Effect of Tariffs on Chilean Exports*

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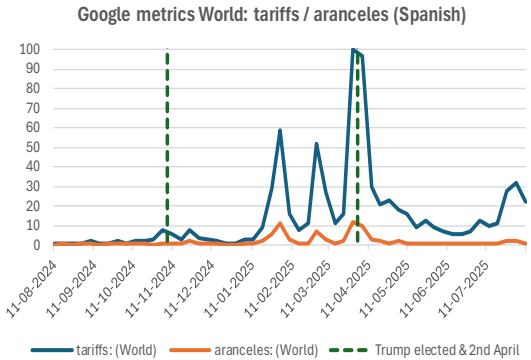
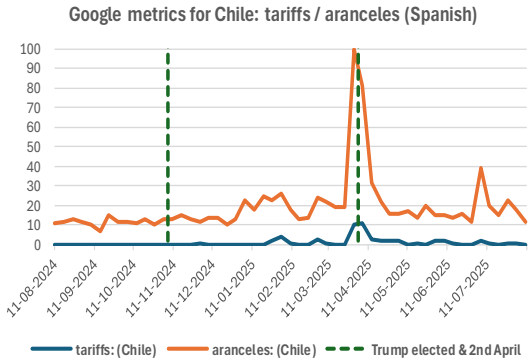
**The findings are preliminary, subject to change*

***The views expressed herein are those of the authors and do not necessarily reflect the opinions of the Central Bank of Chile and/or its Board members*

Motivation

- Headlines around tariffs have taken over the news
- Ignited searches in Google elsewhere





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Introduction

- Trade policy develops gradually over time to achieve long-term objectives. In toolkit: tariffs, quotas.
- Recently, Trump announced higher tariffs (+10pp) on all US imports. Even higher for imports from 57 countries (details), still negotiating.
- In this episode, tariffs are likely to exert a *negative* impact on global economic activity through several **channels:** trade, demand-GDP, spillovers to third countries (integrated production networks) and increase in uncertainty.
- **Objective**: to quantify the direct impact of tariff changes imposed by Chile's main trading partners on its exports.
  - Contributes to an empirical literature that calculates effects of tariffs, and other macro variables on exports
  - Analysis is particularly timely to extrapolate the likely effects on exports due to recent US tariff hike

Literature Review

- International trade theory **textbooks** predict that exact impact in volumes will depend on:
  - Exports and import elasticities depend on demand and supply elasticities of home country and abroad. Example
  - Exact outcomes depend on assumptions, e.g., flexibility to ship other destinations, inventory management, etc.
- **Background prior**: US increased tariffs on Chinese products in 2018, prompting retaliatory tariffs.
  - **Bilateral trade drops** after a hike in tariffs and **trade diversion** (Haberkorn *et al.*, 2024; Hoang & Lewis, 2024) for US. Amiti *et al.* (2020) export volumes fall with **delay**, larger effect in 2nd year, Minondo (2023) exporter firms implement **strategies**, e.g., adjust products' specs, to avoid or **neutralize** tariff's increases
  - **Prices.** Conventional prediction **tariffs would partially be pass-through** to domestic prices, as US decisions significantly affect global markets. Empirical evidence is **mixed** (Amiti *et al.* (2020), Cavallo *et al.* (2019) full pass-through, whereas Ma and Ning, 2024; Yu *et al.*, 2024 incomplete)
- Evidence on **this episode**: US domestic prices increasing within weeks Cavallo *et al.*(2025)
- **Empirical methods.** Vast use of gravity models to guide applications and micro-level datasets.
  - Chile: Alvarez y Andrasen (2025), Fornero *et al.*(2020), Carrasco et al.(2015), Cabezas *et al.*(2004), Aravena (2005), Agosin (1999), De Gregorio (1984).
- **Research gaps**. Lack of data on tariffs, (still) limited use of micro-data, no similar paper for Chile.

Preview of Results

- In the **short-run** +10pp increase in *relative* tariffs on product A in destination B leads on average to a 5.9% decline in exports of product A to country B in the 2nd year, i.e., *lagged* effects, as reported in the literature.
  - Relevant ***heterogenous*** *effects among subsectors*. Chemicals and Food, beverages & tobacco are more sensitive to tariffs.
  - Export elasticities in the short run for RER and foreign GDP **comparable** with previous literature.
  - **Results robust** if we consider *manufacturing* sector firms, to excluding the Pandemic period, to consider absolute tariffs
  - Partial equilibrium calculations for **this episode**, point towards lower exports approximately -0.11% of GDP (in 2026).
- **Long-run:** significative (+) effects of RER, GDP*, (-) tariffs, and FTAs also exert a positive additional effect.
- **Literature.** Fitzgerald & Haller(2018) analyzes effects of tariffs on exports and firm dynamics (Irish microdata).
  - Elasticities of aggregate exports w.r.t. to tariff changes in range [−1.5, −3.5] on impact, [−2, −5] in long run.

