection between the above two studies. (Heterog. Rp share $\xrightarrow{?}$ Heterog. responses)
- Several more studies for empirical & theoretical guidance:
  - ⊛ **Elasticity & Welfare**: Fajgelbaum et al. (2020) (Comprehensive study of the Trump tariffs), Alvarez and Lucas (2007)
  - ⊛ **MNEs & Intrafirm**: Ramondo et al. (2016), Bernard et al. (2006), Ruhl (2015) (intrafirm measurement), Costinot and Rodríguez-Clare (2014) (Structural trade theory), Antràs et al. (2017) (Structural MNEs)
  - ⊛ **Intl Finance**: Engel and Wang (2011) (Durable vs nondurable)

Empirical Framework

Data

Two datasets are used to compute elasticity of MNE:

- Amiti et al. (2019)
  - Monthly data on U.S. imports and tariffs from Jan 2017 to Dec 2018
  - Get: import changes ($\Delta \mathbf{q}$), tariff changes ($\Delta \boldsymbol{\tau}$), before-duty prices ($\Delta \mathbf{p}$).[1]
- Related Party Time Series Data
  - Annual records of bilateral related-party trade imports and exports.
  - Calculate: Share of related-party imports (α_r):[2]

$$\%RelatedParty := \frac{v_{ijt}^r}{v_{ijt}} = \frac{v_{ijt}^r}{v_{ijt}^r + v_{ijt}^a} \equiv \alpha_r \tag{1}$$

[1] To be more concise, $\Delta \mathbf{q} \equiv \Delta \ln q_{ijt}$, $\Delta \boldsymbol{\tau} \equiv \Delta \ln 1 + \tau_{ijt}$, and $\Delta \mathbf{p} \equiv \Delta \ln p_{ijt}$. Also see Table 2.
[2] In Table 1 summary statistics I did not multiply it by 100. Also see Antràs and Yeaple (2014) Section 7 Table (2.5). Here I restrict imports to be decomposed into **related-party** and arms-length parts.

Defining MNE (Second-best)

- **Why calculating α_r?** The share of related-party imports helps define MNEs and proxy their trade elasticities (i.e., shock responses).[3]

- **Definition.(MNE)** Let firms source $\alpha_r \in [0,1]$ share of goods from their foreign affiliates/related parties. A firm is a MNE **iff** $\alpha_r \in (0,1]$.[4]

- **Remark.** $(\alpha_r = 0)$ *None* of imported goods are related-party $\longrightarrow$ NMNE.
  Remark. Since MNE has $\alpha_r > 0$, I define $\tilde{\alpha}_r^+ \equiv \text{median}(\alpha_r; \alpha_r > 0)$.

[3] See Appendix A.1 Proof of Concept.

[4] I titled it "Second-best" definition since the first-best is to identify MNE shipment from firm-level data.

Baseline Estimation

- This paper proceeds with this specification:[5]

$$\Delta \mathbf{q} = \phi_B \Delta \boldsymbol{\tau} + \phi_{MNE} \Delta \boldsymbol{\tau} \times \% \mathit{RelatedParty} + \mu_j + \zeta_{it} + \xi_{ijt}, \tag{2}$$

[5] Recall, $\Delta \mathbf{q} \equiv \Delta \ln q_{ijt}$, $\Delta \boldsymbol{\tau} \equiv \Delta \ln 1 + \tau_{ijt}$, and $\Delta \mathbf{p} \equiv \Delta \ln p_{ijt}$. μ_j: commodity (HS10) fixed effect. ζ_{it}: country $\times$ time fixed effect. ξ_{ijt}: unobserved Supply/Demand shocks. Clustered-robust standard errors at HS8. Also see Draft Section 3.2 Strategy (A2).

