Date	Imports for consumption	Exports
October 2016	461.3	129.7
November 2016	539.8	122.6
December 2016	516.2	104.0
January 2017	612.6	120.6
February 2017	539.9	114.7
March 2017	642.9	131.2
April 2017	600.3	119.4
May 2017	616.2	134.4
June 2017	590.7	133.0
July 2017	606.7	127.5
August 2017	553.4	141.2
September 2017	489.1	120.9
October 2017	535.3	130.5
November 2017	518.9	119.0
December 2017	562.5	108.0
January 2018	549.5	130.7
February 2018	519.7	127.5
March 2018	761.8	137.8
April 2018	553.3	137.1
May 2018	513.3	138.2
June 2018	436.9	130.7
July 2018	482.2	124.0
August 2018	444.3	136.4
September 2018	474.0	115.6
October 2018	478.6	130.6
November 2018	465.9	119.2
December 2018	476.6	94.6
January 2019	481.9	115.4
February 2019	445.1	106.8
March 2019	505.1	112.6
April 2019	505.3	117.7
May 2019	476.4	112.1
June 2019	493.8	104.0
July 2019	602.3	109.1
August 2019	507.4	110.1
September 2019	451.8	104.3
October 2019	474.1	107.6
November 2019	450.8	98.9
December 2019	458.4	86.6
January 2020	504.2	104.5
February 2020	396.9	104.6
March 2020	455.5	110.6
April 2020	471.3	72.0
May 2020	446.6	59.5
June 2020	399.9	79.1
July 2020	390.7	89.8
August 2020	404.6	89.3
September 2020	343.7	91.9
October 2020	364.6	97.5
November 2020	365.9	89.1

Date	Imports for consumption	Exports
December 2020	354.5	86.2
January 2021	381.8	87.8
February 2021	368.7	84.0
March 2021	486.1	106.4
April 2021	485.1	96.0
May 2021	483.9	90.3
June 2021	456.2	95.3
July 2021	448.0	88.3
August 2021	502.7	90.5
September 2021	437.8	91.1
October 2021	503.4	88.5
November 2021	514.5	91.9
December 2021	475.9	77.0

Source: USITC DataWeb/Census, HTS and HS headings 7601, 7604, 7605, 7606, 7607, 7608, 7609, and statistical reporting numbers 7616.99.5160 and 7616.99.5170, accessed September 20, 2022.

Table E.20 U.S. imports for consumption of unwrought aluminum, by duty status and period, 2016–21

Quantity reported in thousand metric tons (mt); shares reported as a percentage of total (i.e., all duty statuses); index reported as a share in percentage of 2016 data. This table corresponds to figure 4.8.

Duty status	Measure	2016	2017	2018	2019	2020	2021
Subject to additional duties	Quantity	0	0	2,065	1,846	722	821
Not subject to additional duties	Quantity	4,267	4,877	2,115	1,956	2,558	2,828
All duty statuses	Quantity	4,267	4,877	4,180	3,802	3,280	3,649
Subject to additional duties	Share	0.0	0.0	49.4	48.6	22.0	22.5
Not subject to additional duties	Share	100.0	100.0	50.6	51.4	78.0	77.5
All duty statuses	Share	100.0	100.0	100.0	100.0	100.0	100.0
All duty statuses	Index	100.0	114.3	98.0	89.1	76.9	85.5

Source: USITC DataWeb/Census, accessed August 16, 2022.
Note: Unwrought aluminum is composed of imports under HTS heading 7601.

Table E.21 U.S. imports for consumption of wrought aluminum, by duty status and period, 2016–21

Quantity reported in thousand metric tons (mt); shares reported as a percentage of total (i.e., all duty statuses); index reported as a share in percentage of 2016 data. This table corresponds to figure 4.8.

Duty status	Measure	2016	2017	2018	2019	2020	2021
Subject to additional duties	Quantity	0	0	1,144	1,388	878	850
Not subject to additional duties	Quantity	1,679	1,991	832	662	741	1,045
All duty statuses	Quantity	1,679	1,991	1,976	2,051	1,619	1,895
Subject to additional duties	Share	0.0	0.0	57.9	67.7	54.2	44.8
Not subject to additional duties	Share	100.0	100.0	42.1	32.3	45.8	55.2
All duty statuses	Share	100.0	100.0	100.0	100.0	100.0	100.0
All duty statuses	Index	100.0	118.6	117.7	122.1	96.4	112.9

Source: USITC DataWeb/Census, accessed August 16, 2022.
Note: Wrought aluminum is composed of imports under HTS headings 7604, 7605, 7606, 7607, 7608, 7609, and HTS statistical reporting numbers 7616.99.5166 and 7616.99.5170.

Table E.22 U.S. imports for consumption of derivative aluminum articles, by duty status and period, 2016–21

Quantity reported in thousand metric tons (mt); shares reported as a percentage of total (i.e., all duty statuses); index reported as a share in percentage of 2016 data. This table corresponds to figure 4.8.

Duty status	Measure	2016	2017	2018	2019	2020	2021
Subject to additional duties	Quantity	0.0	0.0	2.0	2.4	5.7	14.1
Not subject to additional duties	Quantity	8.1	6.7	7.4	12.8	7.6	11.5
All duty statuses	Quantity	8.1	6.7	9.4	15.2	13.3	25.6
Subject to additional duties	Share	0.0	0.0	20.8	15.7	42.6	55.1
Not subject to additional duties	Share	100.0	100.0	79.2	84.3	57.4	44.9
All duty statuses	Share	100.0	100.0	100.0	100.0	100.0	100.0
All duty statuses	Index	100.0	82.5	115.2	187.2	163.6	314.1

Source: USITC DataWeb/Census, accessed August 16, 2022.

Note: Derivative aluminum articles reported in metric tons are composed of imports under HTS subheadings 7614.10.50, 7614.90.20, 7614.90.40, and 7614.90.50.

Table E.23 U.S. imports for consumption of derivative aluminum articles, by duty status and period, 2016–21

Quantity reported in number in thousands (no); shares reported as a percentage of total (i.e., all duty statuses); index reported as a share in percentage of 2016 data. This table corresponds to figure 4.8.

Duty status	Measure	2016	2017	2018	2019	2020	2021
Subject to additional duties	Quantity	0	0	69	236	31	25
Not subject to additional duties	Quantity	3,496	2,918	3,841	3,617	208	1
All duty statuses	Quantity	3,496	2,918	3,910	3,854	239	25
Subject to additional duties	Share	0.0	0.0	1.8	6.1	13.0	96.8
Not subject to additional duties	Share	100.0	100.0	98.2	93.9	87.0	3.2
All duty statuses	Share	100.0	100.0	100.0	100.0	100.0	100.0
All duty statuses	Index	100.0	83.5	111.8	110.2	6.8	0.7

Source: USITC DataWeb/Census, accessed August 16, 2022.

Note: Derivative aluminum articles reported in number are composed of imports under HTS statistical reporting numbers 8708.10.3030, 8708.29.2130, 8708.10.3010, and 8708.29.2100. Data before 2021 are likely overstated as discontinued HTS statistical reporting numbers 8708.10.3010 and 8708.29.2100 include parts made from both steel and aluminum.

Table E.24 U.S. imports for consumption of all aluminum (excluding aluminum derivatives measured in number), by duty status, 2016–21

Quantity reported in thousand metric tons (mt); shares reported as a percentage of total (i.e., all duty statuses); index reported as a share in percentage of 2016 data. This table corresponds to figure 4.8.

Duty status	Measure	2016	2017	2018	2019	2020	2021
Subject to additional duties	Quantity	0	0	3,211	3,236	1,606	1,685
Not subject to additional duties	Quantity	5,955	6,875	2,955	2,631	3,306	3,885
All duty statuses	Quantity	5,955	6,875	6,166	5,868	4,912	5,570
Subject to additional duties	Share	0.0	0.0	52.1	55.2	32.7	30.2
Not subject to additional duties	Share	100.0	100.0	47.9	44.8	67.3	69.8
All duty statuses	Share	100.0	100.0	100.0	100.0	100.0	100.0
All duty statuses	Index	100.0	115.5	103.5	98.5	82.5	93.5

Source: USITC DataWeb/Census, accessed August 16, 2022.

Note: All aluminum is composed of imports under HTS 4-digit headings 7601, 7604, 7605, 7606, 7607, 7608, and 7609 and HTS subheadings 7614.10.50, 7614.90.20, 7614.90.40, 7614.90.50, 7616.99.51, 8708.10.30, and 8708.29.21.

Table E.25 Average monthly U.S. and global prices for primary unwrought aluminum, January 2016–December 2021

In dollars per metric ton ($/mt). This table corresponds to figure 4.9.

Date	Midwest premium	LME global price
January 2016	1,680.6	1,481.1
February 2016	1,733.9	1,531.3
March 2016	1,698.4	1,531.0
April 2016	1,747.2	1,571.2
May 2016	1,734.2	1,550.6
June 2016	1,756.9	1,593.5
July 2016	1,782.2	1,629.1
August 2016	1,774.9	1,639.3
September 2016	1,722.5	1,592.4
October 2016	1,814.8	1,665.9
November 2016	1,895.8	1,737.1
December 2016	1,909.2	1,727.7
January 2017	1,985.5	1,791.2
February 2017	2,079.6	1,860.8
March 2017	2,117.8	1,901.5
April 2017	2,132.1	1,921.2
May 2017	2,112.5	1,913.0
June 2017	2,066.8	1,885.3
July 2017	2,061.1	1,903.0
August 2017	2,212.1	2,030.0
September 2017	2,279.8	2,096.5
October 2017	2,335.6	2,131.5
November 2017	2,304.5	2,097.4
December 2017	2,289.5	2,080.5
January 2018	2,435.9	2,209.7
February 2018	2,465.2	2,181.8
March 2018	2,466.5	2,069.2
April 2018	2,704.2	2,254.7
May 2018	2,784.4	2,299.7
June 2018	2,719.2	2,237.6
July 2018	2,529.8	2,082.2
August 2018	2,515.9	2,051.5
September 2018	2,483.9	2,026.5
October 2018	2,469.0	2,029.9
November 2018	2,369.1	1,938.5
December 2018	2,342.6	1,920.4
January 2019	2,275.2	1,853.7
February 2019	2,297.4	1,863.0
March 2019	2,297.4	1,871.2
April 2019	2,265.7	1,845.4
May 2019	2,196.9	1,781.3
June 2019	2,170.9	1,756.0
July 2019	2,196.2	1,797.0
August 2019	2,134.3	1,740.7
September 2019	2,145.3	1,753.5
October 2019	2,111.8	1,726.0
November 2019	2,136.7	1,774.8
December 2019	2,110.0	1,771.4

Date	Midwest premium	LME global price
January 2020	2,099.2	1,773.1
February 2020	2,001.6	1,688.1
March 2020	1,911.4	1,610.9
April 2020	1,689.0	1,459.9
May 2020	1,659.4	1,466.4
June 2020	1,763.7	1,568.6
July 2020	1,862.5	1,643.8
August 2020	2,072.1	1,737.3
September 2020	2,073.7	1,743.8
October 2020	2,090.9	1,806.1
November 2020	2,233.5	1,935.3
December 2020	2,349.5	2,014.7
January 2021	2,346.8	2,004.0
February 2021	2,434.8	2,078.6
March 2021	2,612.0	2,190.5
April 2021	2,835.1	2,319.4
May 2021	3,019.2	2,433.5
June 2021	3,051.0	2,446.7
July 2021	3,162.7	2,497.6
August 2021	3,383.2	2,603.0
September 2021	3,615.4	2,834.6
October 2021	3,716.3	2,934.4
November 2021	3,319.3	2,636.5
December 2021	3,320.4	2,695.5

Sources: Fastmarkets, Aluminum P1020A all-in price, delivered Midwest US, US cents/lb, accessed July 27, 2022; World Bank, Commodity Price Data (The Pink Sheet), accessed July 27, 2022.

Table E.26 Apparent domestic U.S. consumption and import penetration of unwrought and wrought aluminum, 2016–21

In thousand metric tons and percentages. This table corresponds to figure 4.10.

Measure	Category	2016	2017	2018	2019	2020	2021
Import Penetration (%)	Unwrought	47.0%	50.0%	46.0%	41.0%	38.0%	39.0%
Import Penetration (%)	Wrought	20.0%	23.0%	20.0%	21.0%	19.0%	19.0%
U.S. consumption (1,000 metric tons)	Unwrought	9,016.9	9,764.2	9,019.8	9,172.7	8,740.6	9,267.4
U.S. consumption (1,000 metric tons)	Wrought	8,391.3	8,624.1	9,718.2	9,874.3	8,717.3	10,080.7

Sources: Aluminum Association; Refinitiv World Bureau of Metal Statistics, 2022 Yearbook; USITC DataWeb/Census, accessed September 9, 2022.

Notes: Apparent consumption is calculated as production plus imports minus exports. Import penetration calculated as imports divided by consumption. Unwrought aluminum is composed of imports and exports in HTS and HS heading 7601. Wrought aluminum is composed of imports and exports in HTS and HS headings 7604, 7605, 7606, 7607, 7608, 7609 and HTS and HS subheadings 7616.99.5160 and 7616.99.5170.

Table E.27 U.S. Imports for consumption, by month and whether they were subject to section 301 tariffs

In billions of dollars. — (em dash) = not applicable. This table corresponds to figure 6.1.

Date	Rest of world	China nonsubject	China subject
January 2016	121	37	—
February 2016	125	36	—
March 2016	139	29	—
April 2016	133	33	—

Date	Rest of world	China nonsubject	China subject
May 2016	138	37	—
June 2016	141	38	—
July 2016	134	39	—
August 2016	141	42	—
September 2016	137	41	—
October 2016	140	44	—
November 2016	139	42	—
December 2016	137	39	—
January 2017	135	41	—
February 2017	129	32	—
March 2017	151	34	—
April 2017	141	37	—
May 2017	150	41	—
June 2017	147	42	—
July 2017	140	43	—
August 2017	147	45	—
September 2017	141	45	—
October 2017	153	47	—
November 2017	151	47	—
December 2017	149	44	—
January 2018	149	44	—
February 2018	143	39	—
March 2018	162	39	—
April 2018	157	38	—
May 2018	166	44	—
June 2018	159	44	—
July 2018	161	45	2
August 2018	167	45	3
September 2018	153	32	18
October 2018	173	35	17
November 2018	160	30	16
December 2018	154	26	19
January 2019	155	28	14
February 2019	143	21	12
March 2019	167	20	11
April 2019	165	22	12
May 2019	172	25	13
June 2019	158	26	12
July 2019	168	29	12
August 2019	165	28	12
September 2019	156	19	20
October 2019	169	21	19
November 2019	155	18	17
December 2019	158	16	17
January 2020	155	14	18
February 2020	146	9	13
March 2020	164	9	10
April 2020	128	14	16
May 2020	121	15	20
June 2020	135	16	20
July 2020	151	19	22

Date	Rest of world	China nonsubject	China subject
August 2020	153	19	21
September 2020	156	20	21
October 2020	166	24	20
November 2020	160	24	19
December 2020	165	22	20
January 2021	158	19	19
February 2021	152	17	17
March 2021	186	19	20
April 2021	180	18	18
May 2021	183	18	19
June 2021	193	19	19
July 2021	188	20	19
August 2021	192	20	21
September 2021	187	26	21
October 2021	191	24	22
November 2021	199	25	21
December 2021	198	27	22

Source: USITC DataWeb/Census, accessed July 7, 2022; calculations by USITC.

Table E.28 Index of average unit values of U.S. imports for consumption, by source, period, and whether they were subject to section 301 tariffs

Index values in percentages, January 2016 = 100.0 percent. This table corresponds to figure 6.2.

