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Prehearing statement submitted to the U.S. International Trade Commission Investigation No. 332-591

July 8, 2022

Section 232 measures on imported aluminum are playing a vital role in the recent recovery in the U.S. aluminum industry. After decades of decline amid a mounting overcapacity crisis in global aluminum markets, the result of state-led policies driving overinvestment in foreign production, these measures have largely stabilized the U.S. industry and enabled it to begin to regain footing, to achieve economic margins to remain financially viable, and to restore market expectations that encourage reinvestment and expansion in the industry. Absent other feasible policy options to address the glaring market failures in global aluminum trade, U.S. aluminum production remains at risk of being swallowed up by foreign producers. In fact, as discussed below, due to the current energy crisis and the relatively low duty rates, the U.S. aluminum industry remains highly vulnerable to renewed injury. The Section 232 program saved the industry from disappearing entirely, but more needs to be done shore-up U.S. production and supply chains.

The analysis presented in this testimony shows that these tariffs are working to resuscitate America's aluminum industrial base and to elicit critical new investments. Moreover, my analysis shows that the tariffs had helped to initially achieve these goals but the industry is still in a precarious position and continues to be in danger of broader shutdowns. As these initial gains were made they were achieved without meaningful or statistically measurable adverse impacts on broader prices in aluminum-using industries or consumer prices more generally.[i] I first briefly summarize my main points here, followed by further details elaborating each point in the remainder of this testimony.

1. Sec. 232 measures prioritize national security concerns over economic efficiency and consumer welfare goals. There is no question that the ongoing economic viability of U.S. aluminum production is at threat under conditions of global supply gluts and spiking energy prices. Aluminum is essential for national defense and critical to the orderly operation of the broader economy, including for use in aerospace and energy, transportation, and communications infrastructure systems. All require aluminum, and a dwindling U.S. production capacity poses a high risk for dire supply disruptions. Between 2010 and 2017, 18 of 23 domestic U.S. aluminum smelters shut down production. Recently, there has been only one operating U.S. smelter capable of producing high-purity aluminum required for military and aerospace applications—and it is the only one in a NATO country (the other comparable smelters are located in China, Russia, and the United Arab Emirates). Due to surges in energy costs caused by the Russian invasion of Ukraine, this plant has been forced to temporarily idle production for the next 9-12 months until the energy market stabilizes.[ii]

The continued relief provided by the tariffs, however, create an environment that will allow for the plant's restart when energy prices return to more normal levels. At present, there are 6 U.S. plants capable of producing 1.4 MMT annually. This capacity, however, is under continued pressure due to recent surge in energy costs and subsequent softening in global LME pricing. Under these financial pressures, it is likely producers will idle some of this capacity temporarily in the near term. Without Sec. 232 measures, the entire U.S. aluminum industry would be in jeopardy—as was the case in 2016, when all the remaining smelters in the industry were slated for closure.

The Russian invasion of Ukraine and growing tensions across the Taiwan straits underscore the security imperatives for policymakers to weigh in evaluating Sec. 232 aluminum measures. But a vibrant aluminum industry will also be essential for developing and deploying new technologies need to green the economy and address the nontraditional security risks created by climate change. Increasing temperatures; changing precipitation patterns; and more frequent, intense, and unpredictable extreme weather are exacerbating existing risks and creating new security challenges for U.S. interests, according to the Department of Defense.[iii] Climate change is literally reshaping the geostrategic, operational, and tactical environments with significant implications for U.S. national security. Retaining capacity for aluminum manufacturing in the United States, where production is significantly greener than in places like China and India, would appear to be important to advance U.S. environmental goals as well as national and economic security goals.

Dwindling U.S. aluminum capacity also poses a risk to broader economic security, should defense needs crowd out nondefense uses and disrupt production chains in other sectors essential to economic activity and governance, such as power transmission and transportation systems, manufacturing machinery, and construction. In fact, with a vast portion of the European aluminum industry is shutting down due to the energy crisis there and no new capacity additions are slated in Canada. The ability to near-shore and friend-shore critical aluminum supply chains is difficult at best, making the continued viability of the U.S. aluminum industry all the more critical. The only significant capacity expansion globally have been in non-NATO countries, leaving the U.S. aluminum supply chain highly vulnerable.