Identification

For notation ease, let's rewrite Equation (2) as:

$$\Delta \mathbf{q} = \phi_B \boldsymbol{\Delta\tau} + \phi_{MNE} \boldsymbol{\Delta\tau} \cdot \alpha_r + (\text{FEs}) + \boldsymbol{\xi} \tag{3}$$

- **Empirical assumptions**:
  ① Idiosyncratic shocks: the Trump tariffs ($\boldsymbol{\Delta\tau}$) were *unanticipated* (exog.) and uncorrelated to unobserved $\boldsymbol{\xi}$.[6]
  ② Matched moment: let α_r be exogeneously endowed.
  ③ Complete pass-through: no impact of tariffs to before-duty prices.
- *Potential Threats to Identification if time permitted.[7]

[6] Also see discussion in Amiti et al. (2019), Fajgelbaum et al. (2020), Cox (2023)
[7] ⊛ Simultaneity? Instrument duty-inclusive prices by $\boldsymbol{\Delta\tau}$. ⊛ Tariff Anticipation? ① is a *strong* assumption. ⊛ Tariff pass-through? Supportive evidence in Table 1.

Estimation Results

Table 1: Impact of the Trump tariffs, Related-party (Partial)

	log–diff Before-duty Prices		*log–diff Import Quantities*		
	$\Delta \mathbf{p}$		$\Delta \mathbf{q}$		
	(1)	(2)	(3)	(4)	(5)
$\Delta \tau$	-0.012	-0.057	-1.802***	-0.854*	-1.551***
	(0.023)	(0.038)	(0.327)	(0.499)	(0.413)
$\Delta \tau \times$ %*RelatedParty*		0.113		-2.422**	
		(0.069)		(0.965)	
$\Delta \tau \times \mathbb{1}$*HighRelatedParty*					-0.404
					(0.428)
σ_{NMNE}			-1.802	-0.854	-1.551
σ_{MNE}			-1.802	-1.578	-1.955
N	1,647,617	1,641,326	2,473,895	2,464,296	2,473,895

Note: Clustered SE at HS8 level, with Commodity & Country $\times$ Time FE. Also see Appendix B.1 for more details.

Elasticities for Non/Multinationals

- Recall, my goal is to learn about shock response
- **WANT.** σ_{NMNE} and σ_{MNE}
- Under the assumptions on $\Delta\boldsymbol{\tau}, \alpha_r$ and $\boldsymbol{\xi}$, I can recover the **elasticities** by:

$$\boldsymbol{\sigma}(\phi;\boldsymbol{\alpha}) = \begin{cases} \sigma_{NMNE} = \phi_B \\ \sigma_{MNE} = \phi_B + \phi_{MNE} \cdot \tilde{\alpha}_r^+, \end{cases} \tag{4}$$

where ϕ's identified in OLS.[8]

[8] Logic is to fix $\boldsymbol{\alpha} \longrightarrow \phi$ identified $\longrightarrow \boldsymbol{\sigma}(\phi;\boldsymbol{\alpha})$ recovered. I am still working on the dimensionality. See Appendix A.2 for the derivation. Also see Appendix A.4. for an attempt of Monotone Comparative Statics.

Wrap-up: Estimation Strategy

Table 2: Summary of Estimation Strategy

Notations	Concept	Known?
$\Delta \mathbf{q} \equiv \Delta \ln q_{ijt}$	12-month log changes of import quantities	✓
$\Delta \boldsymbol{\tau} \equiv \Delta \ln (1 + \tau_{ijt})$	12-month log changes of tariffs	✓
$\Delta \mathbf{p} \equiv \Delta \ln p_{ijt}$	12-month log changes of before-duty import prices	✓
m	MNE concentration $m \in [0, \mathcal{M}]$	No, but $\cong \alpha_r$
α_r	Share of Related-party Imports $\alpha_r \in [0, 1]$	✓
$\tilde{\alpha}_r^+$	Median of non-zero Share of Related-party Imports	0.299
ϕ_B	Standalone effect of tariff changes on import quantities	Est. by OLS
ϕ_{MNE}	Differential effect of tariff changes $\times \alpha_r$ on import quantities	Est. by OLS
Parameters of Interest		
σ_{NMNE}	Trade elasticities of Non-multinationals (calculated by $\boldsymbol{\sigma}(\phi; 0)$)	ϕ_B
σ_{MNE}	Trade elasticities of Multinationals (calculated by $\boldsymbol{\sigma}(\phi; \tilde{\alpha}_r^+)$)	$\phi_B + \phi_{MNE} \cdot \tilde{\alpha}_r^+$

Note: See Appendix B.2 and B.3 for a case study of steel-specific. Also see Draft for more details.