Date	Rest of world	China not including tariff	China including tariff
January 2016	100.0	100.0	100.0
February 2016	98.0	116.0	116.0
March 2016	95.0	102.0	102.0
April 2016	94.0	94.0	94.0
May 2016	95.0	97.0	97.0
June 2016	101.0	106.0	106.0
July 2016	104.0	99.0	99.0
August 2016	105.0	109.0	109.0
September 2016	108.0	117.0	117.0
October 2016	107.0	126.0	126.0
November 2016	108.0	119.0	119.0
December 2016	113.0	102.0	102.0
January 2017	110.0	108.0	108.0
February 2017	109.0	115.0	115.0
March 2017	108.0	100.0	100.0
April 2017	108.0	101.0	101.0
May 2017	110.0	113.0	113.0
June 2017	109.0	103.0	103.0
July 2017	107.0	107.0	107.0
August 2017	108.0	112.0	112.0
September 2017	111.0	108.0	108.0
October 2017	110.0	114.0	114.0
November 2017	112.0	116.0	116.0
December 2017	115.0	117.0	117.0
January 2018	120.0	125.0	125.0
February 2018	115.0	116.0	116.0
March 2018	112.0	121.0	121.0

Date	Rest of world	China not including tariff	China including tariff
April 2018	114.0	111.0	111.0
May 2018	117.0	122.0	122.0
June 2018	119.0	120.0	120.0
July 2018	124.0	110.0	115.0
August 2018	124.0	121.0	130.0
September 2018	121.0	123.0	135.0
October 2018	124.0	122.0	140.0
November 2018	138.0	128.0	146.0
December 2018	133.0	110.0	125.0
January 2019	132.0	122.0	138.0
February 2019	138.0	132.0	150.0
March 2019	137.0	127.0	145.0
April 2019	125.0	118.0	134.0
May 2019	125.0	115.0	138.0
June 2019	121.0	106.0	130.0
July 2019	119.0	117.0	144.0
August 2019	118.0	121.0	149.0
September 2019	117.0	121.0	150.0
October 2019	120.0	118.0	147.0
November 2019	118.0	119.0	147.0
December 2019	122.0	103.0	128.0
January 2020	122.0	112.0	139.0
February 2020	113.0	113.0	141.0
March 2020	118.0	118.0	147.0
April 2020	117.0	101.0	124.0
May 2020	110.0	98.0	119.0
June 2020	109.0	99.0	121.0
July 2020	110.0	105.0	129.0
August 2020	115.0	101.0	124.0
September 2020	115.0	106.0	131.0
October 2020	123.0	115.0	142.0
November 2020	118.0	112.0	139.0
December 2020	121.0	106.0	131.0
January 2021	124.0	112.0	139.0
February 2021	138.0	111.0	137.0
March 2021	127.0	119.0	147.0
April 2021	126.0	115.0	142.0
May 2021	130.0	120.0	148.0
June 2021	136.0	115.0	143.0
July 2021	147.0	118.0	146.0
August 2021	141.0	123.0	152.0
September 2021	143.0	127.0	156.0
October 2021	144.0	125.0	154.0
November 2021	149.0	116.0	143.0
December 2021	151.0	132.0	163.0

Source: USITC DataWeb/Census, accessed July 7, 2022; calculations by USITC.
Note: The average unit value of each statistical reporting number is normalized to 100 in the first month that it is imported in the sample period by country. Subsequent values are normalized according to that first value.

Table E.29 Estimated sensitivity of import trade statistics to section 301 and 232 tariffs
This table corresponds to figure 6.3.

Tariff Month	Import value	Importer Quantity	Exporter Price	Importer Price
1	−0.93	−0.67	−0.14	0.84
2	−1.49	−1.35	−0.07	0.90
3	−1.60	−1.54	0.03	1.00
4	−1.23	−1.21	0.08	1.05
5	−1.96	−1.95	0.07	1.05
6	−2.14	−2.18	0.16	1.13
7	−1.79	−1.72	−0.02	0.95
8	−1.97	−2.05	0.14	1.12
9	−1.38	−1.40	0.06	1.04
10	−1.55	−1.59	0.08	1.06
11	−1.91	−1.90	0.08	1.06
12	−1.85	−1.76	−0.01	0.97
13	−1.90	−1.80	0.00	0.98
14	−2.02	−1.95	0.02	1.00
15	−2.04	−2.02	0.09	1.06
16	−1.99	−2.08	0.22	1.19
17	−2.07	−1.90	−0.02	0.95
18	−2.01	−1.84	−0.02	0.95
19	−2.20	−2.33	0.25	1.22
20	−2.08	−2.22	0.27	1.24
21	−1.87	−1.97	0.22	1.19
22	−2.06	−2.16	0.22	1.19
23	−2.23	−2.25	0.16	1.13
24	−2.25	−2.31	0.19	1.17
25	−2.37	−2.38	0.15	1.12
26	−2.40	−2.48	0.23	1.20
27	−2.29	−2.33	0.19	1.16
28	−2.24	−2.30	0.21	1.18
29	−2.27	−2.34	0.22	1.20
30	−2.46	−2.53	0.24	1.21
31	−2.62	−2.78	0.32	1.29
32	−2.54	−2.76	0.39	1.36

Source: USITC calculations based on data from DataWeb/Census, accessed July 7, 2022.
Note: The I-beams for each line show the 95 percent confidence interval of the estimated elasticity. The elasticity estimates presented in this figure include tariff rates come from section 232 tariffs on steel and aluminum in addition to section 301 tariffs. This was necessary because the tariff actions occurred during the same time period. A detailed explanation of the regressions that produced this figure and the input variables to that regression are described in appendix G.

Supplemental Data Tables

Table E.30 U.S. steel imports by product type and source, 2021

In million metric tons; TRQ = tariff-rate quota.

Product category	Partner country	Status as of March 15, 2022	First unit of quantity
Flat Products	Canada	Exempt	4,056,797
Flat Products	South Korea	No additional tariffs under annual quota	1,321,341
Flat Products	Mexico	Exempt	1,011,044
Flat Products	Vietnam	Subject to section 232 tariffs	678,991
Flat Products	Taiwan	Subject to section 232 tariffs	555,774
Long Products	Canada	Exempt	1,131,734
Long Products	Mexico	Exempt	939,061
Long Products	Japan	Subject to section 232 tariffs	399,530
Long Products	Turkey	Subject to section 232 tariffs	384,241
Long Products	Algeria	Subject to section 232 tariffs	320,622
Pipe and Tube	South Korea	No additional tariffs under annual quota	886,440
Pipe and Tube	Canada	Exempt	675,363
Pipe and Tube	Mexico	Exempt	639,431
Pipe and Tube	Argentina	No additional tariffs under annual quota	154,536
Pipe and Tube	Russia	Subject to section 232 tariffs	144,705
Semifinished	Brazil	No additional tariffs under annual quota	3,555,163
Semifinished	Mexico	Exempt	1,695,399
Semifinished	Russia	Subject to section 232 tariffs	1,291,338
Semifinished	Canada	Exempt	420,732
Semifinished	Romania	TRQ	295,117
Stainless	Germany	TRQ	346,471
Stainless	Taiwan	Subject to section 232 tariffs	175,706
Stainless	India	Subject to section 232 tariffs	88,090
Stainless	Italy	TRQ	52,927
Stainless	China	Subject to tariffs under sections 232 and 301	50,169

Source: USITC DataWeb/Census, accessed September 9, 2022.

Note: Table only displays imports from the top five importers of each product category.

Table E.31 Top sources of U.S. wrought aluminum imports, by product, 2021
In thousand metric tons.

Type	Country	Status as of March 15, 2022	Imports for consumption
Bars, Rods, and Profiles	Canada	Exempt	100.1
Bars, Rods, and Profiles	Vietnam	Subject to section 232 tariffs	40.9
Bars, Rods, and Profiles	Mexico	Exempt	33.8
Bars, Rods, and Profiles	Indonesia	Subject to section 232 tariffs	20.6
Bars, Rods, and Profiles	Turkey	Subject to section 232 tariffs	20.6
Wire	Canada	Exempt	161.1
Wire	Bahrain	Subject to section 232 tariffs	50.5
Wire	India	Subject to section 232 tariffs	38.8
Wire	Russia	Subject to section 232 tariffs	28.5
Wire	Argentina	Subject to section 232 quota	8.7
Flat products	China	Subject to tariffs under sections 232 and 301	199.4
Flat products	Canada	Exempt	137.2
Flat products	Thailand	Subject to section 232 tariffs	101.5
Flat products	Oman	Subject to section 232 tariffs	97.5
Flat products	South Korea	Subject to section 232 tariffs	65.0
Pipe, tube, and fittings	Mexico	Exempt	12.5
Pipe, tube, and fittings	China	Subject to tariffs under sections 232 and 301	4.9
Pipe, tube, and fittings	Turkey	Subject to section 232 tariffs	3.1
Pipe, tube, and fittings	India	Subject to section 232 tariffs	3.0
Pipe, tube, and fittings	Canada	Exempt	2.6

Source: USITC DataWeb/Census, accessed September 9, 2022.
Note: Table only displays imports from the top five importers of each product category.

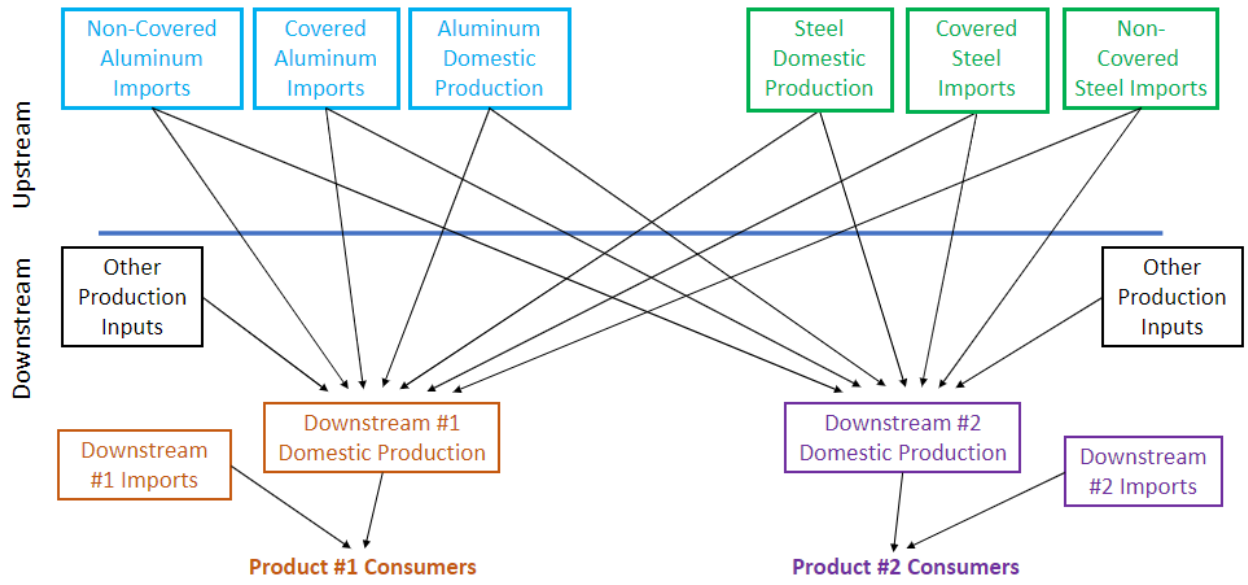
Appendix F
Technical Details of the Steel and Aluminum Model

This modeling appendix accompanies chapter 5 by providing a technical description of the economic model built to estimate the effects of section 232 steel and aluminum tariffs on most-affected industries. The first section describes the model's structural features. The second and third sections describe the data calculations and parameter inputs of the model, including the econometric estimation of the elasticity of substitution parameters. The fourth section provides extended model results to accompany the analysis in chapter 5. Finally, the fifth section adds a sensitivity analysis of the parameters used in the model.

Detailed Technical Description of the Model

The model presented in chapter 5 is a customized partial equilibrium model of the U.S. market. This model was developed specifically for this report and has not been used in any past factfinding reports. It has similar elements to modeling analyses in other USITC reports, but the design is specific to this investigation. The model has two primary industries—steel and aluminum—and several downstream industries for which steel or aluminum is a large share of each industry's total costs (figure F.1). Primary imports are disaggregated into imports subject to section 232 tariffs (covered imports) and imports not subject to section 232 tariffs (non-covered imports). The imports with tariff exclusions are included in the non-covered import category.

Figure F.1 Illustration of model structure with two downstream industries



Source: USITC illustration.

The primary industries are connected to several downstream industries that consume steel and aluminum. Each downstream industry uses domestic steel, imported steel, domestic aluminum, imported aluminum, and all other inputs in their production process. Production inputs—steel,

aluminum, and all other production inputs—are consumed in fixed proportions.[451] Downstream industries view different sources of steel (covered imports, non-covered imports, and domestic) as imperfectly substitutable, with a constant elasticity of substitution across the different sources of supply. The same is true for the aluminum production input; a constant elasticity of substitution exists across different sources of aluminum supply. Total cost factor parameters are calibrated to estimated cost share data from 2018–21 in the cost function.

Downstream consumers substitute between the domestically produced product and the imported variety. Consumers have constant elasticity of substitution (CES) demands for domestic and imported varieties. The price elasticity of total industry demand in each industry is negative one, indicating that total expenditures in each downstream industry are fixed as a share of aggregate expenditures (which the model takes as exogenous). The elasticity of substitution across downstream industries is also one, implying that industry demands are separable because their cross-price elasticities are zero.

In both the primary and the downstream industries, the model assumes there are a large number of producers who compete in perfectly competitive industries. In the primary industries, aluminum production, steel production, and import supply are governed by supply curves that are calibrated to import data from 2018–21, with a constant price elasticity of supply parameter. In the downstream industries, due to a lack of supply elasticity estimates, imports are assumed to be perfectly elastic, reflecting relatively large world markets.

Several data sources are used to calibrate the model in the baseline and econometrically estimate the elasticity of substitution parameters. These data inputs are described more in the next section. The data inputs in the model include the effects of section 232 tariffs; outcomes present in the data are a result of section 232 tariffs in effect. Then, the model simulates a counterfactual set of equilibrium prices and quantities if section 232 tariffs were not in place. Finally, economic effects are calculated as the difference between the outcomes present in the data and the modeled outcomes, so that the economic effects reported in the tables are the effect of the increase in tariffs on the market. The model is run four separate times, once for each year in the 2018–21 window with four different sets of data inputs. This model has no dynamic links between the four periods, like inventory storage or capacity changes.

The section 232 modeling release accompanying this report provides a full set of modeling equations.

Detailed Description of Data Inputs

Identifying the Most-Affected Downstream Industries

The Commission is tasked with estimating the impact of section 232 tariffs on the most-affected industries. The industries most affected would, first, be the primary steel and aluminum industries that are competing against imports subject to the tariffs and, second, downstream industries that use both domestic and foreign inputs of steel and aluminum. Downstream industries were considered most affected by the tariffs if their total steel or aluminum cost shares of production were higher than 5

[451] All other production inputs are exogenous in the model, so the prices of other inputs do not change after a change in the tariff rate.

percent, indicating that the industry uses these products intensively.[452] In order to calculate each industries' total steel and aluminum cost share, the Commission used the BEA's 2012 Use Table, which documents the value of goods and services that comprise each industries' production process.[453] Cost shares are estimated by taking the total value of steel and aluminum inputs in an industry divided by the total intermediate inputs for that industry.[454] Table F.1 provides the steel and aluminum cost shares for those industries with cost shares 5 percent or higher. Additionally, an industry was included if it fell below the 5 percent cut-off but was identified in the hearing or Commission research as being a substantial user of steel or aluminum inputs.[455]

[452] Russ and Cox, "Will Steel Tariffs Put U.S. Jobs at Risk?," February 26, 2018.
[453] BEA, "Input-Output Accounts Data," accessed October 17, 2022. The 2012 benchmark Use table is the latest table available that disaggregates industries to the level of detail required for this analysis.
[454] It should be noted that the cost shares are estimated from the direct use of primary steel and aluminum products by the industry. However, a downstream industry may also incorporate steel and aluminum products in their production process if any of their other intermediate inputs are composed of a sizable share of steel or aluminum. Additionally, these cost shares are based on data from 2012. As such, they may not be reflective of current industry use of steel and aluminum products. As they translate to model inputs, the use values were reviewed by analysts and were updated based on available information as warranted.
[455] For example, the aircraft manufacturing industry was included, even though its share of steel was 3.6 percent, because the total value of steel used in production was substantial ($2.4 billion in 2012).