Exports and markets

a. Chile's Export Structure. Exports to GDP (%) (1)

Exports of goods and services 34.6			
Goods 30.3			Services
Agriculture, Forestry, & Fishing	Mining	Manufacturing	
	16.8		4.3
	Copper Mining	Other Mining	
2.2	13.5	1.6	11.3

b. Destination of Exports (nominal share) (2)

Manufacturing Ranking	Trading partners	Manufacturing	Total
1	United States	17.1	13.7
2	Japan	9.5	9.6
3	China	8.9	25.1
4	Brazil	6.1	4.9
5	Peru	5.5	2.2
6	Bolivia	4.8	1.8
7	Mexico	4.3	2.4
8	Netherlands	3.7	3.5
9	South Korea	3.4	5.8
10	Argentina	2.8	1.2
11	Colombia	2.2	1.0
12	Spain	1.9	2.0
14	United Kingdom	1.7	1.1
16	Belgium	1.4	1.2
18	Italy	1.4	2.5
19	Germany	1.4	1.7
21	Russia	1.3	0.6
22	France	1.2	2.1
37	Finland	0.2	0.3
	Total considered	**78.8**	**82.7**

Notes: Sample period 2003–2024. (1) Nominal ratios from National Accounts. (2) Rank calculations use data from Central Bank of Chile, MM USD FOB. Source: own calculations based on data from the Central Bank of Chile and Chilean National Customs Service.

Data used

Raw data on **exports** product-level quantity data (8-digit level) and innominate firms, both sourced from the Chilean National Customs Service.

- **Dependent variable**: annual volume of exports, measured using microdata on shipments by firms based in Chile to each of the nineteen destination countries listed in Table 2 (b)

- **Sample** annual freq. 2003-2024.
- **Filter:** Keep firms in the sample if they have export records for two consecutive years, a requirement to estimate exports annual growth.

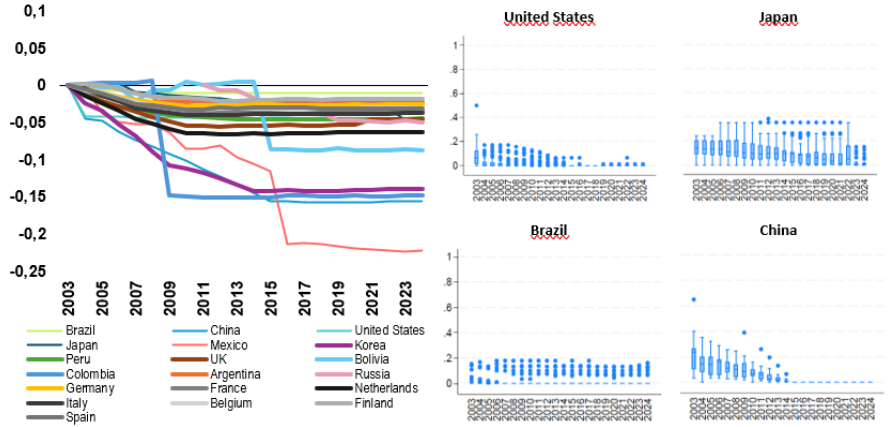
Tariffs

Novel database with **ad *valorem* tariffs by product** (6-digit level) for Chile's nineteen main trading partners, covering period 2003 to 2024. Involved concordating multiple data sources.

Figure 2

a. Average Tariffs by country (1)
(points, difference relative to 2003 levels)

b. Tariff distribution: Food Products (2)
(points)



Notes: (1) The figure reports average tariff (τ) coefficients (B) for each country following Fitzgerald *et al.*, based on the following regression: $\tau_{jt} = \alpha_0 + B \cdot D + v_j + \varepsilon_{jt}$, where D represents a set of year dummies (2004-2024), B is the matrix of estimated coefficients (relative to 2003), and v_j is a product fixed effect. (2) Chapters 16 to 24 of the 2022 customs tariff codes are considered. Boxplot: lower and upper bounds correspond to the 25th and 75th percentiles, respectively. The median is represented as a line within the box. Whiskers indicate minimum and maximum values within 1.5 times the interquartile range, which represents 50% of the dataset. Dots outside the whiskers indicate extreme values or outliers. Source: own calculations based on WTO, ALADI, and Chilean FTA data.