2. In the absence of a multilateral resolution to global aluminum market distortions or a comprehensive industrial strategy, chronic global overcapacity in aluminum risks driving U.S. industry toward economic unviability. Amounting to just 1% of global aluminum capacity in 2021, global overcapacity has withered the U.S. aluminum industry to the bone, as shown in **Table 1**. Sec. 232 tariffs and quotas—in combination with other trade enforcement measures against anti-competitive practices—are working to reverse that trend of long-term decline under pressures from subsidized foreign content. From 2013 to 2017, U.S. aluminum production fell 62% and the industry lost 33% of its production capacity; at the same time, China's aluminum industry added more than 15 MMT in capacity—an expansion of 51% that brought it from 49% to 57% of the world market by 2017.

The global excess capacity crisis began when China directed massive subsidies toward a significant expansion of its aluminum industry. Due to the economics of highly capital-intensive industries that require large economies of scale in production (Hersh and Scott 2021), China's moves forced other nations to follow suit, taking actions to support their own aluminum production in order to counter the adverse effects of China's expansion. Chinese primary aluminum production capacity increased more than 1,400% from 2000 to 2017 and is responsible for 83% of the total increase in global aluminum production capacity in this time.[iv]

China's growth in aluminum production has been fueled both by massive subsidization delivered through concessional financing, tax and environmental regulatory forbearance, and access to key inputs like bauxite ore and electricity at below-market prices.[v] Additionally, Chinese trade measures restricting the export of primary aluminum and subsidizing semi-finished processed aluminum products with WTO-prohibited export tax rebates are succeeding in capturing a growing global market share of both the primary and secondary aluminum market, as well as advantaging other aluminum-consuming goods produced in China.[vi]

Though the largest offender, China is not alone in delivering subsidies that distort the global aluminum market. As the Chinese capacity mushroomed, primary aluminum producers in other regions, such as India and the Persian Gulf states, also expanded capacity with similar types of government supports, by 7.3 million metric tons from 2008 to 2021. This is an increase of over 200% over that period. .[vii] According to the Organisation for Economic Co-operation and Development (OECD), "[g]overnment interventions appear widespread all along the aluminum value chain," including subsidization valued at between $20 billion and $70 billion during 2013–2017.[viii] In addition to China, the OECD identified India, Russia, and Middle East producers as providing significant subsidies to support their primary aluminum industries. Unsurprisingly, capacity and production expansions have occurred primarily in the subsidizing countries.

The continued expansion and maintenance of excess capacity both inside and outside of China suppressed global aluminum prices, transmitting injury directly to domestic aluminum producers in the United States. Aluminum is a global commodity, and prices are primarily driven by total global supply and demand and set on the London Metal Exchange (LME), regardless of where the aluminum is produced, sold, or stored. Thus, even if the United States does not experience direct changes in aluminum imports, the U.S. aluminum market effectively imports the adverse price and volume effects of subsidized production and surplus global capacity through changes in LME aluminum prices. Collapsing prices have decimated U.S. primary aluminum production, capacity, and employment. The LME market price of aluminum fell 39% between 2007 and 2016. In an industry with high fixed costs, most domestic producers were unable to weather this long-term sustained price collapse.

Surplus capacity puts downward pressure on prices for aluminum products, squeezing producer profit margins to an extent that threatens the ability of firms to service debts; to invest in research and development in more advanced products and cleaner production technology; to maintain workers' jobs, compensation, and retiree pensions; and even to remain financially solvent. Businesses incur both fixed costs and variable costs in aluminum production. Variable costs change with the quantity a firm produces, whereas fixed costs must be incurred no matter how much a firm produces. For example, in the case of aluminum, variable costs include the cost of material inputs like carbon, alumina, pitch, as well as electricity and compensation for workers. However, capital-intensive industries like aluminum face enormous fixed costs for investments in production facilities and equipment that dominate total costs of production.