Table F.1 Steel and aluminum cost shares, by downstream industry, 2012

NAICS code	NAICS description	Steel cost share	Aluminum cost share
211	Oil and Gas Extraction	4.29	0
31211	Soft Drink and Ice Manufacturing	0	18.38
3149	Other Textile Product Mills	7.00	0.00
3322	Cutlery and Handtool Manufacturing	27.48	10.07
3323	Architectural and Structural Metals	37.38	5.72
3324	Boiler, Tank, and Shipping Container Manufacturing	24.36	29.42
3325	Hardware Manufacturing	11.61	6.34
3326	Spring and Wire Manufacturing	41.90	1.33
3327	Machine Shops Turned Product and Screw, Nut, and Bolt Manufacturing	15.15	7.43
3328	Coating, Engraving, Heat Treating and Allied Activities	28.83	0.86
3329	Other Fabricated Metal Product Manufacturing	18.97	9.19
3331	Agriculture, Construction and Mining Machinery Manufacturing	14.16	1.61
3332	Industrial Machine Manufacturing	6.55	2.77
3334	Ventilation, Heating, Air-conditioning, Commercial Refrigeration Equipment Manufacturing	7.98	3.48
3335	Metalworking Machinery Manufacturing	13.76	5.19
3336	Engine and Turbine Manufacturing	4.54	8.46
3339	Other General Purpose Machinery Manufacturing	14.20	4.22
3351	Electric Lighting Equipment Manufacturing	7.77	7.55
3352	Household Appliance Manufacturing	14.12	3.54
3353	Electrical Equipment Manufacturing	8.15	2.41
3359	Other Electrical Equipment and Component Manufacturing	6.39	2.83
336212	Truck Trailer Manufacturing	8.35	15.40
336214	Travel Trailer and Camper	7.96	4.48
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing	8.40	9.84
336370	Motor Vehicle Metal Stamping	58.35	1.91
336390	Other Motor Vehicle Parts Manufacturing	11.71	5.06
3363A0 (336330, 336340)	Motor Vehicle Steering, Suspension Component (except Spring), and Brake Systems Manufacturing	11.97	6.85
336411	Aircraft Manufacturing	3.62	0.19
3365	Railroad Rolling Stock Manufacturing	11.02	3.09
3366	Ship and Boat Building	3.41	5.47
3369	Other Transportation Equipment Manufacturing	16.38	6.67
3372	Office Furniture	15.01	3.04
3399	Other Miscellaneous Manufacturing	5.20	1.42

Source: Bureau of Economic Analysis, Use Tables, 2012; USITC calculations.
Note: The aluminum group is composed of NAICS 331313, 331314, 331315, 331318, 331523, and 332112. The steel group is comprised of NAICS 331100, 331210, and 331222.

Calculating the Flow of Steel and Aluminum Products to Downstream Industries

Yearly data on the flow of steel and aluminum inputs, from both foreign and domestic sources to downstream industries, is generally not available. Estimates of these flows are derived using the BEA 2012 Use Tables and Import Matrices, 2018–21 trade and domestic production data, and judgments based on specific industry knowledge.[456] Several steps are required to estimate the share of steel and aluminum inputs (wrought and unwrought) subject to sections 232 tariffs used by the most affected downstream industries for 2018–21:

Step 1: The BEA 2012 Use Tables show the use of goods and services, from foreign and domestic producers, by domestic industries.[457] However, these use values are not separated by domestic and foreign supply. As such, the Commission uses the BEA 2012 Import Matrices, which show the value of imports of the same commodities used by each industry, to reduce the Use Table values by the value from the Import Matrix in order to isolate inputs used from both domestically produced sources and foreign produced sources.

Step 2: The BEA Use Table and Import Matrix data are reported using BEA industry codes, which are based on the North American Industry Classification System (NAICS).[458] The subheading levels range from 3-digit to 6-digit, but certain NAICS codes are also combined into BEA-specific groupings. As such, it was necessary to split some reported Use and Import values into separate NAICS headings. There is little reason to assume that Use and Import values in these groupings should be split equally across subheadings. Values from the Import Matrix were apportioned by each subheading's share of 2012 total imports in the respective larger NAICS grouping. Domestically produced inputs were apportioned by each subheading's share of total U.S. production in the respective larger NAICS grouping.

Step 3: Additionally, not all HTS products that fall under a particular NAICS category are subject to section 232 tariffs. Therefore, we used the Census NAICS-HTS concordance to identify in-scope and out-of-scope HTS tariff lines and calculate the share of steel and aluminum NAICS imports that are in scope (the share of trade coming in under HTS tariff lines that represent applicable products).

Step 4: Finally, we calculate the share that in-scope foreign and domestic inputs used by each downstream industry comprise of total industry commodity use: downstream industry use of in scope product (foreign and domestic)/total use of product (foreign and domestic). This share is then multiplied by current domestic shipment and import data to derive the total value of primary steel and aluminum products used by each downstream industry for 2018–21 (table F.2).

[456] BEA, "Input-Output Accounts Data," accessed October 17, 2022.
[457] Young et al., "Supply-Use Tables for the United States," 2015, 8.
[458] The North American Industry Classification System (NAICS) is a classification of businesses by economic activity.

Table F.2 Data inputs used in the chapter 5 modeling analysis, 2018–21
In millions of dollars and percentages.

	2018	2019	2020	2021
Total imports, aluminum (millions of dollars)	19,389.64	17,124.31	12,514.65	19,329.06
Total imports, steel (millions of dollars)	42,266.23	34,324.13	24,490.85	47,451.90
Share of covered imports, aluminum (percent)	54.13	57.28	36.90	30.99
Share of covered imports, steel (percent)	45.14	50.94	32.45	31.49
Total domestic production, aluminum (millions of dollars)	51,942.16	47,826.80	38,933.00	38,933.00
Total domestic production, steel (millions of dollars)	123,035.97	111,960.03	92,276.49	92,276.49

Sources: Imports data are from USITC DataWeb/Census, accessed September 28, 2022. Domestic production data are from the U.S. Census Annual Survey of Manufactures, accessed October 17, 2022.
Note: The aluminum group is composed of a subset of NAICS 331313, 331314, 331315, 331318, 331523, and 332112. The steel group is composed of a subset of NAICS 331100, 331210, and 331222. A full set of data inputs used in the model, including the value of steel and aluminum sent to each downstream industry, can be found in the model release that accompanies this report.

Detailed Description of Parameter Inputs

The model has two sets of parameters that are held constant across all years: the industry-specific constant elasticity of substitution parameters between foreign and domestic sources and the industry-specific price elasticity of supply parameters. The elasticity of substitution is estimated using the trade cost method and further described in the next section.

Import supply elasticities in the primary industries were calibrated to the industry-specific pass-through results from the chapter 6 modeling. The econometric analysis in chapter 6 found nearly 100 percent pass-through of the tariffs into U.S. import prices for the steel and aluminum industries after one year. The import supply elasticities in the chapter 5 analysis were chosen such that nearly 100 percent of the tariff passed through into steel and aluminum import prices (table F.3).

Domestic supply elasticities for semifinished steel and unwrought aluminum were estimated using information from Commission staff reports of recent antidumping and countervailing duty investigations, as well as available capacity utilization data. Capacity utilization data were obtained from the Peterson Institute.[459] Steel capacity utilization ranged from 70 to 85 percent from 2018 to 2021. Aluminum capacity utilization ranged from 45 to 65 percent. Because steel capacity utilization has been high since 2018, the upper bound of the elasticity range was used in the modeling. For the aluminum domestic supply elasticity, the midpoint value was used.

[459] USITC, *Cut-to-Length Carbon-Quality Steel Plate from India, Indonesia, Italy, Japan, and Korea*, December 2011; USITC, *Hot-Rolled Flat-Rolled Carbon-Quality Steel Products from Brazil, Japan, and Russia*, June 2011; USITC, *Certain Hot-Rolled Steel Flat Products from Australia, Brazil, Japan, Korea, the Netherlands, Turkey, and the United Kingdom*, July 2016; USITC, *Cold-Rolled Steel Flat Products from China and Japan*, July 2016; Bown and Russ, "Biden and Europe Remove Trump's Steel and Aluminum Tariffs, but It's Not Free Trade," November 11, 2021.

Table F.3 Price elasticity of supply estimates used in the model

Parameter name	Parameter value
Steel domestic supply elasticity	2.5
Aluminum domestic supply elasticity	4
Steel import supply elasticity	15
Aluminum import supply elasticity	20

Source: USITC estimates.

Description of Econometric Method to Estimate the Elasticities of Substitution

The elasticity of substitution is a model parameter that describes how consumers shift sourcing after a change in relative prices. A higher value means that the products are more substitutable, or less differentiated, leading to larger estimated effects of imports on the domestic market. It is an important parameter in trade policy models with CES demands because the magnitude can significantly impact model predictions.[460]

The substitution elasticities used in the model were estimated using the trade cost method described in Riker (2020).[461] The method assumes a non-nested CES structure with a single elasticity of substitution parameter for all sources of supply.[462] The method uses variation in international trade costs, such as freight costs and tariffs, to identify the elasticity of substitution across sources of imports. Annual panel import data from 2016–21 were obtained from the U.S. International Trade Commission's DataWeb and were disaggregated by product, source country, customs district of import entry, and year. The measure for international trade costs is the ratio between the landed duty-paid value of imports and the customs value, and includes international freight costs, tariffs, and other import charges. The estimation uses country-year and district-year fixed effects to control for variation in prices and other factors, including the price index, producer prices, and total expenditures. Table F.4 reports the substitution elasticity point estimate and standard error for each of the products modeled.

[460] For example, McDaniel and Balistreri (2002) show that the value of the elasticity of substitution can have a significant effect on welfare gains or losses in trade policy simulations. McDaniel and Balistreri, "A Review of Armington Trade Substitution Elasticities," 2003, 301–13.
[461] Riker, "A Trade Cost Approach to Estimating the Elasticity of Substitution," July 2020, 1–12.
[462] A nested structure could have been used if the domestic variety were believed to be significantly different than the imported varieties.

Table F.4 Elasticity of substitution point estimates and standard errors, primary and downstream industries

NAICS code	NAICS description	Point estimate	Standard error
331110; 331210; 331221; 331222	Primary steel products	1.49	0.36
331313; 331314; 331315; 331318; 331523; 332112	Primary aluminum products	6.05	0.36
211	Oil and Gas Extraction	5.42	1.01
31211	Soft Drink and Ice Manufacturing	2.42	0.44
3149	Other Textile Product Mills	6.33	0.66
3322	Cutlery and Handtool Manufacturing	9.54	0.93
3323	Architectural and Structural Metals	4.54	0.58
3324	Boiler, Tank, and Shipping Container Manufacturing	3.84	0.54
3325	Hardware Manufacturing	5.24	0.85
3326	Spring and Wire Manufacturing	5.51	0.61
3327	Machine Shops Turned Product and Screw, Nut, and Bolt Manufacturing	4.22	0.69
3329	Other Fabricated Metal Product Manufacturing	5.74	0.61
3331	Agriculture, Construction and Mining Machinery Manufacturing	6.95	0.75
3332	Industrial Machine Manufacturing	7.80	0.84
3334	Ventilation, Heating, Air-conditioning, Commercial Refrigeration Equipment Manufacturing	9.27	0.86
3335	Metalworking Machinery Manufacturing	8.90	2.00
3336	Engines and Turbines	8.30	0.47
3339	Other General Purpose Machinery Manufacturing	7.02	0.75
3351	Electric Lighting Equipment Manufacturing	5.34	0.72
3352	Household Appliance Manufacturing	6.67	0.97
3353	Electrical Equipment Manufacturing	9.68	1.01
3359	Other Electrical Equipment and Component Manufacturing	7.82	0.74
336212	Truck Trailer Manufacturing	3.07	0.70
336214	Travel Trailer and Camper	4.83	0.61
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing	6.48	0.77
336370	Motor Vehicle Metal Stamping	4.02	0.45
336390	Other Motor Vehicle Parts Manufacturing	4.28	0.36
3363A0 (336330, 336340)	Motor Vehicle Steering, Suspension Component (except Spring), and Brake Systems Manufacturing	6.44	0.53
3365	Railroad Rolling Stock Manufacturing	7.12	1.27
3366	Ship and Boat Building	7.51	0.65
3369	Other Transportation Equipment Manufacturing	7.16	0.81
3372	Office Furniture	4.27	0.41
3399	Other Miscellaneous Manufacturing	6.78	0.55

Source: USITC estimates.

The elasticity of substitution could not be estimated for aircraft manufacturing industry. The industry structure does not match the econometric model used in this analysis. Industry analysts qualitatively chose an estimate of 3 because of the significant amount of time to change suppliers on orders and multiyear backlogs.

Extended Results

This section presents the full set of downstream modeling results for all 33 industries. Table F.5 shows the effects of section 232 tariffs on downstream production output, downstream prices, and downstream total value. These tables accompany tables 5.4–5.7 in chapter 5.

Table F.5 Extended model results for all downstream industries, 2021
In percentage changes.

NAICS	NAICS Sector	Percentage change domestic quantity	Percentage change domestic price	Percentage change in value
2110	Oil and Gas Extraction	−0.08	0.03	−0.05
312110	Soft Drink and Ice Manufacturing	−0.22	0.21	−0.01
3149	Other Textile Product Mills	−0.27	0.07	−0.20
3322	Cutlery and Handtool Manufacturing	−2.56	0.41	−2.16
3323	Architectural and structural metals	−0.38	0.30	−0.09
3324	Boiler, Tank, and Shipping Container Manufacturing	−0.80	0.56	−0.25
3325	Hardware Manufacturing	−0.57	0.16	−0.41
3326	Spring and Wire Manufacturing	−1.37	0.55	−0.83
3327	Machine Shops Turned Product and Screw, Nut, and Bolt Manufacturing	−0.25	0.19	−0.06
3328	Coating, Engraving, Heat Treating and Allied Activities	−0.32	0.32	0.00
3329	Other Fabricated Metal Product Manufacturing	−0.92	0.30	−0.63
3331	Agriculture, Construction and Mining Machinery Manufacturing	−1.03	0.31	−0.72
3332	Industrial Machine Manufacturing	−2.98	0.45	−2.54
3334	Ventilation, Heating, Air-conditioning, Commercial Refrigeration Equipment Manufacturing	−0.36	0.09	−0.27
3335	Metalworking Machinery Manufacturing	−0.74	0.18	−0.55
3336	Engine and turbine manufacturing	−1.25	0.23	−1.02
3339	Other General Purpose Machinery Manufacturing	−0.88	0.23	−0.65
3351	Electric Lighting Equipment Manufacturing	−0.48	0.13	−0.34
3352	Household Appliance Manufacturing	−0.66	0.13	−0.53
3353	Electrical Equipment Manufacturing	−0.77	0.13	−0.65
3359	Other Electrical Equipment and Component Manufacturing	−0.64	0.12	−0.52
336212	Truck Trailer Manufacturing	−0.36	0.24	−0.11
336214	Travel Trailer and Camper	−0.12	0.10	−0.02
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing	−0.30	0.14	−0.17
336370	Motor Vehicle Metal Stamping	−0.54	0.51	−0.04
336390	Other Motor Vehicle Parts Manufacturing	−0.50	0.20	−0.31
336300	Motor Vehicle Steering, Suspension Component (except Spring), and Brake Systems Manufacturing	−1.57	0.34	−1.23
336411	Aircraft manufacturing	−0.06	0.04	−0.01
3365	Railroad Rolling Stock Manufacturing	−0.50	0.28	−0.22
3366	Ship and Boat Building	−0.08	0.05	−0.03
3369	Other Transportation Equipment Manufacturing	−0.91	0.26	−0.65
3372	Office Furniture	−0.29	0.16	−0.14
3399	Other Miscellaneous Manufacturing	−0.39	0.08	−0.32

Source: USITC estimates.

Table F.6 Extended model results for all downstream industries, 2020
In percentage changes.