Summary sources

Relative Tariffs

Relative tariff: $\Delta\tilde{\tau}_{jpt} \equiv \Delta\tau_{jpt} - \Delta\bar{\tau}_{j(-p)t}$

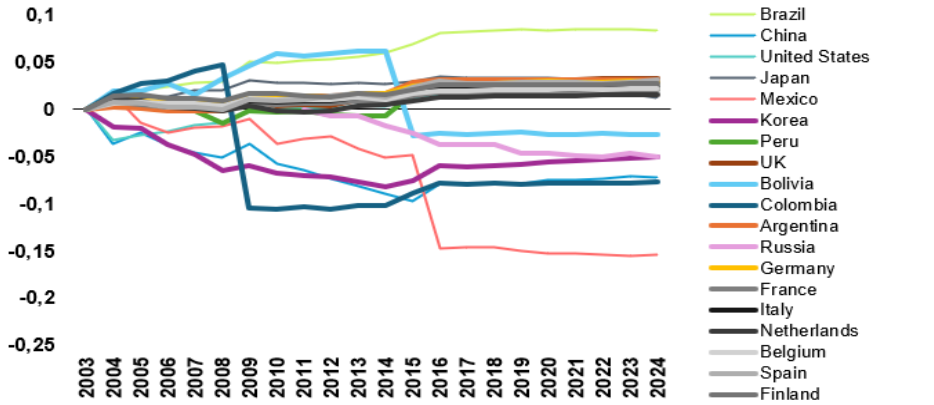
- $\Delta\tau_{jpt}$ change (pp) in the tariff applied to product j in year t by destination p
- $\Delta\bar{\tau}_{j(-p)t}$ change (pp) in the average tariff on product j across all other destination countries (excluding p) in the same year.

X: Δ tariffs imposed by one country relative to average Δ tariffs imposed by the rest

Figure 3

Average evolution of *relative* tariffs ($\tilde{\tau}_{jpt}$) by country

(difference relative to 2003 levels, points)



Notes: The figure reports average tariff ($\tilde{\tau}$) coefficients (B) for each country. See details in Note (1) of Figure 2.
Source: own calculations based on WTO, ALADI, and Chilean Free Trade Agreements data.

Methodology

- **Short-term (growth).** Micro-level data panel regression

$$\Delta\, exp_{ijpt} = \alpha\ \Delta\, rer_{pt} + \beta\ \Delta gdp_{pt} + \gamma \Delta\tilde{\tau}_{jpt} + v_{ijt} + \delta_{jp} + \varepsilon_{ijpt} \qquad \textbf{(2)}$$

where:

- $\boldsymbol{\Delta\, exp}$ log change in the annual export volume of firm i exporting product j to country p in year t.
- $\boldsymbol{\Delta\, rer_{pt}}$ log change in the bilateral real exchange rate (RER) between Chile and country p in year t.
  - a country's competitiveness relative to the export destination
- Δgdp_{pt} log change in the GDP of country p in year t.
  - as a proxy for external demand
- $\Delta\tilde{\boldsymbol{\tau}}_{\boldsymbol{jpt}}$ our measure of relative tariff to product j by country p (w.r.t. avg rest countries-p) in year t
- Fixed effects (FEs)
  - v_{ijt} firm–product–year (captures e.g., unobserved supply shocks);
  - δ_{jp} product–destination (copes with time-invariant demand- or trade-related unobserved variability specific to each market)

  Equation (2) found in studies for Chile: Fornero *et al.* (2020) and Carrasco *et al.* (2015) Chile, and other countries (references therein).
- **one-year lag** to account for Δtariffs that affect export flows with delay, Amiti *et al.*(2020), Minondo (2023)

- **Long-term (levels).** Same equation but variables all in levels.

Note: Unbalanced panel. Indices: i=2895 firms; j= 194 products; p=19 countries; t=22 years.