Conclusion

Motivation. How do MNEs respond differently to short-run tariff shock?

Contribution. Refine the short-run shock responses "elasticity" by related-party channel (σ_{MNE}) and arms-length channels (σ_{NMNE}).

(Related-party elasticity). Import demand of MNE (related-party) is more *elastic* than NMNEs' ($|\sigma_{NMNE}| < |\sigma_{MNE}|$), monotonically increasing in α_r.

(Implication: Shock Response). MNE importers are *more responsive* to $\Delta\tau$ than NMNE, monotonically increasing in α_r (fixed foreign supply).

① **Why?** May reflect "profit–shifting," better ability to switch sourcing origins

② The "more responsive" drop of MNE imports $\longrightarrow$ profit–shifting process to alternative origins?

③ Built on ①, profit-shifting is increasing in α_r

Limitations and Future Directions

- Push forward on the **policy implications**
  - ⊛ MNE: what clusters are really reducing the imports?
  - ⊛ PM: What's the efficiency/goal of tariff policy if MNE can do profit-shifting? What about home production?
- Investigate the MNE sourcing dynamics
  - ⊛ Modeling $\pi-$ max MNEs
  - ⊛ Uncertainty affects imports diversion or intermediates prod reshoring?
  - ⊛ # of origins; up/downstreams; labor/capital-intensive industry
- Refine the intrafirm measurements (connect to Ruhl (2015))
  - ⊛ This paper is an attempt to proxy MNEs without firm-level data.
- Add more years of data to see shock responses (connect to Cox (2023))
- Construct structural parameters (connect to Fajgelbaum et al. (2020))

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Appendix A: Empirical Framework

Appendix A.1 Proof of Concept

- To define MNE in the second-best setting, I have not yet shown but taken advantage of relating **share of related-party imports** to **MNE concentration** already.

- **Assumption.(Data)** By reordering, the MNE concentration $m \in \mathbb{R}_+$ has $\sup m = \mathcal{M},\ \mathbb{E}\,|\mathcal{M}| < \infty$ (finite), $\mathcal{M} \neq 0$, in data.

- **Proposition.** *The MNE concentration $m \in [0, \mathcal{M}]$ is order isomorphic to the share of related-party trade $\alpha_r \in [0, 1]$.*

- **Remark.** The idea is to (hopefully) use the share of related-party imports (α_r) to later help proxy trade elasticities of Multinationals (σ_{MNE}).

Appendix A.1 Proof of Concept (Cont'd)

Proof.
We need to show there exists an affine transformation from m onto α_r and check if the ordering is preserved. By **Assumption. (Data)** and Heine-Borel Theorem, $[0, \mathcal{M}] \subseteq \mathbb{R}$ is compact. So, any continuous function defined on $[0, \mathcal{M}]$ attains its min/max values. Let's consider the simplest possible affine transformation $\alpha_r = \varphi(m) = \frac{1}{\mathcal{M}} m, \ m \in [0, \mathcal{M}]$. Note that:

① The supp of α: $\frac{1}{\mathcal{M}} m \in [0, 1]$ for all $m \in [0, \mathcal{M}]$ and attains min/max (✓)

② Bijection: automatically true since $\varphi(\cdot)$ is linear (✓)

③ Ordering: take $m_1 \leq m_2, m_1, m_2 \in [0, \mathcal{M}]$. Since $\mathcal{M} \neq 0$ and $\frac{1}{\mathcal{M}} > 0$, we have $\alpha_{r,1} = \frac{1}{\mathcal{M}} m_1 \leq \frac{1}{\mathcal{M}} m_2 = \alpha_{r,2}$ (✓)

We conclude that $\alpha_r = \varphi(m)$ is one affine transformation that preserves order-isomorphic property from m to α_r. □