NAICS	NAICS Sector	Percentage change domestic quantity	Percentage change domestic price	Percentage change in value
2110	Oil and Gas Extraction	−0.10	0.04	−0.06
312110	Soft Drink and Ice Manufacturing	−0.19	0.18	−0.01
3149	Other Textile Product Mills	−0.21	0.04	−0.17
3322	Cutlery and Handtool Manufacturing	−1.35	0.24	−1.12
3323	Architectural and structural metals	−0.23	0.18	−0.05
3324	Boiler, Tank, and Shipping Container Manufacturing	−0.53	0.39	−0.14
3325	Hardware Manufacturing	−0.31	0.09	−0.21
3326	Spring and Wire Manufacturing	−0.79	0.35	−0.44
3327	Machine Shops Turned Product and Screw, Nut, and Bolt Manufacturing	−0.15	0.12	−0.03
3328	Coating, Engraving, Heat Treating and Allied Activities	−0.17	0.17	−0.00
3329	Other Fabricated Metal Product Manufacturing	−0.47	0.17	−0.30
3331	Agriculture, Construction and Mining Machinery Manufacturing	−0.47	0.16	−0.31
3332	Industrial Machine Manufacturing	−0.67	0.12	−0.55
3334	Ventilation, Heating, Air-conditioning, Commercial Refrigeration Equipment Manufacturing	−0.20	0.06	−0.14
3335	Metalworking Machinery Manufacturing	−0.38	0.10	−0.28
3336	Engine and turbine manufacturing	−0.59	0.12	−0.47
3339	Other General Purpose Machinery Manufacturing	−0.44	0.13	−0.32
3351	Electric Lighting Equipment Manufacturing	−0.31	0.09	−0.22
3352	Household Appliance Manufacturing	−0.36	0.08	−0.28
3353	Electrical Equipment Manufacturing	−0.41	0.07	−0.34
3359	Other Electrical Equipment and Component Manufacturing	−0.35	0.07	−0.28
336212	Truck Trailer Manufacturing	−0.24	0.18	−0.06
336214	Travel Trailer and Camper	−0.07	0.06	−0.01
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing	−0.17	0.09	−0.08
336370	Motor Vehicle Metal Stamping	−0.33	0.31	−0.02
336390	Other Motor Vehicle Parts Manufacturing	−0.27	0.12	−0.16
336300	Motor Vehicle Steering, Suspension Component (except Spring), and Brake Systems Manufacturing	−0.84	0.19	−0.64
336411	Aircraft manufacturing	−0.03	0.02	−0.01
3365	Railroad Rolling Stock Manufacturing	−0.27	0.16	−0.11
3366	Ship and Boat Building	−0.05	0.03	−0.01
3369	Other Transportation Equipment Manufacturing	−0.46	0.16	−0.31
3372	Office Furniture	−0.17	0.09	−0.07
3399	Other Miscellaneous Manufacturing	−0.20	0.04	−0.16

Source: USITC estimates.

Table F.7 Extended model results for all downstream industries, 2019
In percentage changes.

NAICS	NAICS Sector	Percentage change domestic quantity	Percentage change domestic price	Percentage change in value
2110	Oil and Gas Extraction	−0.12	0.05	−0.07
312110	Soft Drink and Ice Manufacturing	−0.38	0.36	−0.02
3149	Other Textile Product Mills	−0.27	0.08	−0.19
3322	Cutlery and Handtool Manufacturing	−2.90	0.52	−2.39
3323	Architectural and structural metals	−0.45	0.37	−0.08
3324	Boiler, Tank, and Shipping Container Manufacturing	−1.07	0.79	−0.28
3325	Hardware Manufacturing	−0.70	0.21	−0.50
3326	Spring and Wire Manufacturing	−1.47	0.64	−0.84
3327	Machine Shops Turned Product and Screw, Nut, and Bolt Manufacturing	−0.27	0.22	−0.06
3328	Coating, Engraving, Heat Treating and Allied Activities	−0.33	0.33	0.00
3329	Other Fabricated Metal Product Manufacturing	−1.11	0.38	−0.74
3331	Agriculture, Construction and Mining Machinery Manufacturing	−0.94	0.31	−0.63
3332	Industrial Machine Manufacturing	−1.14	0.21	−0.93
3334	Ventilation, Heating, Air-conditioning, Commercial Refrigeration Equipment Manufacturing	−0.43	0.13	−0.31
3335	Metalworking Machinery Manufacturing	−0.80	0.21	−0.59
3336	Engine and turbine manufacturing	−0.92	0.19	−0.73
3339	Other General Purpose Machinery Manufacturing	−0.86	0.25	−0.61
3351	Electric Lighting Equipment Manufacturing	−0.54	0.16	−0.38
3352	Household Appliance Manufacturing	−0.81	0.17	−0.63
3353	Electrical Equipment Manufacturing	−0.88	0.15	−0.73
3359	Other Electrical Equipment and Component Manufacturing	−0.82	0.17	−0.65
336212	Truck Trailer Manufacturing	−0.42	0.30	−0.12
336214	Travel Trailer and Camper	−0.15	0.13	−0.02
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing	−0.31	0.15	−0.15
336370	Motor Vehicle Metal Stamping	−0.57	0.54	−0.03
336390	Other Motor Vehicle Parts Manufacturing	−0.52	0.22	−0.30
336300	Motor Vehicle Steering, Suspension Component (except Spring), and Brake Systems Manufacturing	−1.64	0.38	−1.27
336411	Aircraft manufacturing	−0.06	0.05	−0.01
3365	Railroad Rolling Stock Manufacturing	−0.46	0.26	−0.20
3366	Ship and Boat Building	−0.11	0.08	−0.03
3369	Other Transportation Equipment Manufacturing	−0.86	0.31	−0.55
3372	Office Furniture	−0.31	0.18	−0.14
3399	Other Miscellaneous Manufacturing	−0.46	0.10	−0.36

Source: USITC estimates.

Table F.8 Extended model results for all downstream industries, 2018
In percentage changes.

NAICS	NAICS Sector	Percentage change domestic quantity	Percentage change domestic price	Percentage change in value
2110	Oil and Gas Extraction	−0.10	0.04	−0.06
312110	Soft Drink and Ice Manufacturing	−0.38	0.36	−0.02
3149	Other Textile Product Mills	−0.29	0.08	−0.21
3322	Cutlery and Handtool Manufacturing	−3.18	0.57	−2.63
3323	Architectural and structural metals	−0.49	0.40	−0.09
3324	Boiler, Tank, and Shipping Container Manufacturing	−1.17	0.85	−0.33
3325	Hardware Manufacturing	−0.72	0.21	−0.51
3326	Spring and Wire Manufacturing	−1.40	0.62	−0.80
3327	Machine Shops Turned Product and Screw, Nut, and Bolt Manufacturing	−0.28	0.22	−0.06
3328	Coating, Engraving, Heat Treating and Allied Activities	−0.36	0.36	0.00
3329	Other Fabricated Metal Product Manufacturing	−1.23	0.41	−0.83
3331	Agriculture, Construction and Mining Machinery Manufacturing	−1.11	0.37	−0.74
3332	Industrial Machine Manufacturing	−1.52	0.27	−1.26
3334	Ventilation, Heating, Air-conditioning, Commercial Refrigeration Equipment Manufacturing	−0.49	0.14	−0.35
3335	Metalworking Machinery Manufacturing	−0.81	0.21	−0.60
3336	Engine and turbine manufacturing	−0.84	0.19	−0.66
3339	Other General Purpose Machinery Manufacturing	−0.98	0.28	−0.70
3351	Electric Lighting Equipment Manufacturing	−0.55	0.16	−0.39
3352	Household Appliance Manufacturing	−0.98	0.21	−0.78
3353	Electrical Equipment Manufacturing	−1.00	0.17	−0.83
3359	Other Electrical Equipment and Component Manufacturing	−0.87	0.18	−0.69
336212	Truck Trailer Manufacturing	−0.44	0.31	−0.12
336214	Travel Trailer and Camper	−0.18	0.15	−0.03
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing	−0.34	0.17	−0.17
336370	Motor Vehicle Metal Stamping	−0.59	0.56	−0.03
336390	Other motor vehicle parts manufacturing	−0.53	0.23	−0.31
336300	Motor Vehicle Steering, Suspension Component (except Spring), and Brake Systems Manufacturing	−1.68	0.39	−1.30
336411	Aircraft manufacturing	−0.04	0.03	−0.01
3365	Railroad Rolling Stock Manufacturing	−0.46	0.26	−0.20
3366	Ship and Boat Building	−0.12	0.08	−0.03
3369	Other Transportation Equipment Manufacturing	−0.97	0.34	−0.63
3372	Office Furniture	−0.34	0.19	−0.15
3399	Other Miscellaneous Manufacturing	−0.51	0.10	−0.41

Source: USITC estimates.

Sensitivity Analyses

This section presents steel and aluminum modeling results under alternate assumptions about the policy changes and some parameter inputs. In the first sensitivity analysis, section 232 tariffs on steel and aluminum imports are applied separately, rather than simultaneously, to isolate the direct effects on the

steel and aluminum industries. The second sensitivity analysis estimates the economic effects of both tariffs under sections 232 and 301 on the steel and aluminum industries.

Separate Effects

This first sensitivity analysis estimates the direct effects of section 232 tariffs on each industry individually. First, section 232 tariffs are only applied to steel imports with no section 232 tariff applied to aluminum imports (table F.9). After, section 232 tariffs are only applied to the aluminum imports with no section 232 tariff applied to steel imports (table F.10). Results in tables F.9 and F.10 show that the separate effects of section 232 tariffs on each industry are slightly higher than the main chapter results where steel and aluminum tariffs enter the model simultaneously. This is because of the spill-over effects of the steel tariff on the aluminum industry and the aluminum tariff on the steel industry.

Table F.9 Estimated separate effects of section 232 steel tariffs on U.S. steel production, U.S. steel prices, and U.S. steel imports
In percentage changes.

Variable	2018	2019	2020	2021	Average effect
Price of domestic steel production	0.86	0.92	0.54	0.79	0.78
Producer price of covered steel imports	−1.79	−1.77	−1.86	−1.80	−1.81
Delivered price of covered steel imports	22.77	22.79	22.67	22.75	22.74
Price of non-covered steel imports	0.22	0.24	0.14	0.20	0.20
Quantity of domestic steel production	2.17	2.32	1.36	1.98	1.96
Quantity of covered steel imports	−23.68	−23.49	−24.59	−23.88	-−23.91
Quantity of non-covered steel imports	3.34	3.59	2.10	3.06	3.02

Source: USITC estimates.
Note: The domestic steel price is the price paid for U.S. production of steel. The producer price of imports is the price that the foreign producer receives for the imported steel products. The delivered price of imports is the price that the U.S. downstream industry pays for imported steel.

Table F.10 Estimated separate effects of section 232 aluminum tariffs on U.S. aluminum production, U.S. aluminum prices, and U.S. aluminum imports
In percentage changes.

Variable	2018	2019	2020	2021	Average effect
Price of domestic aluminum production	1.11	1.17	0.71	0.78	0.94
Producer price of covered aluminum imports	−1.75	−1.73	−1.91	−1.88	−1.82
Delivered price of covered aluminum imports	8.07	8.10	7.90	7.93	8.00
Price of non-covered aluminum imports	0.44	0.47	0.29	0.31	0.38
Quantity of domestic aluminum production	4.50	4.78	2.88	3.17	3.83
Quantity of covered aluminum imports	−29.80	−29.43	−31.98	−31.61	−30.70
Quantity of non-covered aluminum imports	9.27	9.85	5.88	6.46	7.86

Source: USITC estimates.
Note: The domestic aluminum price is the price paid for U.S. production of aluminum. The producer price of imports is the price that the foreign producer receives for the imported aluminum products. The delivered price of imports is the price that the U.S. downstream industry pays for imported aluminum.

Section 232 and 301 Tariff Effects

The second sensitivity analysis estimates the effects of both of the tariffs under sections 232 and 301 on the U.S. steel and aluminum industries (tables F.11 and F.12). The model applies section 301 tariffs to

U.S. imports of steel and aluminum from China, in addition to section 232 tariffs applied in the main chapter 5 results. Both tariffs under sections 232 and 301 are applied simultaneously. This section also presents the full set of downstream modeling results for all 33 industries (tables F.13–F.16).

Comparing results in tables F.11 and F.12 with tables 5.7 and 5.8 in chapter 5, the economic effects on domestic prices and quantity of production are larger when both tariffs under sections 232 and 301 are applied in the model. As described in chapter 5, section 232 tariffs are estimated to have increased domestic steel prices by about 0.7 percent (table 5.2). The effect of both tariffs under sections 232 and 301 on domestic steel prices is a 1.0 percent increase, implying that section 232 tariffs had a larger effect (about three times larger) on steel outcomes than section 301 tariffs. This is not surprising given that section 232 tariffs are larger and that section 301 tariffs are applied to only imports of Chinese steel products in the model. The same patterns are found in the estimated effects on domestic aluminum production (table F.12).

Table F.11 Estimated effects of steel and aluminum tariffs under sections 232 and 301 on U.S. steel production, U.S. steel prices, and U.S. steel imports
In percentage changes.

Variable	2018	2019	2020	2021	Average effect
Price of domestic steel production	1.02	1.13	0.70	0.93	0.95
Producer price of covered steel imports (excluding China)	−2.09	−2.07	−2.17	−1.76	−2.02
Delivered price of covered steel imports (excluding China)	22.39	22.42	22.28	22.79	22.47
Producer price of steel imports from China	−1.75	−1.74	−1.81	−1.78	−1.77
Delivered price of steel imports from China	30.18	30.20	30.10	30.15	30.16
Price of non-covered steel imports	0.26	0.29	0.18	0.24	0.24
Quantity of domestic steel production	2.58	2.85	1.77	2.34	2.38
Quantity of covered steel imports (excluding China)	−27.17	−26.87	−28.07	−23.43	−26.39
Quantity of steel imports from China	−29.79	−29.56	−30.61	−30.11	−30.02
Quantity of non-covered steel imports	3.97	4.39	2.69	3.62	3.67

Source: USITC estimates.
Note: The domestic steel price is the price paid for U.S. production of steel. The producer price of imports is the price that the foreign producer receives for the imported steel products. The delivered price of imports is the price that the U.S. downstream industry pays for imported steel.

Table F.12 Estimated effects of steel and aluminum tariffs under sections 232 and 301 on U.S. aluminum production, U.S. aluminum prices, and U.S. aluminum imports
In percentage changes.

Variable	2018	2019	2020	2021	Average effect
Price of domestic aluminum production	1.31	1.41	0.97	0.96	1.16
Producer price of covered aluminum imports (excluding China)	−1.92	−1.89	−2.06	−1.81	−1.92
Delivered price of covered aluminum imports (excluding China)	7.88	7.93	7.74	8.01	7.89
Producer price of aluminum imports from China	−2.69	−2.66	−2.80	−2.81	−2.74
Delivered price of aluminum imports from China	14.36	14.40	14.23	14.23	14.30
Price of non-covered aluminum imports	0.52	0.56	0.39	0.38	0.46
Quantity of domestic aluminum production	5.34	5.76	3.95	3.90	4.74
Quantity of covered aluminum imports (excluding China)	−32.21	−31.67	−34.01	−30.83	−32.18
Quantity of aluminum imports from China	−49.20	−48.78	−50.57	−50.63	−49.80
Quantity of non-covered aluminum imports	11.01	11.89	8.05	7.96	9.73

Source: USITC estimates.
Note: The domestic aluminum price is the price paid for U.S. production of aluminum. The producer price of imports is the price that the foreign producer receives for the imported aluminum products. The delivered price of imports is the price that the U.S. downstream industry pays for imported aluminum.

Table F.13 Extended model results of the economic effects of steel and aluminum tariffs under sections 232 and 301 on downstream prices, quantities, and value, 2021
In percentage changes.

NAICS	NAICS Sector	Percentage change domestic quantity	Percentage change domestic price	Percentage change in value
2110	Oil and Gas Extraction	−0.09	0.04	−0.05
312110	Soft Drink and Ice Manufacturing	−0.29	0.28	−0.02
3149	Other Textile Product Mills	−0.31	0.08	−0.23
3322	Cutlery and Handtool Manufacturing	−2.77	0.45	−2.33
3323	Architectural and structural metals	−0.43	0.34	−0.10
3324	Boiler, Tank, and Shipping Container Manufacturing	−0.94	0.65	−0.29
3325	Hardware Manufacturing	−0.63	0.18	−0.45
3326	Spring and Wire Manufacturing	−1.63	0.66	−0.98
3327	Machine Shops Turned Product and Screw, Nut, and Bolt Manufacturing	−0.28	0.22	−0.07
3328	Coating, Engraving, Heat Treating and Allied Activities	−0.33	0.34	0.00
3329	Other Fabricated Metal Product Manufacturing	−1.00	0.33	−0.68
3331	Agriculture, Construction and Mining Machinery Manufacturing	−1.08	0.32	−0.76
3332	Industrial Machine Manufacturing	−3.35	0.51	−2.86
3334	Ventilation, Heating, Air-conditioning, Commercial Refrigeration Equipment Manufacturing	−0.41	0.10	−0.30
3335	Metalworking Machinery Manufacturing	−0.80	0.20	−0.60
3336	Engine and turbine manufacturing	−1.38	0.25	−1.13
3339	Other General Purpose Machinery Manufacturing	−0.95	0.25	−0.70
3351	Electric Lighting Equipment Manufacturing	−0.57	0.16	−0.41
3352	Household Appliance Manufacturing	−0.71	0.14	−0.57
3353	Electrical Equipment Manufacturing	−0.84	0.14	−0.71
3359	Other Electrical Equipment and Component Manufacturing	−0.72	0.13	−0.59
336212	Truck Trailer Manufacturing	−0.44	0.30	−0.14
336214	Travel Trailer and Camper	−0.13	0.10	−0.02
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing	−0.34	0.16	−0.19
336370	Motor Vehicle Metal Stamping	−0.60	0.56	−0.04
336390	Other Motor Vehicle Parts Manufacturing	−0.55	0.22	−0.34
336300	Motor Vehicle Steering, Suspension Component (except Spring), and Brake Systems Manufacturing	−1.71	0.37	−1.34
336411	Aircraft manufacturing	−0.06	0.05	−0.01
3365	Railroad Rolling Stock Manufacturing	−0.53	0.29	−0.24
3366	Ship and Boat Building	−0.09	0.06	−0.03
3369	Other Transportation Equipment Manufacturing	−0.99	0.29	−0.71
3372	Office Furniture	−0.32	0.17	−0.15
3399	Other Miscellaneous Manufacturing	−0.43	0.08	−0.34

Source: USITC estimates.