Results

Table 3: Estimated short-term supply coefficients- export volume

	Total				Manufacturing			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Δrer	0.229***	0.322***	0.344***	0.232***	0.212***	0.312***	0.322***	0.216***
L1.	0.241***	0.281***		0.242***	0.304***	0.362***		0.304***
Δgdp	0.914***	1.219***	1.113***	0.910***	1.106***	1.285***	1.192***	1.098***
L1.	-0.133	-0.337		-0.131	-0.366*	-0.476		-0.361*
$\Delta tariffs_{jpt}$	-0.042	-0.042	-0.026	-0.125	-0.07	-0.12	-0.041	-0.188
L1.	-0.591***	-0.579***		-0.683***	-0.605***	-0.613***		-0.670***
Observations	195,686	143,939	287,629	195,686	112,285	82,954	162,373	112,285
R-squared	0.43	0.44	0.43	0.43	0.45	0.46	0.45	0.45

Notes: *** p<0.01, ** p<0.05, * p<0.1. L1 denotes a one-period lagged variable (year). Estimations correspond to equation (2). Includes FEs: v_{ijt} firm–product–year; δ_{jp} product–destination. (1) Main regression using *relative* tariffs $\Delta\tilde{\tau}_{jpt}$ and full sample. (2) Subsample up to 2019. (3) Only contemporaneous variables. (4) Use absolute tariffs $\Delta\tau_{jpt}$.

Export unit values

Results

Table 4: Estimated supply coefficients- export volume separating manufacturing sectors

	Chemicals	Food products, beverages and tobacco	Forestry & wooden furniture, pulp, paper & others	Metal products, machinery & equipment	Other manufacturing products
Δrer	0.272	0.195**	0.268	0.068	0.601**
L1.	0.183	0.271***	0.307	0.633**	-0.134
Δgdp	1.648***	1.210***	0.861	0.467	1.112
L1.	-1.320***	-0.279	-1.106**	0.291	1.106
$\Delta\tilde{\tau}_{jpt}$	0.149	-0.586***	0.515	1.441	0.687
L1.	-0.991**	-0.362*	-0.594	-0.734	-1.219**
Observations	21,826	48,974	10,036	22,527	8,922
R-squared	0.45	0.41	0.44	0.47	0.51
Share 2024	23.3	43.6	19.1	9.7	7.2

Notes: Share 2024 for each subsector in total manufacturing exports in MM USD according to Balance of Payments, Central Bank of Chile. Other manufacturing products include Textile, clothing, leather and footwear, Non-metallic minerals and base metals and other industrial products. Estimation corresponds to equation (2), separating sectors. Include FEs: v_{ijt} firm–product–year; δ_{jp} product–destination.

Heterogeneity

Future agenda:

- product differentiation and responses to tariffs,
- concentration in sectors,
- Consider sector specific variables, e.g., supply shocks, sectoral bilateral RER, etc.

Results

$$exp_{ijpt} = \alpha_{LT}\, rer_{pt} + \beta_{LT} gdp_{pt} + \gamma_{LT}\tilde{\tau}_{jpt} + \gamma_1 FTA_{pt} + \gamma_2 FTA_{pt}\tilde{\tau}_{jpt} + v_{ijt} + \delta_{jp} + \varepsilon_{ijpt} \quad \textbf{(3')}$$

Table 7: Robustness- Estimated long-term supply coefficients- export volume

	Total exports			Manufacturing exports		
	(1)	(2)	(3)	(1)	(2)	(3)
rer	0.370***	0.395***	0.394***	0.398***	0.452***	0.444***
gdp	0.426***	0.408***	0.412***	0.253***	0.215***	0.231***
$\tilde{\tau}_{jpt}$	-0.437***	-0.415***	-0.222*	-0.288*	-0.236	-0.007
FTA		0.041*	0.027		0.071**	0.054*
$FTA*\tilde{\tau}_{jpt}$			-1.339***			-1.406***
Observations	195,686	195,686	195,686	112,285	112,285	112,285
R-squared	0.91	0.91	0.91	0.91	0.91	0.91

Notes: *** p<0.01, ** p<0.05, * p<0.1. Estimation corresponds to equation (3) and (3)' restricting sample to results in Table 3. Columns (1) Main regression (2) Adding the step variable FTA (3) Adding step variable FTA and interaction between FTA and relative tariffs. Dependent variable "exp": log export volume. Includes FEs: v_{ijt} firm–product–year; δ_{jp} product–destination.

No tariffs

Application: +10pp US Tariff

- Calculate partial-equilibrium impact on Chilean exports in 2nd year, considering two effects (*):

    1. ***Reduced exports to the US:*** increase in tariffs desincentives exports to US.
    2. ***Trade diversion to other destinations:*** as the *relative* tariff marginally decreases for the rest of partners.