Appendix A.2 Elasticities for Non/Multinationals

Denote $\Delta\mathbf{q} \equiv \Delta \ln q_{ijt}$, $\Delta\boldsymbol{\tau} \equiv \Delta \ln (1+\tau_{ijt})$, $\alpha_r \equiv \% \mathit{RelatedParty}$. Then, Equation (2) becomes:

$$\Delta\mathbf{q} = \phi_B \Delta\boldsymbol{\tau} + \phi_{MNE} \Delta\boldsymbol{\tau} \cdot \alpha_r + \mu_j + \zeta_{it} + \xi_{ijt} \tag{5}$$

Under our empirical assumptions on $\Delta\boldsymbol{\tau}, \alpha_r$ and $\boldsymbol{\xi}$, we obtain the CEF:

$$\begin{aligned}
\mathbb{E}[\Delta\mathbf{q}|\Delta\boldsymbol{\tau},\alpha_r] &= \mathbb{E}\left[\phi_B \Delta\boldsymbol{\tau} + \phi_{MNE} \Delta\boldsymbol{\tau} \cdot \alpha_r + \mu_j + \zeta_{it} + \xi_{ijt} | \Delta\boldsymbol{\tau},\alpha_r\right] && (6)\\
&= \mathbb{E}\left[\phi_B \Delta\boldsymbol{\tau} + \phi_{MNE} \Delta\boldsymbol{\tau} \cdot \alpha_r | \Delta\boldsymbol{\tau}\right] + \mathbb{E}[\xi_{ijt}|\Delta\boldsymbol{\tau},\alpha_r] && (7)\\
&= \mathbb{E}\left[(\phi_B + \phi_{MNE} \cdot \alpha_r)\Delta\boldsymbol{\tau}|\Delta\boldsymbol{\tau},\alpha_r\right] + 0 && (8)\\
&= \mathbb{E}\left[(\phi_B + \phi_{MNE} \cdot \alpha_r)\Delta\boldsymbol{\tau}|\Delta\boldsymbol{\tau},\alpha_r\right] && (9)\\
&= (\phi_B + \phi_{MNE} \cdot \alpha_r)\Delta\boldsymbol{\tau} && (10)\\
&= \underbrace{\begin{pmatrix} 1 & 0 \\ 1 & \alpha_r \end{pmatrix}}_{\equiv \boldsymbol{\alpha}} \underbrace{\begin{pmatrix} \phi_B \\ \phi_{MNE} \end{pmatrix}}_{\equiv \boldsymbol{\phi}} \Delta\boldsymbol{\tau} \longleftarrow \text{stack 2 eqns with boundary cond.} && (11)\\
&\equiv \boldsymbol{\sigma}(\boldsymbol{\phi};\boldsymbol{\alpha})\Delta\boldsymbol{\tau} && (12)
\end{aligned}$$

Appendix A.2 Elasticities for Non/Multinationals (Cont'd)

- Let's focus on $\alpha_r \in (0,1]$ (in particular $\tilde{\alpha}_r^+$) and the CEF:

$$\mathbb{E}[\Delta \mathbf{q} | \Delta \boldsymbol{\tau}, \boldsymbol{\alpha}] = \boldsymbol{\sigma}(\phi; \boldsymbol{\alpha}) \Delta \boldsymbol{\tau} \tag{13}$$

$\implies$ Fixed $\boldsymbol{\alpha}$ (p.d.), I have 2 unknowns (ϕ's) with 2 equations
$\implies$ ϕ identified via OLS $\implies$ can calculate $\boldsymbol{\sigma}(\phi; \boldsymbol{\alpha})$!

- Thus, the final step is to recover **elasticities $\boldsymbol{\sigma}(\phi; \boldsymbol{\alpha})$**:

$$\boldsymbol{\sigma}(\phi; \boldsymbol{\alpha}) = \begin{cases} \sigma_{NMNE} = \phi_B \\ \sigma_{MNE} = \phi_B + \phi_{MNE} \cdot \tilde{\alpha}_r^+ \end{cases} \tag{14}$$

⊛ Interpretation: a proxy of trade elasticity of a median MNE
⊛ MCS: $\boldsymbol{\sigma}(\phi; \boldsymbol{\alpha})$ is increasing (in abs value) in α_r.[9]

[9] Also see Appendix A.4. Monotone Comparative Statics.