Table F.14 Extended model results of the economic effects of steel and aluminum tariffs under sections 232 and 301 on downstream prices, quantities, and value, 2020
In percentage changes.

NAICS	NAICS Sector	Percentage change domestic quantity	Percentage change domestic price	Percentage change in value
2110	Oil and Gas Extraction	−0.14	0.06	−0.08
312110	Soft Drink and Ice Manufacturing	−0.28	0.26	−0.01
3149	Other Textile Product Mills	−0.28	0.06	−0.22
3322	Cutlery and Handtool Manufacturing	−1.59	0.28	−1.32
3323	Architectural and structural metals	−0.30	0.24	−0.06
3324	Boiler, Tank, and Shipping Container Manufacturing	−0.68	0.50	−0.17
3325	Hardware Manufacturing	−0.38	0.12	−0.26
3326	Spring and Wire Manufacturing	−1.24	0.56	−0.69
3327	Machine Shops Turned Product and Screw, Nut, and Bolt Manufacturing	−0.19	0.16	−0.04
3328	Coating, Engraving, Heat Treating and Allied Activities	−0.20	0.20	0.00
3329	Other Fabricated Metal Product Manufacturing	−0.56	0.20	−0.36
3331	Agriculture, Construction and Mining Machinery Manufacturing	−0.53	0.18	−0.35
3332	Industrial Machine Manufacturing	−0.88	0.16	−0.72
3334	Ventilation, Heating, Air-conditioning, Commercial Refrigeration Equipment Manufacturing	−0.25	0.07	−0.18
3335	Metalworking Machinery Manufacturing	−0.45	0.12	−0.33
3336	Engine and turbine manufacturing	−0.72	0.14	−0.58
3339	Other General Purpose Machinery Manufacturing	−0.52	0.15	−0.37
3351	Electric Lighting Equipment Manufacturing	−0.46	0.14	−0.32
3352	Household Appliance Manufacturing	−0.42	0.09	−0.33
3353	Electrical Equipment Manufacturing	−0.51	0.09	−0.42
3359	Other Electrical Equipment and Component Manufacturing	−0.44	0.09	−0.35
336212	Truck Trailer Manufacturing	−0.32	0.24	−0.08
336214	Travel Trailer and Camper	−0.07	0.06	−0.01
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing	−0.21	0.11	−0.10
336370	Motor Vehicle Metal Stamping	−0.39	0.37	−0.02
336390	Other Motor Vehicle Parts Manufacturing	−0.33	0.14	−0.19
336300	Motor Vehicle Steering, Suspension Component (except Spring), and Brake Systems Manufacturing	−1.00	0.23	−0.77
336411	Aircraft manufacturing	−0.04	0.03	−0.01
3365	Railroad Rolling Stock Manufacturing	−0.31	0.18	−0.13
3366	Ship and Boat Building	−0.06	0.04	−0.02
3369	Other Transportation Equipment Manufacturing	−0.55	0.18	−0.36
3372	Office Furniture	−0.20	0.11	−0.09
3399	Other Miscellaneous Manufacturing	−0.24	0.05	−0.19

Table F.15 Extended model results of the economic effects of steel and aluminum tariffs under sections 232 and 301 on downstream prices, quantities, and value, 2019
In percentage changes.

NAICS	NAICS Sector	Percentage change domestic quantity	Percentage change domestic price	Percentage change in value
2110	Oil and Gas Extraction	−0.15	0.06	−0.09
312110	Soft Drink and Ice Manufacturing	−0.47	0.45	−0.02
3149	Other Textile Product Mills	−0.34	0.10	−0.24
3322	Cutlery and Handtool Manufacturing	−3.20	0.57	−2.64
3323	Architectural and structural metals	−0.53	0.44	−0.10
3324	Boiler, Tank, and Shipping Container Manufacturing	−1.23	0.92	−0.33
3325	Hardware Manufacturing	−0.80	0.23	−0.56
3326	Spring and Wire Manufacturing	−1.99	0.87	−1.13
3327	Machine Shops Turned Product and Screw, Nut, and Bolt Manufacturing	−0.32	0.26	−0.07
3328	Coating, Engraving, Heat Treating and Allied Activities	−0.36	0.36	0.00
3329	Other Fabricated Metal Product Manufacturing	−1.23	0.42	−0.81
3331	Agriculture, Construction and Mining Machinery Manufacturing	−1.02	0.34	−0.68
3332	Industrial Machine Manufacturing	−1.34	0.25	−1.09
3334	Ventilation, Heating, Air-conditioning, Commercial Refrigeration Equipment Manufacturing	−0.50	0.15	−0.35
3335	Metalworking Machinery Manufacturing	−0.89	0.23	−0.66
3336	Engine and turbine manufacturing	−1.04	0.22	−0.83
3339	Other General Purpose Machinery Manufacturing	−0.96	0.28	−0.68
3351	Electric Lighting Equipment Manufacturing	−0.69	0.21	−0.48
3352	Household Appliance Manufacturing	−0.89	0.19	−0.70
3353	Electrical Equipment Manufacturing	−1.00	0.17	−0.83
3359	Other Electrical Equipment and Component Manufacturing	−0.94	0.19	−0.75
336212	Truck Trailer Manufacturing	−0.50	0.36	−0.14
336214	Travel Trailer and Camper	−0.16	0.14	−0.02
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing	−0.36	0.18	−0.18
336370	Motor Vehicle Metal Stamping	−0.64	0.61	−0.03
336390	Other Motor Vehicle Parts Manufacturing	−0.59	0.25	−0.34
336300	Motor Vehicle Steering, Suspension Component (except Spring), and Brake Systems Manufacturing	−1.84	0.42	−1.43
336411	Aircraft manufacturing	−0.06	0.05	−0.01
3365	Railroad Rolling Stock Manufacturing	−0.50	0.28	−0.22
3366	Ship and Boat Building	−0.13	0.09	−0.04
3369	Other Transportation Equipment Manufacturing	−0.95	0.34	−0.61
3372	Office Furniture	−0.35	0.20	−0.15
3399	Other Miscellaneous Manufacturing	−0.51	0.11	−0.40

Table F.16 Extended model results of the economic effects of steel and aluminum tariffs under sections 232 and 301 on downstream prices, quantities, and value, 2018
In percentage changes. NAICS = North American Industry Classification System.

NAICS	NAICS Sector	Percentage change domestic quantity	Percentage change domestic price	Percentage change in value
2110	Oil and Gas Extraction	−0.12	0.05	−0.07
312110	Soft Drink and Ice Manufacturing	−0.48	0.46	−0.02
3149	Other Textile Product Mills	−0.35	0.10	−0.25
3322	Cutlery and Handtool Manufacturing	−3.43	0.61	−2.84
3323	Architectural and structural metals	−0.55	0.45	−0.10
3324	Boiler, Tank, and Shipping Container Manufacturing	−1.33	0.97	−0.37
3325	Hardware Manufacturing	−0.80	0.24	−0.57
3326	Spring and Wire Manufacturing	−1.71	0.75	−0.97
3327	Machine Shops Turned Product and Screw, Nut, and Bolt Manufacturing	−0.32	0.25	−0.07
3328	Coating, Engraving, Heat Treating and Allied Activities	−0.38	0.39	0.00
3329	Other Fabricated Metal Product Manufacturing	−1.34	0.45	−0.90
3331	Agriculture, Construction and Mining Machinery Manufacturing	−1.18	0.39	−0.79
3332	Industrial Machine Manufacturing	−1.72	0.31	−1.42
3334	Ventilation, Heating, Air-conditioning, Commercial Refrigeration Equipment Manufacturing	−0.56	0.16	−0.40
3335	Metalworking Machinery Manufacturing	−0.89	0.23	−0.66
3336	Engine and turbine manufacturing	−0.94	0.21	−0.73
3339	Other General Purpose Machinery Manufacturing	−1.05	0.30	−0.75
3351	Electric Lighting Equipment Manufacturing	−0.66	0.19	−0.47
3352	Household Appliance Manufacturing	−1.07	0.22	−0.85
3353	Electrical Equipment Manufacturing	−1.10	0.19	−0.91
3359	Other Electrical Equipment and Component Manufacturing	−0.98	0.20	−0.78
336212	Truck Trailer Manufacturing	−0.52	0.37	−0.15
336214	Travel Trailer and Camper	−0.18	0.16	−0.03
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing	−0.39	0.19	−0.19
336370	Motor Vehicle Metal Stamping	−0.65	0.62	−0.03
336390	Other Motor Vehicle Parts Manufacturing	−0.58	0.25	−0.34
336300	Motor Vehicle Steering, Suspension Component (except Spring), and Brake Systems Manufacturing	−1.84	0.42	−1.42
336411	Aircraft manufacturing	−0.04	0.04	−0.01
3365	Railroad Rolling Stock Manufacturing	−0.50	0.28	−0.22
3366	Ship and Boat Building	−0.13	0.09	−0.04
3369	Other Transportation Equipment Manufacturing	−1.05	0.37	−0.69
3372	Office Furniture	−0.37	0.20	−0.16
3399	Other Miscellaneous Manufacturing	−0.56	0.11	−0.44

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Appendix G
Technical Details of the Tariff Sensitivity Analysis and Section 301 Model

Model Descriptions

The following sections provide additional detail for the two methodologies described in chapter 6. The first is an econometric model that uses an event study framework to estimate the elasticity of various trade variables with section 301 tariffs. The second is a set of partial equilibrium models that is estimated to trade and domestic data and then used to simulate a counterfactual scenario where the tariffs are absent in a given year.

Event Study

The econometric model for the event study uses the following equation:

$$ln\, y_{ijt} = \alpha_{ij} + \alpha_{it} + \alpha_{jt} + \sum_{s=0}^{\overline{T}} \left(\beta_s I_{ijs} \ln \frac{1+\tau_{ijs}}{1+\tau_{ij0}} \right) + \epsilon_{ijt}.$$

The i subscripts denote country (exporter), the j subscripts denote an HTS statistical reporting number, and the t subscripts denote time in months. The subscript s denotes time in months relative to the implementation of the tariff where $s = 0$ is the last month prior to the implemented tariff. The variable y_{ijt} on the lefthand side can be exporter price p_{ijt}, importer price $(1+\tau_{ijt})p_{ijt}$, import quantity q_{ijt}, or import value $p_{ijt}q_{ijt}$. The coefficients α_{ij}, α_{it}, and α_{jt} are country-product, country-time, and product-time fixed effects that control for anything happening over this time period that is not an effect of the tariffs. The error term is ϵ_{ijt}. The tariff rates used for this regression are calculated by dividing the estimated duties collected by the customs value.

Event time (s in the regression) is defined so that event time zero is the last month that a country-product was not affected by section 301 tariffs or section 232 tariffs on steel and aluminum. Event time is restricted from zero until $\overline{T} \geq 1$ periods after the product is first covered. Event times greater than $\overline{T}$ are included in the last period. Even though section 301 tariffs are the emphasis of chapter 5, section 232 tariffs need to be included to avoid omitted variable bias. The indicator I_{ijs} is defined as 1 if product i from source j at time t is currently at event time s (that is, the product from that source is covered by section 301 tariffs or section 232 tariffs on steel and aluminum, and specifically that time t is the s^{th} month of the tariff being in place based on the event time definition above) and defined as zero otherwise. That means I_{ijs} is defined as zero for all s for country products ij that are never affected by the tariffs. For any given lefthand side variable, at most one I_{ijs} term on the righthand side can be equal to 1.

The tariffs on the righthand side of the regression are the monthly scaled tariffs described in the Data section of this appendix.

The coefficients of interest are the β_s terms, which can be interpreted as the elasticity of the lefthand side variable with respect to the total section 301 tariffs and section 232 tariff at the time horizon of s months after (or before, if s is negative) the tariff was implemented. This month-specific elasticity is pooled across all products that were covered by the described tariffs. These β_s terms are plotted in figure 6.3 and figure G.1 for each of the four lefthand side trade variables of interest.

Months with no imports of a product from a specific source are not included in the regressions. It is likely that the absolute value of the coefficients on logged import quantities and logged import values would be greater if the econometric model allowed for zeros to be included in the regression, but the regression would need to be done using Poisson pseudo maximum likelihood (PPML) or another regression model. However, exporter and importer prices do not make sense to consider as zero when missing and would therefore not be suitable for PPML. Because the pass-through of section 301 tariffs to price is one of the key results, and PPML cannot be used to estimate those values, the analysis of this report is restricted to the log linear regression described in this section.

This event study methodology is based closely on the approach used by Amiti et al. (2020) and has similarities to that of Fajgelbaum et al. (2020).[463] These other studies similarly use event study econometric methods to estimate monthly impacts of the recent tariff actions with comparable data. There are several minor differences in how regression variables are calculated and defined for this report. Most notably, pre-event variables are not included in this estimation, which instead focuses only on direct effects. However, the present version is able to take advantage of more recent data and estimate impacts over a longer time horizon following the imposition of the tariffs (32 months) than either of the other studies.

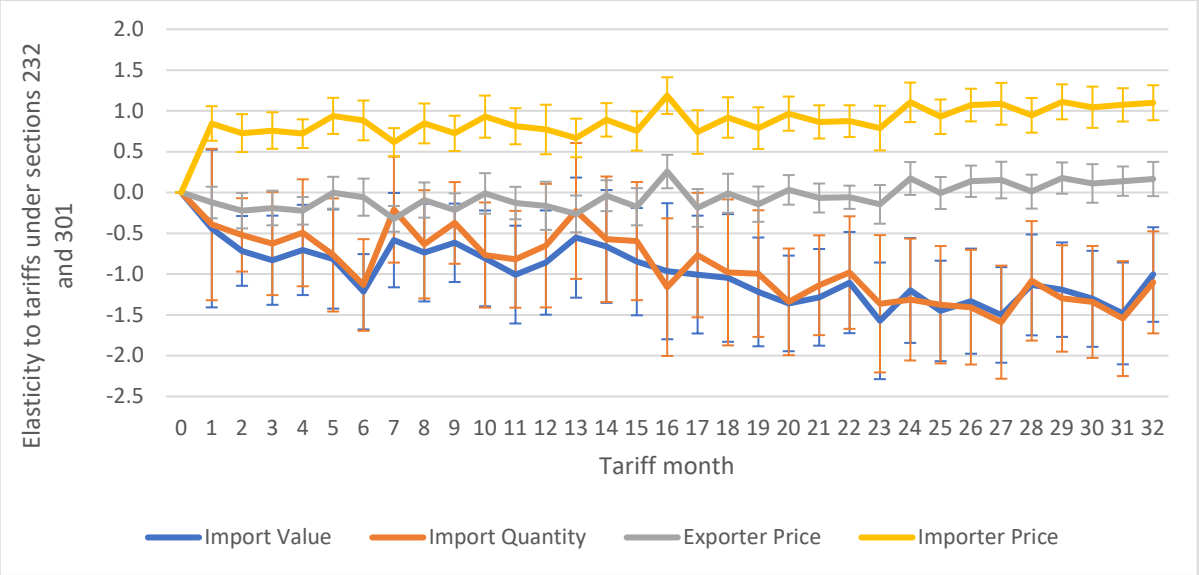
Steel and Aluminum Specification and Results

Chapter 5 of this report uses some elasticity estimates from an alternate specification of the event study that considers only steel and steel-related products affected by tariffs under sections 232 and 301. The methodology is exactly the same except that the data are reduced to the products that are covered by section 232 tariff actions related to steel or aluminum.