- Simple calculation:
    - Last observation of exports and GDP data, 2024:
        - Δ US tariffs of +10pp affect a share of 8.4% of total exports(**)
        - Export to GDP ratio ≈ 30% of GDP
    - Relative tariff semi-elasticity reported in Table 2 (≈ -0.6)

Effects	**% of GDP**
(1) *Reduced exports to the US*	-0.15
(2) *Trade diversion to other destinations*	+0.04
Net effect	-0.11

Notes:
(*) It assumes muted effects from RER and foreign GDP.
(**) Copper, lithium and its derivatives, and wood are exempt from tariffs, based on the Executive Order of April 2. Therefore, affected products correspond to all other goods.

Conclusion

- Using a **novel micro-level dataset** for period 2003-2024 with exporter firms, tariffs applied to products by trading partners and other macroeconomic controls, we find negative impacts of tariffs on exports.
- In the **short-run** a 10pp increase in tariffs on product A in destination B leads on average to a 5.9% decline in exports of product A to country B in the 2nd year, with *lagged* effects, as reported in literature.
- Other results
  - Relevant ***heterogenous*** *effects among subsectors*. Chemicals and Food, beverages and tobacco are more sensitive to tariffs.
  - Export elasticities in the short run for RER and foreign GDP **comparable** with previous literature.
  - Results **robust** if we consider *manufacturing* sector firms, to excluding the Pandemic period, and to consider absolute tariffs
- **Long-run:** significative (+) effects of RER, GDP*, and (-) tariffs, FTAs also exert a positive additional effect.
- **Calculation effects Trump tariffs:** Using the estimated semi-elasticities and the exports-GDP share in 2024, we estimate a net negative impact of -0.11% in terms of GDP in 2026 (partial equilibrium analysis).
  - Limitations: Non-trivial degrees of uncertainty limiting extrapolation to events beyond those observed in the sample, so we are looking forward to explore data that will be available in the following months.
- **Future agenda:** interested in learning more about firm dynamics (margins, entry/exit, scale-up, etc.).

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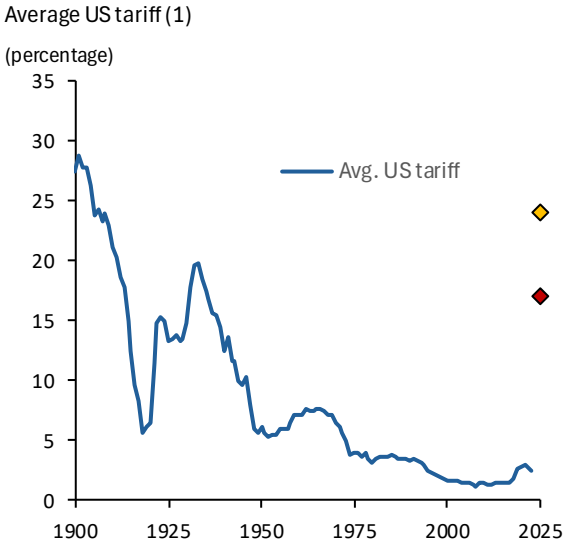
Appendix