Appendix A.3 Summary Statistics (Full)

Table 3: Summary Statistics, Related-party Trade (Full)

	mean	sd	min	p25	p75	max
Total Imports	81.70	906.41	0.00	0.03	7.60	78398.92
Related-party Imports	40.47	601.18	0.00	0.00	1.28	48329.58
Non related-party Imports	41.23	485.62	0.00	0.02	4.31	59038.40
$\mathbb{1}\{\text{Related-party Imports}\}_t$	0.61	0.49	0.00	0.00	1.00	1.00
% RelatedParty	0.25	0.33	0.00	0.00	0.45	1.00
Total Trade Balance	-44.68	875.44	-77986.20	-1.62	1.84	27524.11
Related-party Trade Balance	-27.50	552.13	-48329.58	-0.27	0.05	9460.98
Non related-party Trade Balance	-17.83	499.37	-58686.64	-0.59	1.98	22232.32
$\mathbb{1}\{\text{Related-party Trade Balance}\}_t$	0.42	0.49	0.00	0.00	1.00	1.00
			Obs = 58988			
Lagged status						
$\mathbb{1}\{\text{Related-party Imports}\}_{t-1}$	0.65	0.48	0.00	0.00	1.00	1.00
$\mathbb{1}\{\text{Related-party Trade Balance}\}_{t-1}$	0.44	0.50	0.00	0.00	1.00	1.00
			Obs = 52956			

Note: The data is obtained from the Related Party Time Series, with a sample period 2017-2018. Units in million.

Appendix A.4 MCS of Elasticity function

Definition. (Single-crossing) $f : \mathbb{R}^2 \to \mathbb{R}$ satisfies single-crossing (SC) if $\forall x' > x, t' > t \in T$, we have $f(x';t) - f(x;t) > 0 \implies f(x';t') - f(x;t') > 0$ and the "$\geq$" version.

Proposition. $\boldsymbol{\sigma}(\phi; \boldsymbol{\alpha}) : \mathbb{R}^2 \to \mathbb{R}$ satisfies SC in absolute values.

Proof.
I show strict version. Since ϕ_B is a common term, let's focus on ϕ_{MNE}. Take $\phi_{MNE,1} < \phi_{MNE,2}$ (in abs value) and $\boldsymbol{\alpha}_1 \ll \boldsymbol{\alpha}_2$. We have:

$$\begin{aligned} 0 < \boldsymbol{\sigma}(\phi_{MNE,2}; \boldsymbol{\alpha}_1) - \boldsymbol{\sigma}(\phi_{MNE,1}; \boldsymbol{\alpha}_1) &= (\phi_B + (\phi_{MNE,2} - \phi_{MNE,1}) \cdot \alpha_{r,1}) \\ &< (\phi_B + (\phi_{MNE,2} - \phi_{MNE,1}) \cdot \alpha_{r,2}) \\ &= \boldsymbol{\sigma}(\phi_{MNE,2}; \boldsymbol{\alpha}_2) - \boldsymbol{\sigma}(\phi_{MNE,1}; \boldsymbol{\alpha}_2) \end{aligned}$$

□

Proposition. $\boldsymbol{\sigma}(\phi; \boldsymbol{\alpha}) : \mathbb{R}^2 \to \mathbb{R}$ is increasing in α_r in SSO in absolute value.

Proof.
Apply Milgrom-Shannon Thm to $|\boldsymbol{\sigma}(\phi; \boldsymbol{\alpha})|$ and note $|\boldsymbol{\sigma}|$ is OLS maximizer. □

Appendix B: Estimation Results

Appendix B.1 Table 2 (Full)