The estimation results for exporter and importer prices are similar to the main specification presented in figure 6.3 in chapter 6, with evidence of full pass-through of the tariffs to the importer price. The full pass-through result for steel and aluminum is actually closer to basic economic theory compared to the baseline results in chapter 6 since the estimated coefficients in the steel and aluminum specification do not statistically significantly rise above 0 or 1 for exporter or importer prices, respectively (figure G.1). The elasticities of import value and import quantity to the tariffs are smaller than the pooled estimates of all goods, indicating that steel and aluminum import quantities were less sensitive to the tariffs than products overall. Standard errors of the estimated coefficients were larger in the steel and aluminum specification than the standard errors in the main specification, which is likely due to the smaller sample size but could also be indicative that the impacts of the steel tariffs were less uniform across products or sources.

[463] Amiti, Redding, and Weinstein, "Who's Paying the US Tariffs?," January 2020; Fajgelbaum et al., "The Return to Protectionism," February 1, 2020.

Figure G.1 Estimated sensitivity of steel and aluminum trade statistics to tariffs under sections 232 and 301



Source: USITC DataWeb/Census, accessed July 7, 2022, and calculations by USITC. Estimating data only include HTS statistical reporting numbers that were affected by 232 tariffs on steel and aluminum at some point in the time series. Vertical whisker lines represent a 95 percent confidence interval around the point estimates.

Partial Equilibrium Section 301 Model

Separate partial equilibrium models are solved for each of the selected industry groups and each year. The models use constant elasticity of substitution (CES) demand functions to capture the substitutability between various imported and domestic sources.

The elasticities of substitution are estimated using a trade cost method based on Riker (2020), which is described in appendix F.[464] Each NAICS 4-digit industry group has a separately estimated elasticity of substitution (table G.1). The demand shifter parameters are calculated using the market share of each source. All sources are used in the elasticity estimation, but each model only has the United States, China, the top three non-China sources, and then an aggregated "rest of world" source. Model results tables further aggregate the top three non-China sources into the rest of world values.

The only demand parameter that is not estimated from the data is the total elasticity of demand that controls the aggregate expenditure on products from the North American Industry Classification System (NAICS) industry group. This demand parameter is set to be unit elastic, which means total expenditure in a given year will not change even though consumers may shift expenditure between sources.

The supply elasticities are set differently, whether the product is imported or produced domestically. Imported products have perfectly elastic supply. This is inferred from the complete pass-through seen in the econometric results. Two ways that complete price pass-through can occur are either perfectly inelastic demand or perfectly elastic supply. Because the estimated demand is nonzero (that is, not perfectly inelastic), the supply elasticity is set to be perfectly elastic. The domestic supply is set to be

[464] Riker, "A Trade Cost Approach to Estimating the Elasticity of Substitution," July 2020, 1–12.

unit elastic in the baseline model. The unit elasticity assumption is necessary because the domestic production data are not sufficient to estimate a data-based value. Assuming unit elastic supply means that percentage changes in the quantity of domestic production will exactly match the percentage changes in the price of the domestic good.

Table G.1 Elasticities of substitution between sources by NAICS 4-digit industry group

NAICS 4-digit industry group	Description	Elasticity of substitution	Standard error
3152	Cut and Sew Apparel Manufacturing	6.33	0.23
3344	Semiconductors and Other Electronic Components	8.01	0.48
3341	Computer Equipment	8.54	0.69
3371	Household and Institutional Furniture and Kitchen Cabinets	3.19	0.14
3363	Motor Vehicle Parts	4.55	0.29
3359	Other Electrical Equipment and Components	4.42	0.36
3399	Other Miscellaneous Manufacturing	5.95	0.24
3343	Audio and Video Equipment	8.73	0.58
3339	Other General Purpose Machinery	5.65	0.40
3261	Plastics Products	3.88	0.16

Source: USITC estimates.

Aggregate Section 301 Tariff Effects

The model used to estimate the effects of section 301 tariffs on all affected industries is a partial equilibrium model that is very similar to the model used for individual industries described above. It includes three sources of production: domestic, China, and other countries. The trade-weighted average change in the tariff rate on all U.S. imports from China is calculated to be 7.7 percent.

Comparison to Chapter 5 Partial Equilibrium Models

The partial equilibrium models in chapters 5 and 6 use similar frameworks and mostly use the same estimation strategies. Both types of models use CES demand, where buyers can imperfectly substitute between sources. Both types of models use the same strategy for estimating those substitution parameters and both types of model mostly focus on NAICS 4-digit industry groups, although the chapter 5 models sometimes break out more disaggregated information for specific industries. Market shares are calculated in the same way for both types of models, and both types of models assume a total elasticity of demand of −1 (i.e., constant total expenditure).

The models are similar but not identical on the supply side. Both types of models use the full pass-through results from the event study to infer perfectly elastic supply of imports. However, chapter 5 sets domestic elasticities of supply using the values found in AD/CVD cases for the related products but chapter 6 uses an assumption of unit elasticity as a relatively agnostic baseline for the wider variety of products considered in that chapter. The chapter 5 models also include upstream and downstream industries and therefore have additional parameters that are not used in the chapter 6 models.

Data Transformations

The constructed data set for the modeling in this chapter is mostly built upon trade data from the U.S. Census Bureau. The trade data have monthly imports for consumption by trading partner at the HTS 10-digit statistical reporting number level from January 2017 through March 2022. Aside from customs value, this trade data set also includes the first unit of quantity and estimated duties collected. Average unit values are constructed by dividing import value by the first unit of quantity. Another version of the data uses customs value and landed duty-paid value of annual imports for consumption by trading partner data at the NAICS 4-digit industry group level. These data include district information for the port of entry.

Individual statistical reporting numbers and trading partners were associated with specific trade policy actions (i.e., "tranches") by USITC staff, using *Federal Register* notices and the Harmonized Tariff Schedule. Those trade policy actions were then linked to changes in tariff rates for all months during the time frame of the trade data. A monthly tariff rate is calculated proportionally for each month considering how many days a tariff rate was imposed during the month and is used in the counterfactual partial equilibrium simulations. The econometric event study regression uses the monthly tariff rate calculated from estimated duties collected.

Event times, defined in the Event Study section of this appendix, are calculated using the date that the related tariff action was imposed, which means it is possible for "skipped" section 301 tariff months if products were not imported from China under a statistical reporting number in a particular month. Section 232 tariffs on steel and aluminum were imposed on many source countries, not just China, and the status of section 232 tariffs changed several times for many source countries. The tariff month for section 232 tariffs is still defined in the same manner as for section 301 tariffs, which means that the section 232 tariff rate for a given source can sometimes be zero even for positive tariff months.

A combined tariff is defined by adding section 301 and section 232 tariffs. Most statistical reporting numbers are only affected by one or the other, but some are affected by both. The tariff month (i.e., event time s in the regression described in the Event Time section of this appendix) variable is the maximum of the two tariff months, meaning the tariff month is based on whichever tariff was imposed first.

The trade data (using HTS statistical reporting numbers) were associated with NAICS 4-digit industry groups using yearly concordances from the U.S. Census Bureau. This concordance also includes end use information that is used in some of the alternate specification in this appendix. Observations with an end use classification starting with "5" (Other Goods) were dropped from the dataset. These accounted for 0.14 percent of the trade value that occurred during the time frame for subheading-country pairs that were targeted by section 301 tariffs or section 232 tariffs on steel and aluminum.

The partial equilibrium model also uses gross output by sector from the Bureau of Economic Analysis, which is scaled using the total value of imports associated with the industry group compared to the total value of imports associated with the sector, assuming that the ratio of total domestic value to import value is the same for all industry groups within the sector.

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Appendix H
Related Economic Publications

Several other publications have examined the impacts of recent tariff actions, both from the United States and other countries. The following lists a selection of these studies that assess the impacts of the tariffs under sections 232 and 301 on U.S. trade, production, and prices as at least part of their scope. Importantly, many of the estimates in these other studies reflect the impacts of factors beyond the recent tariffs under sections 232 and 301, such as U.S. safeguard actions and tariff actions in other countries, and therefore may not be directly comparable to the Commission's estimates.

- Amiti et al. (2019) "The Impact of the 2018 Tariffs on Prices and Welfare."[465]
- Carvallo et al. (2021) "Tariff Pass-through at the Border and at the Store: Evidence from US Trade Policy." [466]
- Cigna et al. (2022) "The Impact of US Tariffs against China on US Imports: Evidence for Trade Diversion?"[467]
- Fajgelbaum et al. (2020) "The Return to Protectionism."[468]
- Fajgelbaum and Khandelwal (2022) "The Economic Impacts of the US–China Trade War."[469]
- Jiao et al. (2022) "The Impacts of the U.S. Trade War on Chinese Exporters."[470]

[465] Amiti, Redding, and Weinstein, "The Impact of the 2018 Tariffs on Prices and Welfare," November 1, 2019.
[466] Cavallo et al., "Tariff Pass-through at the Border and at the Store: Evidence from Us Trade Policy," 2021.
[467] Cigna et al., "The Impact of US Tariffs against China on US Imports," January 2022.
[468] Fajgelbaum et al., "The Return to Protectionism," February 1, 2020.
[469] Fajgelbaum and Khandelwal, "The Economic Impacts of the US–China Trade War," 2022.
[470] Jiao et al., "The Impacts of the U.S. Trade War on Chinese Exporters," 2022.

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Fajgelbaum, Pablo D, and Amit K Khandelwal. "The Economic Impacts of the US–China Trade War." *Annual Review of Economics* 14. (2022): 205–28. https://doi.org/10.1146/annurev-economics-051420-110410.

Jiao, Yang, Zhikuo Liu, Zhiwei Tian, and Xiaxin Wang. "The Impacts of the U.S. Trade War on Chinese Exporters." *The Review of Economics and* Statistics (July 26, 2022): 1–34. https://doi.org/10.1162/rest_a_01229.

EXHIBIT 203

Posted June 21, 2022 at 2:00 pm by **Adam S. Hersh**

Revoking tariffs would not tame inflation

But it would leave our supply chains even more vulnerable to disruption

Key takeaways:

- **Section 232 and 301 tariffs have nothing to do with the current inflationary spike**. The tariffs—implemented in 2018—had little effect on U.S. prices, and inflation only spiked after the pandemic recession began in February 2020.
- **Eliminating tariffs would not significantly reduce inflation**. At best, removing these tariffs would result in a one-time price decrease of 0.2%—a drop in the bucket when consumer prices have risen by more than three times as much, on average, *every month* since January 2021, driven largely by pandemic-related global supply chain disruptions and the war in Ukraine.
- **Removing these tariffs would undermine U.S. steel and aluminum industries and increase domestic dependence on unstable supply chains**. Tariff removal would result in job losses, plant closures, cancellations of planned investments, and further destabilize the U.S. manufacturing base at a time of intensifying strategic importance for good jobs, national security, and the race to green industry.

With dwindling options on inflation and a mounting chorus of special interest business lobbies, the Biden-Harris administration is **reportedly** considering removing some Trump-era tariffs in an effort to moderate rising prices in the U.S. economy.

Tempting as such an action may seem, it is certain to have unnoticeable effects on overall prices—at best. And the action will ensure, moving forward, that our supply chains will be even more vulnerable to the kinds of disruption risks we are seeing play out right now. These tariffs offer a tangible policy response to a real-world economy rife with market failures that invalidate the predictions of canonical economic trade models used to argue against keeping the tariffs.

In the absence of a more comprehensive approach to U.S. industrial strategy, the tariffs are working to resuscitate America's industrial base and have done so with no meaningful adverse impacts on prices. Pulling the rug from under this rebuild now, without first putting in place other policy solutions to address costly market failures, risks undoing this progress and jeopardizing the financial conditions in industries that are critical to building the infrastructure and renewable energy investments needed to power future economic growth.

Two broad sets of tariffs implemented under U.S. trade law in 2018 are under review by the Biden-Harris administration. The first and biggest group retaliated against findings of intellectual property theft and forced technology transfer in U.S. companies doing business in China, following a United States Trade Representative (USTR) investigation under Sec. 301 authority. This led the Trump administration to negotiate a "**Phase One**" economic agreement with China.

The second set of tariffs invoked national security concerns under Sec. 232 of the trade act to bolster **U.S. steel** and **aluminum industries**, perennially at risk of financial insolvency amid long-running, state policy-driven global supply gluts. Since joining the World Trade Organization in 2001, China's mushrooming steel investment accounted for nearly 70% of the growth in the world's steel production capacity—a 423% increase—though the tariffs apply more broadly to cover imports from a range of countries where industrial policies are driving investment on a non-commercial basis, worsening chronic overcapacity in global steel and aluminum markets, among other energy- and carbon-intensive basic industries.

Ever since these tariffs were enacted, business lobbies and orthodox economists have warned that tariffs would devastate the economy. One can debate what alternative policy outcomes were possible or preferable, but it is clear that tariffs didn't make the sky fall. The data show no material adverse impact on consumers or the broader U.S. economy. Previous EPI analysis has shown that the Section 232 measures on **steel** and **aluminum** imports have had no meaningful real-world impact on the prices of the leading metal-consuming products (such as motor vehicles, machinery, construction materials, and more).

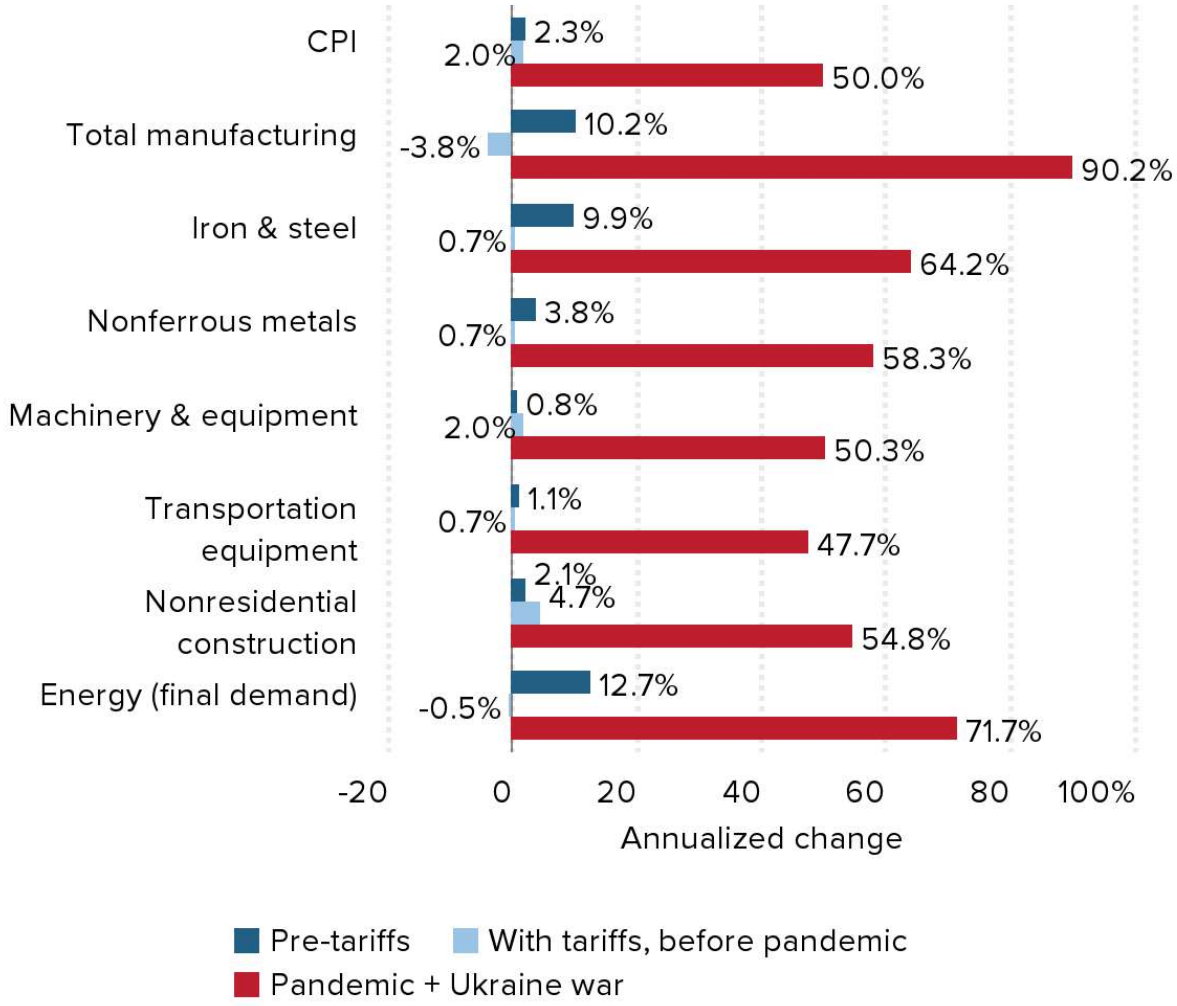
The unspectacular effects of these tariffs on prices are plain to see by breaking up the recent experience into three periods. **Figure A** compares the average inflation rate performance across consumer price and various key industrial goods price measures in the period preceding these tariffs, the nearly two-year period with tariffs in effect prior to the pandemic, and from the pre-pandemic business cycle peak through the latest May 2022 data. Inflation, broadly, decelerated substantially after implementation of the tariffs in the pre-pandemic period. This is true for manufactured goods writ large, as well as for consumer prices overall, measured in the Consumer Price Index (CPI). Tellingly, price increases for steel and aluminum slowed sharply

to 0.7-0.8% annually from roughly 10% and 4% annually, respectively—largely attributable to U.S. producers redeploying and reinvesting in domestic production capacity amid improved financial conditions resulting from the tariffs.