But following the Sec. 232 measures in the first quarter of 2018, until the COVID-19 recession in 2020, U.S. production expanded by 34%, although the overall capacity of the industry fell by 2%, or just shy of 1 MMT. The fact that output is expanding while aggregate capacity is shrinking indicates that some U.S. aluminum producers have been able to operate at higher capacity utilization rates necessary to make investments in new and re-opening production facilities economically viable, though market conditions—amid ongoing global state-driven capacity growth, demand uncertainty, and spiking energy prices—are insufficient to sustain net new capacity investments.

In the global picture, Chinese production plateaued from 2017 through 2020 as Chinese producers began curbing domestic investments and seeking foreign direct investments in third countries as platforms to evade Sec. 232 and other trade enforcement measures (Table 1), although Chinese production rebounded by 5% in 2021. Asian producers outside China and India—largely ASEAN—increased aluminum capacity by 11%. In Russia and a group of Middle Eastern countries—Bahrain, Oman, Qatar, and Saudi Arabia—state-policies and energy subsidies that distort producer costs and socialize the negative externalities from dirty energy-intensive development efforts fueled capacity expansion of 4% and 14%, respectively, from 2017 to 2020.

Unsurprisingly, capacity and production expansions in the subsidizing countries are leading the global industry in the pandemic recovery (and prior to the Ukraine invasion). Table 1 shows that Chinese (2%), Russian (3%), Middle Eastern (1%), and other Asian producers (4%) continued adding aluminum capacity apace in 2021. U.S. output fell 10 percent over the prior year and the industry added no net new capacity. Sec. 232 and other trade enforcement measures are still plugging the dyke, but behind the dam a deluge of global surplus capacity is mounting. The dam is leaky, including because of nearly 22,000 exclusions from Sec. 232 measures that the Department of Commerce has granted to importers of aluminum products, amounting to 19.7 MMT annually. Whittling away at the program with such excessive product exclusions destroys downstream demand for U.S. primary aluminum and undermines the effectiveness of the policy. Despite these headwinds, the Sec. 232 measures have supported an overall increase in output: on average U.S. industry produced 976 MMT on an annualized basis following the Sec. 232 measures, compared with 873 MMT in the two years preceding the measures.

3. Section 232 measures stabilized the industry and afforded aluminum producers the financial breathing space to start rebuilding investment and jobs.

Aluminum industry projects, investments, jobs, and capacity are on the rise in the United States since the initiation of the Section 232 tariffs.[ix] In the two years after the March 2018 implementation of the Section 232 aluminum import measures to the February 2020 business cycle peak, U.S. production of primary aluminum increased by 37.6% compared with the preceding two-year period. This increase was a result of restarts or production increases at five of the six remaining smelters. Domestic aluminum production reached 1.14 million metric tons at an annualized rate before the COVID-19 economic shock took hold, up from 741,000 metric tons in 2017. Shipments in all segments of the market increased significantly, including rods and bars, up more than 54 million pounds (5.3%); pipes and tubes, up more than 19 million pounds (2.3%); and other extruded shapes, up nearly 208 million pounds (2.4%) from the onset of Sec. 232 measures to the Great Lockdown.[x] These gains are currently at risk from the Russian invasion of Ukraine and the resulting spike in energy costs. These financial pressures make the margins provided by Sec. 232 measures essential to supporting the restarting of smelter production when energy costs normalize.

U.S. and Canadian shipments of semi-finished products, industries that are closely intertwined with primary aluminum production, also rebounded. Shipments of all extruded products increased 2.7% (281.2 million pounds), and total sheet and plate shipments increased 7% (1.2 billion pounds) relative to the preceding two-year period. Before the pandemic shock, employment in primary and downstream aluminum industries increased by 1,200 on net, inclusive of 5,570 jobs and $6.4 billion investment created by restarted and newly expanded primary aluminum production and secondary rolling and extrusion mills. Similarly, U.S. producers of downstream semi-finished aluminum invested in restarts or expanded capacity at 55 facilities, projected to create 4,475 new jobs, with a capital investment of $6 billion.