Table 4: IMPACT OF THE TRUMP TARIFFS, RELATED-PARTY (FULL)

	log–diff Foreign Exporter Prices		*log–diff Import Quantities*			*log–diff Import Values*	
	$\Delta \ln p_{ijt}$		$\Delta \ln q_{ijt}$			$\Delta \ln (p_{ijt} \times q_{ijt})$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\Delta \ln(1+\tau_{ijt})$	-0.012	-0.057	-1.802***	-0.854*	-1.551***	-1.597***	0.164
	(0.023)	(0.038)	(0.327)	(0.499)	(0.413)	(0.340)	(0.549)
$\Delta \ln(1+\tau_{ijt}) \times$ *%RelatedParty*		0.113		-2.422**			-4.430***
		(0.069)		(0.965)			(1.146)
$\Delta \ln(1+\tau_{ijt}) \times \mathbb{1}$*HighRelatedParty*					-0.404		
					(0.428)		
σ for Non-MNE			-1.802***	-0.854*	-1.551***		
			(0.327)	(0.499)	(0.413)		
σ for MNE			-1.802***	-1.578***	-1.955***		
			(0.327)	(0.341)	(0.370)		
Commodity FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country $\times$ Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1,647,617	1,641,326	2,473,895	2,464,296	2,473,895	2,473,895	2,464,296

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The elasticities of MNE in Column 3–5 are recovered by the median = 0.299 for all non-zero share of related-party imports, and their point estimates are reported. Standard errors in parentheses are clustered at the HTS8 level, respecting that tariff variations for some commodities only happened at the HTS8 aggregation. Also see Draft for more details.

Appendix B.2 Table 3 (Full)

Table 5: Related-party Trade Elasticity, Steel Industry (Full)

	log–diff Import Quantities							
	General: $\Delta \ln q_{ijt}$				*Steel Industry:* $\Delta \ln q_{ijt}^{steel}$			
	Reduced form		Structural		Reduced form		Structural	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta \ln(1+\tau_{ijt})$	-1.802***	-0.854*			-2.509**	0.192		
	(0.327)	(0.499)			(1.100)	(1.694)		
$\Delta \ln(1+\tau_{ijt}) \times$ %*RelatedParty*		-2.422**				-6.368*		
		(0.965)				(3.518)		
$\Delta \ln(\tilde{p}_{ijt})$			-11.234***	-9.787***			-65.735**	-66.186**
			(2.038)	(2.884)			(28.809)	(29.077)
			[54.92]	[31.93]			[1.54]	[0.92]
$\Delta \ln(\tilde{p}_{ijt}) \times$ %*RelatedParty*				-2.501				-13.139
				(3.543)				(9.363)
				[38.44]				[40.57]
σ for Non-MNE	-1.802***	-0.854*	-11.234***	-9.787***	-2.509**	0.192	-65.735**	-66.186**
	(0.327)	(0.499)	(2.038)	(2.884)	(1.100)	(1.694)	(28.809)	(29.077)
σ for MNE	-1.802***	-1.578***	-11.234***	-10.535***	-2.509**	-3.119***	-65.735**	-73.018**
	(0.327)	(0.341)	(2.038)	(2.200)	(1.100)	(1.199)	(28.809)	(29.348)
Commodity FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country × Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2,473,895	2,464,296	2,473,895	2,464,296	73,295	73,295	73,295	73,295

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Column 3–4 and 7–8 follow Fajgelbaum et al. (2020) to estimate the structural trade elasticity for MNEs (unit values instrumented by tariff changes). The first-stage F statistics are reported in square brackets. The elasticities of MNEs in Column 1–4 are recovered by $\text{med}(\alpha_+) = 0.299$. The elasticities of MNE in Column 5–8 are recovered by the steel-specific $\text{med}^{steel}(\alpha_+) = 0.520$. Standard errors in parentheses at the HTS8 level. Also see Draft for more details.

Appendix B.3 Summary of Preliminary results

- **(Related-party).** I found that demand of related-party (MNE) imports is more *elastic* than NMNEs' ($|\sigma_{NMNE}| < |\sigma_{MNE}|$).
- **(Welfare implication).** Under complete pass-through, domestic importers bear entire tariff burdens. Holding foreign supply fixed, MNE importers suffer *less* tariff incidence (more responsive to $\Delta\tau$) among importers.
- **(Case: Steel manufacturing).** Steel import demand is estimated to be more *elastic* than general imports ($|\sigma| < \left|\sigma^{steel}\right|$).
  - Within industry, related-party imports are the main drivers of its industry-level elasticity.
  - MNE imports estimated to be more *elastic* than the NMNE counterparts ($\left|\sigma^{steel}_{NMNE}\right| < \left|\sigma^{steel}_{MNE}\right|$).