Tariffs

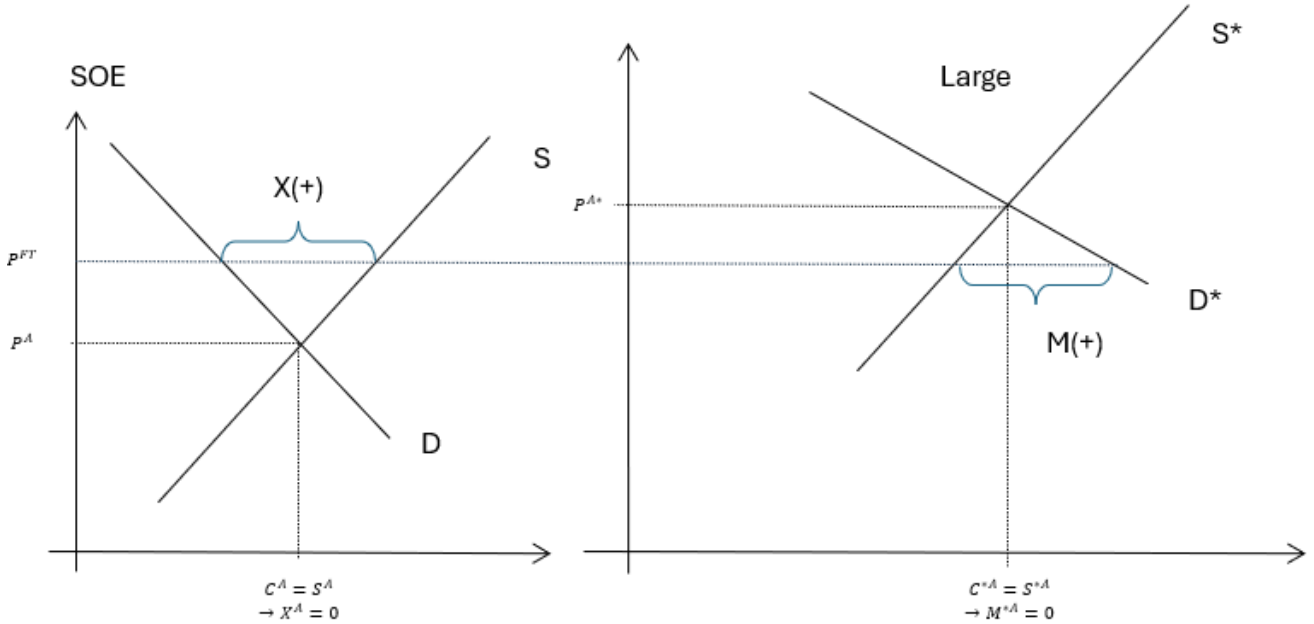


Today's average tariff is comparable with levels seen in the postwar period in the XXth century.

(1) The yellow diamond represents avg tariff after the April 2 announcements, whereas the red one avg tariff as of June 11 (Monetary Policy Report Jun 2025). Sources: Central Bank of Chile, U.S. International Trade Commission, and Tax Foundation.

return

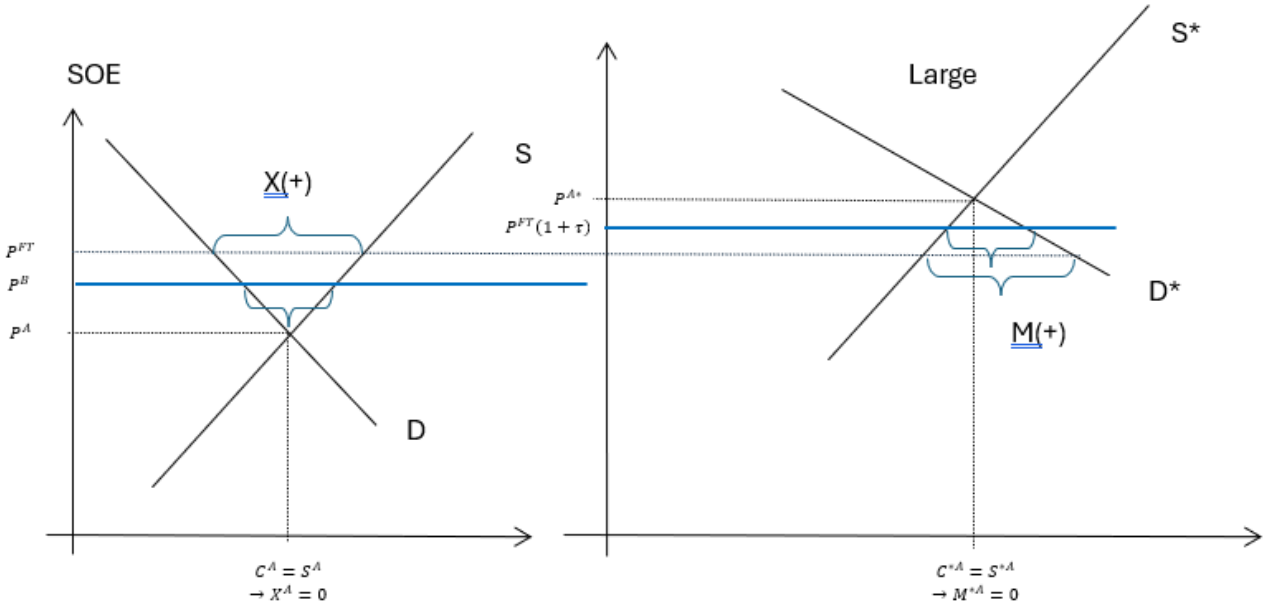
Textbook example. From autarky to free trade



Assumptions: TC =1, two countries, one is a SOE and the other is a large country. A "*" denote large country variables. The following case illustrates the equilibrium of autarky (A) and free trade (FT).