Price increases for transportation equipment—the biggest metals-consuming industry, including for cars and trucks and their parts—slowed by more than one-third. In some other leading metal-using industries, prices accelerated modestly, but nothing to affect the overall downward trend in prices, and nothing on the order of doomsday predictions prophesied by tariff opponents. In other words, for two years markets and policymakers adjusted to these measures *before* the pandemic without a hiccup. Inflation, broadly, only spiked after February 2020; it is simply not plausible to infer that these tariffs had a causal role in pandemic-era inflation.

FIGURE A

Tariffs have nothing to do with the current inflationary spike



Note: Pre-tariffs = April 2016–February 2018; With tariffs, before pandemic = March 2018–January 2020; Pandemic = February 2020–May 2022.

Source: EPI analysis of BLS 2022 data.

It should not be surprising that these tariffs, though affecting a wide swath of U.S. imports, had little effect on U.S. prices. First, Chinese policymakers responded to the tariffs by depreciating their exchange rate by 15% from February 2018 to late 2019, offsetting much of the price impact by making *all* Chinese exports to the United States that much cheaper in dollar terms.

Second, the tariff measures themselves are rather porous, allowing significant shares of imports to pass around these duties. The Department of Commerce has granted hundreds of thousands of exclusions to both the Section 301 and Section 232 tariffs where businesses could demonstrate adverse economic impacts from limited alternative domestic sources, and where

deemed essential under the COVID-19 public health emergency. More importers bypassed the tariffs by transshipping products through countries with preferable access to U.S. markets, perhaps after performing some trivially minimal transformation to qualify as a different product under U.S. trade rules.

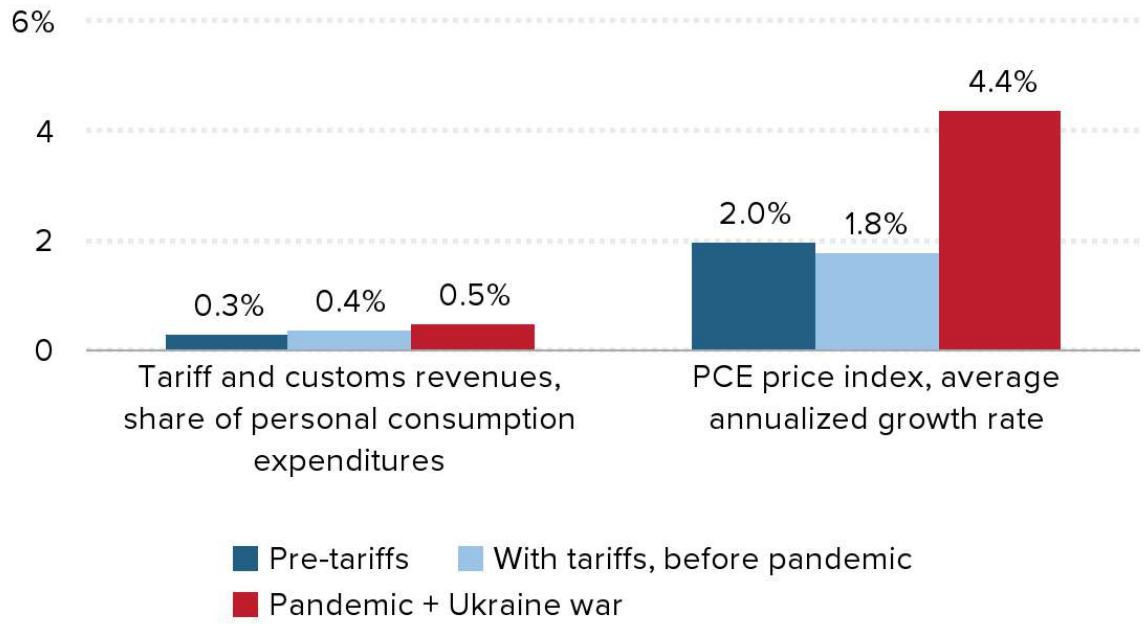
Finally, the tariffs are levied on a much smaller base than is implied by the volume of imports covered: the primary steel and aluminum and intermediate inputs of more processed parts and materials. These make up just a fraction of the overall cost of a final good supplied to consumers. For example, looking at pre-pandemic prices, the steel inputs required to make a new U.S. car amount to **just 2%** of the sales price, compared with 40% for semiconductors and other electronic components.

This suggests that removing the tariffs now—even ignoring impacts on already strained supply chains—would have a similarly negligible impact on the surging inflation we are now experiencing. **Figure B** illustrates why: overall tariff and customs duties paid on U.S. imports amount to a trivial share of overall personal consumption expenditures. In the nearly two years following the Sec. 232 and Sec. 301 tariffs, customs duties as a share of consumer expenditures increased from 0.3% to 0.4%, on average, relative to the period preceding tariffs. Even if one were to assume (implausibly) this was due to Sec. 301 and 232 tariffs and no other factors, they amounted to at most a 0.1% increase in prices.

But, of course, there were other economic factors at work and the increased tariff collection did not translate into higher inflation. In fact, Figure B shows that consumer prices decelerated from 2.0% to 1.8%, on average, annualized, after implementation of the tariffs and through the business cycle peak in the first quarter of 2020. Customs duties continued to ratchet up during the pandemic, minimally and mechanically, as people shifted from consuming services—less available in the pandemic—to goods, and imports surged with a stronger U.S. dollar, adding another 0.1% as a share of consumer spending. At best, removing these tariffs would result in a one-time price decrease of 0.2%—a drop in the bucket when you consider consumer prices have risen by more than three times as much, on average, *every month* since January 2021.

FIGURE B

Eliminating tariffs would yield at best inconsequential gains for consumers



Note: Pre-Trump tariffs = 2016, third quarter–2018, first quarter; With tariffs, before pandemic = 2018, second quarter–2019, fourth quarter; Pandemic = 2020, first quarter–present.

Source: EPI analysis of BEA 2022 data.

This is not to say that the tariffs had no impact—they did, particularly in helping U.S. steel and aluminum producers. The increase in the price of imported metal products makes it possible for U.S. producers to achieve economically viable financial margins and stabilize expectations of market conditions enough to entice reinvestment in new production capacity. Nonetheless, conditions of global chronic glut–especially given **expected global growth slowdown** from China's partial economic lockdown, the war in Ukraine, and ongoing pandemic-related supply chain disruptions—continue to threaten U.S. metals industries. This affects the strategic goods they produce and the millions of jobs they support directly and indirectly—and a robust manufacturing base more generally. The tariffs may be a crude instrument, but absent other feasible policy options to address the glaring market failures in global trade, they remain a critical tool to support ongoing industrial rebuilding and to ensure that these essential industries have the necessary resources for technology investments to decarbonize moving forward.

Congress applied different criteria for considering these two sets of tariff measures. The Sec. 232 measures clearly prioritize national security concerns over economic efficiency and consumer welfare; under conditions of chronic global gluts, U.S. steel and aluminum producers have been perennially at the brink of economic viability to the extreme that **only one** producer in a NATO country is capable of producing military- and aerospace-grade aluminum. The Department of Commerce identifies an 80% capacity utilization rate in steel production as a minimum threshold for long-term financial viability of the industry. In the business cycle prior to the 232 tariffs, U.S. steelmakers reached this level of activity less than 5% of the time; though this has improved to 26% of the time since March 2018. The Sec. 232 measures afforded metals producers the financial breathing space to start rebuilding the industry with expanded investment and job creation.

As for the Sec. 301 tariffs, the Phase One agreement with China has gone largely **unfulfilled** in terms of the bulk commodity purchases pledged by Chinese policymakers and the promise to continue negotiations on further prying open Chinese markets to U.S. foreign direct investment and intellectual property monopolies. Ironically, however, if Chinese policymakers had lived up to their end of the bargain, the United States would arguably be in a worse position today in regard to inflation and supply-chain vulnerabilities. The kinds of intellectual property protections and free reign for their foreign investment in China that U.S. business interests sought would make it easier for big corporations to move—or merely threaten to relocate—operations to China, and to book profits in offshore tax havens.

People often focus on trade's tendency to push down prices. But by exporting in bulk U.S. natural gas and agricultural products to China, Phase One would have made these commodities scarcer, and therefore prices paid by American businesses and households for electricity and food would be higher.

It is clear that the United States is in dire need of an economic strategy rethink. Until a more comprehensive policy approach to U.S. industrial development is heeded, policymakers should at least keep in place the parts of policy that are working to promote U.S. industry.

EXHIBIT 204

AUGUST 09, 2023

Executive Order on Addressing United States Investments in Certain National Security Technologies and Products in Countries of Concern

By the authority vested in me as President by the Constitution and the laws of the United States of America, including the International Emergency Economic Powers Act (50 U.S.C. 1701 *et seq*.) (IEEPA), the National Emergencies Act (50 U.S.C. 1601 *et seq*.) (NEA), and section 301 of title 3, United States Code,

I, JOSEPH R. BIDEN JR., President of the United States of America, find that countries of concern are engaged in comprehensive, long-term strategies that direct, facilitate, or otherwise support advancements in sensitive technologies and products that are critical to such countries' military, intelligence, surveillance, or cyber-enabled capabilities. Moreover, these countries eliminate barriers between civilian and commercial sectors and military and defense industrial sectors, not just through research and development, but also by acquiring and diverting the world's cutting-edge technologies, for the purposes of achieving military dominance. Rapid advancement in semiconductors and microelectronics, quantum information technologies, and artificial intelligence capabilities by these countries significantly enhances their ability to conduct activities that threaten the national security of the United States. Advancements in sensitive technologies and products in these sectors will accelerate the development of advanced computational capabilities that will enable new applications that pose significant national security risks, such as the development of more sophisticated weapons systems, breaking of cryptographic codes, and other applications that could provide these countries with military advantages.

As part of this strategy of advancing the development of these sensitive technologies and products, countries of concern are exploiting or have the

ability to exploit certain United States outbound investments, including certain intangible benefits that often accompany United States investments and that help companies succeed, such as enhanced standing and prominence, managerial assistance, investment and talent networks, market access, and enhanced access to additional financing. The commitment of the United States to open investment is a cornerstone of our economic policy and provides the United States with substantial benefits. Open global capital flows create valuable economic opportunities and promote competitiveness, innovation, and productivity, and the United States supports cross-border investment, where not inconsistent with the protection of United States national security interests. However, certain United States investments may accelerate and increase the success of the development of sensitive technologies and products in countries that develop them to counter United States and allied capabilities.

I therefore find that advancement by countries of concern in sensitive technologies and products critical for the military, intelligence, surveillance, or cyber-enabled capabilities of such countries constitutes an unusual and extraordinary threat to the national security of the United States, which has its source in whole or substantial part outside the United States, and that certain United States investments risk exacerbating this threat. I hereby declare a national emergency to deal with this threat.

Accordingly, I hereby order:

Section 1. Notifiable and Prohibited Transactions. (a) To assist in addressing the national emergency declared in this order, the Secretary of the Treasury (Secretary), in consultation with the Secretary of Commerce and, as appropriate, the heads of other relevant executive departments and agencies (agencies), shall issue, subject to public notice and comment, regulations that require United States persons to provide notification of information relative to certain transactions involving covered foreign persons (notifiable transactions) and that prohibit United States persons from engaging in certain other transactions involving covered foreign persons (prohibited transactions).

(b) The regulations issued under this section shall identify categories of notifiable transactions that involve covered national security technologies and products that the Secretary, in consultation with the Secretary of

Commerce and, as appropriate, the heads of other relevant agencies, determines may contribute to the threat to the national security of the United States identified in this order. The regulations shall require United States persons to notify the Department of the Treasury of each such transaction and include relevant information on the transaction in each such notification.

(c) The regulations issued under this section shall identify categories of prohibited transactions that involve covered national security technologies and products that the Secretary, in consultation with the Secretary of Commerce and, as appropriate, the heads of other relevant agencies, determines pose a particularly acute national security threat because of their potential to significantly advance the military, intelligence, surveillance, or cyber-enabled capabilities of countries of concern. The regulations shall prohibit United States persons from engaging, directly or indirectly, in such transactions.

Sec. 2. Duties of the Secretary. In carrying out this order, the Secretary shall, as appropriate:

(a) communicate with the Congress and the public with respect to the implementation of this order;

(b) consult with the Secretary of Commerce on industry engagement and analysis of notified transactions;

(c) consult with the Secretary of State, the Secretary of Defense, the Secretary of Commerce, the Secretary of Energy, and the Director of National Intelligence on the implications for military, intelligence, surveillance, or cyber-enabled capabilities of covered national security technologies and products and potential covered national security technologies and products;

(d) engage, together with the Secretary of State and the Secretary of Commerce, with allies and partners regarding the national security risks posed by countries of concern advancing covered national security technologies and products;

(e) consult with the Secretary of State on foreign policy considerations related to the implementation of this order, including but not limited to the

issuance and amendment of regulations; and

(f) investigate, in consultation with the heads of relevant agencies, as appropriate, violations of this order or the regulations issued under this order and pursue available civil penalties for such violations.

Sec. 3. Program Development. Within 1 year of the effective date of the regulations issued under section 1 of this order, the Secretary, in consultation with the Secretary of Commerce and, as appropriate, the heads of other relevant agencies, shall assess whether to amend the regulations, including whether to adjust the definition of "covered national security technologies and products" to add or remove technologies and products in the semiconductors and microelectronics, quantum information technologies, and artificial intelligence sectors. The Secretary, in consultation with the Secretary of Commerce and, as appropriate, the heads of other relevant agencies, shall periodically review the effectiveness of the regulations thereafter.

Sec. 4. Reports to the President. Within 1 year of the effective date of the regulations issued under section 1 of this order and, as appropriate but no less than annually thereafter, the Secretary, in coordination with the Secretary of Commerce and in consultation with the heads of other relevant agencies and the Director of the Office of Management and Budget, as appropriate, shall provide the President, through the Assistant to the President for National Security Affairs:

(a) to the extent practicable, an assessment of the effectiveness of the measures imposed under this order in addressing threats to the national security of the United States described in this order; advancements by the countries of concern in covered national security technologies and products critical for such countries' military, intelligence, surveillance, or cyber-enabled capabilities; aggregate sector trends evident in notifiable transactions and related capital flows in covered national security technologies and products, drawing on analysis provided by the Secretary of Commerce, the Director of National Intelligence, and the heads of other relevant agencies, as appropriate; and other relevant information obtained through the implementation of this order; and

(b) recommendations, as appropriate, regarding:

(i) modifications to this order, including the addition or removal of identified sectors or countries of concern, and any other modifications to avoid circumvention of this order and enhance its effectiveness; and

(ii) the establishment or expansion of other Federal programs relevant to the covered national security technologies and products, including with respect to whether any existing legal authorities should be used or new action should be taken to address the threat to the national security of the United States identified in this order.

Sec. 5. Reports to the Congress. The Secretary is authorized to submit recurring and final reports to the Congress on the national emergency declared in this order, consistent with section 40l(c) of the NEA (50 U.S.C. 1641(c)) and section 204(c) of IEEPA (50 U.S.C. 1703(c)).