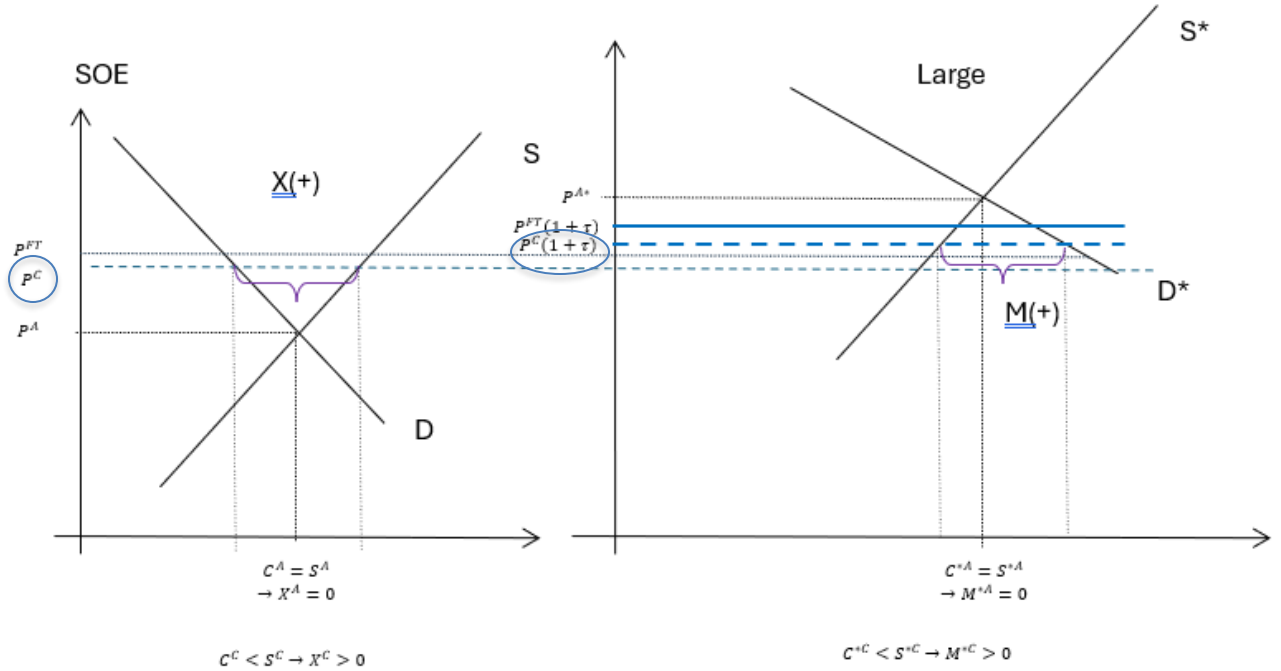
Large country levies a tariff

(world price fixed, internal prices ≠)



Maintain assumptions. The foreign country imposes a tariff (τ). At the new price abroad, $P^{FT}(1+\tau)$, the flow of trade is in disequilibrium as the large country wants less imports than the SOE is willing to supply. An extreme case is that the SOE pushed down the price to P^{B}, but then both blue horizontal lines are not compatible as $P^{FT}(1+\tau) - \tau P^{FT} > P^{B}$, thus the SOE is willing to supply more it will exert a downward pressure on P^{FT}.