Sec. 6. Official United States Government Business. Nothing in this order or the regulations issued under this order shall prohibit transactions for the conduct of the official business of the United States Government by employees, grantees, or contractors thereof.

Sec. 7. Confidentiality. The regulations issued by the Secretary under this order shall address the confidentiality of information or documentary material submitted pursuant to this order, consistent with applicable law.

Sec. 8. Additional Notifications and Prohibitions. (a) Any conspiracy formed to violate any regulation issued under this order is prohibited.

(b) Subject to the regulations issued under this order, any action that evades or avoids, has the purpose of evading or avoiding, causes a violation of, or attempts to violate any of the prohibitions set forth in this order or any regulation issued under this order is prohibited.

(c) In the regulations issued under this order, the Secretary may prohibit United States persons from knowingly directing transactions if such transactions would be prohibited transactions pursuant to this order if engaged in by a United States person.

(d) In the regulations issued under this order, the Secretary may require United States persons to:

(i) provide notification to the Department of the Treasury of any transaction by a foreign entity controlled by such United States person that would be a notifiable transaction if engaged in by a United States person; and

(ii) take all reasonable steps to prohibit and prevent any transaction by a foreign entity controlled by such United States person that would be a prohibited transaction if engaged in by a United States person.

Sec. 9. Definitions. For purposes of this order:

(a) the term "country of concern" means a country or territory listed in the Annex to this order that the President has identified to be engaging in a comprehensive, long-term strategy that directs, facilitates, or otherwise supports advancements in sensitive technologies and products that are critical to such country's military, intelligence, surveillance, or cyber-enabled capabilities to counter United States capabilities in a way that threatens the national security of the United States;

(b) the term "covered foreign person" means a person of a country of concern who or that is engaged in activities, as identified in the regulations issued under this order, involving one or more covered national security technologies and products;

(c) the term "covered national security technologies and products" means sensitive technologies and products in the semiconductors and microelectronics, quantum information technologies, and artificial intelligence sectors that are critical for the military, intelligence, surveillance, or cyber-enabled capabilities of a country of concern, as determined by the Secretary in consultation with the Secretary of Commerce and, as appropriate, the heads of other relevant agencies. Where applicable, "covered national security technologies and products" may be limited by reference to certain end-uses of those technologies or products;

(d) the term "entity" means a partnership, association, trust, joint venture, corporation, group, subgroup, or other organization;

(e) the term "person of a country of concern" means:

(i) any individual that is not a United States person and is a citizen or permanent resident of a country of concern;

(ii) any entity organized under the laws of a country of concern or with a principal place of business in a country of concern;

(iii) the government of each country of concern, including any political subdivision, political party, agency, or instrumentality thereof, or any person owned, controlled, or directed by, or acting for or on behalf of the government of such country of concern; or

(iv) any entity owned by a person identified in subsections (e)(i) through (e)(iii) of this section;

(f) the term "person" means an individual or entity;

(g) the term "relevant agencies" includes the Departments of State, Defense, Justice, Commerce, Energy, and Homeland Security, the Office of the United States Trade Representative, the Office of Science and Technology Policy, the Office of the Director of National Intelligence, the Office of the National Cyber Director, and any other department, agency, or office the Secretary determines appropriate; and

(h) the term "United States person" means any United States citizen, lawful permanent resident, entity organized under the laws of the United States or any jurisdiction within the United States, including any foreign branches of any such entity, and any person in the United States.

Sec. 10. General Provisions. (a) The Secretary is authorized to take such actions and to employ all powers granted to the President by IEEPA as may be necessary to carry out the purposes of this order, including to:

(i) promulgate rules and regulations, including elaborating upon the definitions contained in section 9 of this order for purposes of the regulations issued under this order and further prescribing definitions of other terms as necessary to implement this order;

(ii) investigate and make requests for information relative to notifiable or prohibited transactions from parties to such transactions or other relevant persons at any time, including through the use of civil administrative subpoenas as appropriate;

(iii) nullify, void, or otherwise compel the divestment of any prohibited transaction entered into after the effective date of the regulations issued under this order; and

(iv) refer potential criminal violations of this order or the regulations issued under this order to the Attorney General.

(b) Notwithstanding any other provision of this order, the Secretary is authorized to exempt from applicable prohibitions or notification requirements any transaction or transactions determined by the Secretary, in consultation with the heads of relevant agencies, as appropriate, to be in the national interest of the United States.

(c) To the extent consistent with applicable law, the Secretary may redelegate any functions authorized hereunder within the Department of the Treasury. All agencies of the United States Government shall take all appropriate measures within their authority to carry out the provisions of this order.

(d) If any provision of this order, or the application of any provision of this order to any person or circumstance, is held to be invalid, the remainder of this order and its application to any other person or circumstance shall not be affected thereby.

(e) Nothing in this order shall be construed to impair or otherwise affect:

(i) the authority granted by law to an executive department or agency, or the head thereof; or

(ii) the functions of the Director of the Office of Management and Budget relating to budgetary, administrative, or legislative proposals.

(f) This order shall be implemented consistent with applicable law and subject to the availability of appropriations.

(g) This order is not intended to, and does not, create any right or benefit, substantive or procedural, enforceable at law or in equity by any party against the United States, its departments, agencies, or entities, its officers, employees, or agents, or any other person.

JOSEPH R. BIDEN JR.

THE WHITE HOUSE,
August 9, 2023.

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Annex

The People's Republic of China
The Special Administrative Region of Hong Kong
The Special Administrative Region of Macau

EXHIBIT 205

The CCP's United Front Fentanyl Operation Against the United States

Jacqueline Deal, PhD

October 14, 2024

Americans are accustomed to viewing military threats as separate and distinct from organized crime. The U.S. Department of Defense handles military threats; law enforcement deals with crime. Perhaps this is why successive administrations have had such trouble grappling with the idea that the Chinese Communist Party (CCP) deliberately subsidizes fentanyl precursor exports as a form of asymmetric warfare.[1] Judge by the results: the People's Republic of China (PRC) gets stronger while the United States grows weaker. As fentanyl disables and depletes the U.S. population, particularly the military-aged segment,[2] the proceeds from trafficking can be reinvested back into the CCP and its military,[3] the People's Liberation Army (PLA). From the party's perspective, U.S. addiction and death could well be a win-win, softening the United States ahead of a war that Beijing will be increasingly ready to launch in the coming years. If this hypothesis is correct, engagement will not work. Dialogue will not work. Only by imposing costs on the PRC, the "ultimate geographic source" of illicit fentanyl,[4] will the United States stem the tide.

Americans are not used to facing asymmetric, gray-zone threats, but for the CCP, "united front work" – that is, sub-conventional operations designed to infiltrate, co-opt, and subvert target populations while pretending to cooperate with them[5] – are key to securing an advantage and

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[1] On the CCP's subsidies, see "Select Committee Unveils Findings into CCP's Role in American Fentanyl Epidemic - REPORT & HEARING," April 16, 2024, https://selectcommitteeontheccp.house.gov/media/press-releases/select-committee-unveils-findings-ccps-role-american-fentanyl-epidemic-report.

[2] Kelsey Baker, "'You Can't Fix the Problem If You're in Denial:' The Military's Surge of Fentanyl Overdoses," Military.com, 17 Feb. 2023, https://www.military.com/daily-news/2023/02/17/you-cant-fix-problem-if-youre-denial-militarys-surge-of-fentanyl-overdoses.html; Meryl Kornfield, Kyle Rempfer, and Steven Rich, Fentanyl Has Taken a Record Toll on the Army. Families Demand Answers, *Washington Post*, June 12, 2023, https://www.washingtonpost.com/national-security/2023/06/12/fentanyl-overdoses-military-fort-bragg/.

[3] One estimate is that the revenue from the sale of the chemicals themselves, about $10 million per year, is dwarfed by the billions in proceeds from money-laundering for the cartels in which the CCP is complicit. Ben Westoff, "Chinese Launder Billion in Fentanyl Profits," June 19, 2024, https://benwesthoff.substack.com/p/chinese-launder-billions-in-fentanyl, cites https://gfintegrity.org/report/made-in-china/.

[4] "Select Committee Unveils Findings."

[5] Anne-Marie Brady, "Magic Weapons: China's Political Influence Activities under Xi Jinping," Wilson Center, September 2017, https://www.wilsoncenter.org/article/magic-weapons-chinas-political-influence-activities-under-xi-jinping; Alexander Bowe, "China's Overseas United Front Work Background and Implications for the United States," U.S.-China Economic and Security Review Commission, August 24, 2018, https://www.uscc.gov/research/chinas-overseas-united-front-work-background-and-implications-united-states; Alex Joske, "The Party Speaks for You: Foreign Interference and the Chinese Communist Party's United Front System", Australian Strategic Policy Institute, 2020, https://www.aspi.org.au/report/party-speaks-you; Alex Joske, *Spies and Lies* (San Francisco: Hardie Grant, 2022).

ensuring victory before military hostilities break out in earnest.[6] For this reason, from Mao Zedong to Xi Jinping, CCP chairmen have called the united front their first "magic weapon," ahead even of the PLA, the party's military. And from the beginning, the CCP's participation in fentanyl production has been tied to its united front strategy against the United States and the broader West.

A united front operation in 1976 enabled the PRC to enter the global pharmaceutical market and learn to synthesize fentanyl precursors. In that year Paul Janssen, the inventor of fentanyl and head of the Belgian pharmaceutical company Janssen, traveled to China and met the physician George Hatem, who convinced him to open the first Western drug manufacturing facility in the PRC. Hatem, an American, had been recruited by the CCP in the 1930s. As the united front scholar Anne-Marie Brady explains, he was living in Shanghai and literally starving before being invited by the CCP to attend to their medical needs at their base in Yan'an.[7] By the 1970s, Hatem was a CCP "bridge builder" or "friendship ambassador" to the West,[8] tasked with cultivating foreign targets on the party's behalf.

Hatem's outreach to Janssen resulted in the joint venture Xian-Janssen Pharmaceuticals, known in the PRC as "the Whampoa" of the Chinese pharmaceutical industry.[9] This reference underscores Xian-Janssen's connection to the united front, as Whampoa was the Chinese Nationalist Party's military academy that the CCP infiltrated as part of its first "United Front" (as the agreement between the two parties was formally known) with the Nationalists in the mid-1920s. Under the terms of this CCP-Nationalist United Front, Chinese Communists were supposed to shed their affiliation with the CCP and become Nationalists. Instead, Whampoa became the birthplace of the PLA, as the CCP secretly used its access to the academy to learn military skills and recruit Nationalist cadets to its own side.[10] When the United Front ended in 1927, these secret recruits mutinied against the Nationalists and founded the PLA.

If Xian-Janssen, launched in 1985, was the Whampoa of the PRC's pharmaceutical industry, this means that from the start, the CCP intended to use it as a training ground to acquire skills that would eventually be turned on its Western benefactors. It is not clear when Xian-Janssen began

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[6] Jacqueline Deal and Eleanor Harvey, "CCP Weapons of Mass Persuasion," Andrew W. Marshall Foundation, December 20, 2022, https://www.andrewwmarshallfoundation.org/library/ccp-weapons-of-mass-persuasion/.

[7] Anne-Marie Brady, *Making the Foreign Serve China: Managing Foreigners in the People's Republic* (Lanham, MD: Routledge, 2003), pp. 44-45, 48, 62, and 101. Brady explains that Hatem accompanied Edgar Snow on his trip to Yan'an that resulted in the publication of his pro-CCP book *Red Star Over China*, perhaps the most effective piece of propaganda ever written; joined the party in the 1940s; and in 1950 became the first foreigner to obtain permanent legal residence in the PRC.

[8] Brady, 194.

[9] Zhang Jing, "The Disappearance of Xi'an Janssen," China Business Network, September 20, 2023, https://business.sohu.com/a/722131321_115362.

[10] Gao Wenqian, *Zhou Enlai: The Last Perfect Revolutionary*, trans. Peter Rand and Lawrence R. Sullivan (New York: Public Affairs, 2007), p. 51.

producing fentanyl, which Paul Janssen had invented in 1959, but Xian-Janssen's original charter provided for the production of antifungals, antiparasitics, and anesthetics,[11] so fentanyl was likely included. At a minimum, Chinese sources confirm that when Janssen's fentanyl patch Duragesic was introduced in the PRC in 1999, it was produced in the country.[12]

The PRC thus originally acquired the ability to produce fentanyl precursors from a united front operation. Shortly after Xian-Janssen was founded, the then-scholar (and current CCP Politburo Standing Committee member) Wang Huning traveled to the United States where he observed, among other things, the Reagan Administration's war on drugs. "The ability to curb and curtail the proliferation of drugs is a test of the social institutions and even of the moral spirit," he wrote in his book about the trip, *America Against America*.[13] "We [in China] are well aware of the harmful effects that drug use can have on a nation," Wang concluded, referring to Chinese experience with opium in the 19th century, the harm from which he says the PRC continues to suffer.[14] For Wang, drugs were connected both to contemporary American spiritual dissolution and to the fall of the last Chinese empire. This is because, as the CCP expert Matthew Johnson observes, Wang's thought is distinguished by his focus on culture as an "independent factor in determining political outcomes."[15] Just as opium contributed to the Qing's decline, Wang could easily see American drug addiction as a symptom of, and tool for ensuring, the PRC's ascent.

Wang is now one of the seven most powerful men in the PRC. He is considered Xi Jinping's "éminence grise" or the power behind the throne.[16] During Xi's tenure "the CCP has fueled America's fentanyl crisis" according to the U.S. House of Representatives CCP Select Committee.[17] And yet, the U.S. government has responded not by penalizing Beijing but by

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[11] JANSSEN/CHINA JOINT VENTURE PRODUCTION WILL FOCUS ON ANTIFUNGALS, Pink Sheet, April 29, 1985, https://pink.citeline.com/PS008242/JANSSENCHINA-JOINT-VENTURE-PRODUCTION-WILL-FOCUS-ON-ANTIFUNGALS.

[12] 新京报 [Beijing News], 《西安杨森发力止痛药市场》 ["Xian Janssen Focuses on the Painkiller Market,"] Sina, December 11, 2003, https://finance.sina.cn/sa/2003-12-11/detail-ikkntiak7834070.d.html; Fejoy, 《西安杨森回应芬太尼止痛药可能致死》 ["Xian Janssen Responds to Fentanyl Painkillers that May Cause Death"], 丁香园 [Dingxiangyuan Community], December 27, 2007, https://www.dxy.cn/bbs/newweb/pc/post/11576647.

[13] Wang Huning, *America Against America* (Shanghai: Shanghai Literature and Art Publishing House, 1991), anonymous translation (Middletown, DE: 2022).

[14] Ibid.

[15] Matthew Johnson, Introduction to Wang Huning, "Cultural Expansion and Cultural Sovereignty," David Ownby, Reading the Chinese Dream, https://www.readingthechinadream.com/wang-huning-ldquocultural-expansion-and-cultural-sovereignty.html.

[16] N.S. Lyons, "The Triumph and Terror of Wang Huning," *Palladium*, October 11, 2021, https://www.palladiummag.com/2021/10/11/the-triumph-and-terror-of-wang-huning/.

[17] The Select Committee on the Strategic Competition Between the United States and the Chinese Communist Party, "The CCP's Role in the Fentanyl Crisis," https://selectcommitteeontheccp.house.gov/sites/evo-subsites/selectcommitteeontheccp.house.gov/files/evo-media-document/The%20CCP's%20Role%20in%20the%20Fentanyl%20Crisis%204.16.24%20(1).pdf, p. 8.

rewarding it, pursuing dialogue that for all intents and purposes absolves the CCP of responsibility while dignifying it with a seat at the table. If the CCP believes that the United States is suffering from cultural and moral decay, of which American vulnerability to Chinese-sponsored drugs is an indicator, how does supplication do anything to refute this notion? If the United States were being targeted by PLA assassins, would the response be to request talks, or to defend the homeland?

The proposed trade action has the virtue of bringing U.S. strengths to bear to impose costs on Beijing and thereby protect the American people. The PRC depends more on its trade with the United States than the United States depends on its trade with the PRC. Further, Beijing still cares about its international reputation and seeks to be known as a rule-follower. The CCP can therefore ill afford to flout well-founded American legal initiatives. Unless and until the CCP-produced precursors stop flowing, the PRC will have to contribute to a fund to compensate victims and fortify the United States against further coercion.

The real danger would be to continue to pursue talks instead of justice. If the U.S. government fails to defend the American people from the fentanyl scourge, more lives will be lost and the CCP will be emboldened to escalate its aggression.