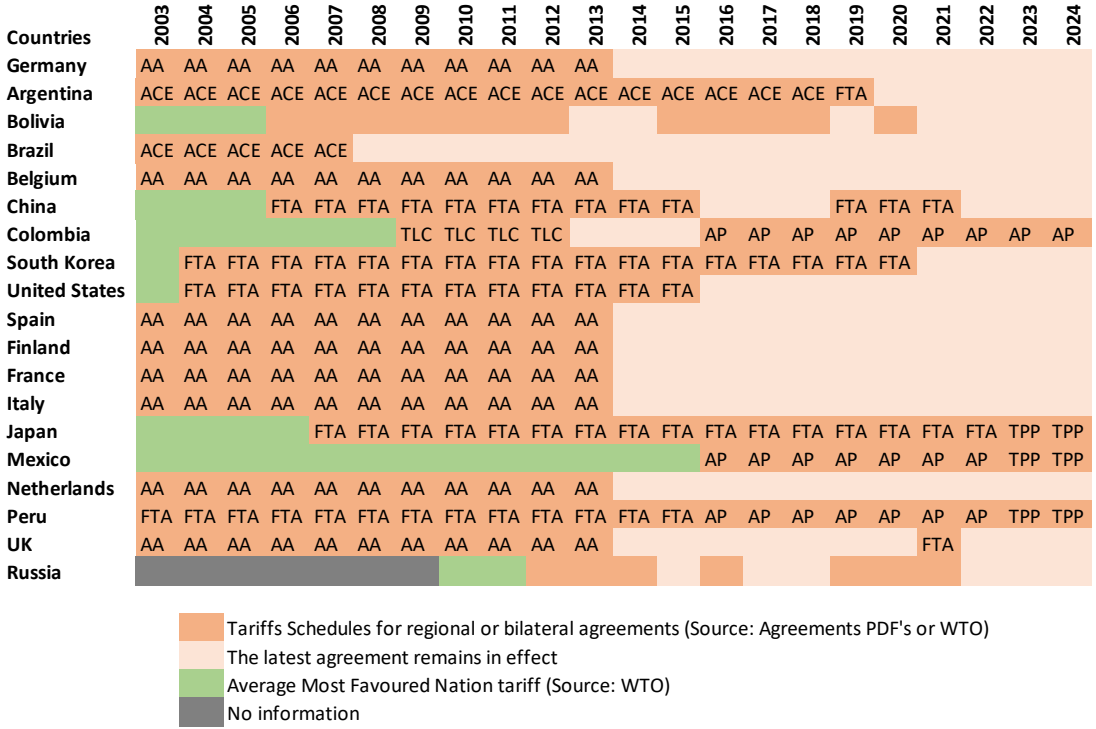
Equilibrium with tariffs, World Price falls



Continuation partial equilibrium analysis (2). Maintain assumptions. Foreign country imposes a tariff (τ) and international prices go down to re-establish the equilibrium in the world market, the SOE receives P^C (which is the new world price) per good exported and foreign consumers pay $P^C(1+\tau)$ and the foreign government levies τP^C per good consumed. Then, in equilibrium, $X^C - M^{*C} = 0$.

Summary sources and agreements

Figure A.1. Summary of Sources and agreements of Tariff Database



Notes: FTA: Free trade agreement, AA: Association Agreement, ACE: Economic Complementation Agreement, AP: Pacific Alliance. TPP: Comprehensive and Progressive Agreement for Trans-Pacific Partnership. Source: Own elaboration.

XUV

Table 5: Estimated short-run supply coefficients- export unit values (XUV)

	Full sample		Up to 2019	
	Total	**Manufacturing**	**Total**	**Manufacturing**
Δrer	0.086***	0.027	0.127***	0.027
L1.	0.001	-0.014	0.014	0.002
Δgdp	0.160**	0.143	0.161	0.270*
L1.	0.033	0.038	-0.094	-0.14
$\Delta\tilde{\tau}_{jpt}$	-0.02	-0.017	-0.028	-0.019
L1.	-0.004	0.001	-0.019	-0.026
Observations	195,722	113,382	143,959	83,764
R-squared	0.48	0.47	0.49	0.48

Notes: *** p<0.01, ** p<0.05, * p<0.1. L1 denotes a one-period lagged variable (year). Estimation corresponds to equation (2), but changing volumes for XUV, measured in dollars. Include FEs: v_{ijt} firm–product–year; δ_{jp} product–destination.

- **Dep. Var.**: Export prices at the border (ex- tariffs).
- Semi-elasticities to tariffs with expected signs, but lower order of magnitude than volumes (statistically =zero)

Results

Table 6: Estimated long-term supply coefficients- export volume

	Total		Manufacturing	
	(1)	(2)	(1)	(2)
rer	0.359***	0.370***	0.368***	0.399***
gdp	0.549***	0.426***	0.421***	0.253***
$\tilde{\tau}_{jpt}$		-0.437***		-0.288**
Observations	254,592	195,686	162,669	112,285
R-squared	0.89	0.91	0.87	0.91

Notes: *** p<0.01, ** p<0.05, * p<0.1. Table report estimated elasticities equation (3), making two cases, (1) omit relative tariffs, whereas (2) considers them. Dependent variable "exp": log export volume. Include FEs: v_{ijt} firm–product–year; δ_{jp} product–destination.