Overall, U.S. production in the primary and secondary industries increased by 16.3% through December 2018.[xi] In the following year, production waned with relaxation of the Section 232 import measures, but by December 2019 U.S. output remained more than 6% above the level prior to implementation of Section 232. In contrast, U.S. production of nonferrous metals other than aluminum declined by 2.5% over the same time, offering a parallel case without the support of Section 232 measures against which to compare effects on the U.S. aluminum industry. Yet even with the demand surge caused by households shifting consumption from services to goods and improving household balances, U.S. aluminum production is straining to lift-off. At this margin, Sec. 232 measures have played a pivotal role in preventing aluminum shutdowns and providing a basis for modest reinvestment. But the U.S. aluminum industry's future course remains in precarious shape and withdrawal of the these measures could be the last straw, with all of the security implications that entails.

4. The Sec. 232 tariffs have had no economically significant impact on prices for the leading aluminum-using industries or consumer price inflation more broadly.

The resurgence of the U.S. aluminum industry with minimal apparent knock-on effects in other parts of the economy belies the claims of Sec. 232 opponents. It is important for the Commission to consider the potential impacts on downstream aluminum-using industries and broader consumer welfare. I present here results of econometric analysis that tests the existence of a causal relationships between the price for aluminum inputs and prices in leading downstream aluminum-using industrial and commercial goods with the highest aluminum content. The analysis employs standard, related, and time-tested econometric techniques known as Granger causality analysis, a method developed by Nobel Prize-winning economists Robert Engle and Clive Granger.[xii] This tests for evidence of a statistically causal relationship between the variables in the model. If past values of variable 1 are shown to (statistically) significantly predict current values of variable 2, then it can be concluded that variable 1 "Granger-causes" variable 2.

Table 2 summarizes the key results.[xiii] Each row of the table presents results of separately estimated models relating the price of an aluminum-containing product with the price of primary aluminum input(s) and reports the causal effect found on end-use product prices. The end-use products investigated represent the U.S. industries consuming the largest volume of aluminum products, as a share of overall value-added in the industry.

For most items, using the most aluminum content, there is zero significant causal impact of primary and secondary aluminum prices on the prices of intermediate and end-user goods. Unsurprisingly, the beverage industry is a leading user of aluminum, amounting to 10% of the overall value chain. But the increased prices consumers may be paying for beverages is not due to aluminum prices. The Granger test results show that aluminum prices have no significant (measurable) impact on the prices of beverage manufacturing, beverage and beverage materials production, canned beer and ale case goods, aluminum cans or parts of aluminum cans. Similarly, aluminum content makes up 6% of the value-added in the architectural and structural metals industry and 4% of the value-added in certain kitchen utensils. But aluminum prices show no evidence of a causal relationship with prices of either aluminum-using goods.

While there is some evidence of a causal relationship between aluminum prices and two other aluminum-using industries—commercial furniture and motor vehicle parts, where aluminum amounts to 3% and 1% respectively of industry value-added, the scale of the effect of aluminum prices on downstream prices is so small as to be negligible to overall price levels. The econometric results indicate that a 1% increase in aluminum prices could be expected to cause a 0.07% increase in the price of both commercial furniture and motor vehicle parts. Finally, to assess the potential impacts on other downstream aluminum users, I test the causal relationship between primary aluminum prices and secondary aluminum products, often an intermediate step in production between smelting and final goods. The evidence here also indicates no statistically observable effect on downstream prices from changes to aluminum prices.

These results, therefore, suggest that even if Sec. 232 measures caused an increase in the price of aluminum products, one would not expect it to result in a meaningful change of prices for these downstream goods—certainly not on a scale that could cause or could unwind the current spark of general price inflation. Sec. 232 measures simply did not have a meaningful, real-world impact on prices for aluminum-intensive products. This fact should not be surprising. Even in the industries that consume the largest volumes of aluminum products, aluminum is just one cost in a long list of inputs to production. 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.

That Sec. 232 measures had such negligible impact on downstream sectors should not be surprising. First, aluminum is an intermediate industrial input, but even in the most aluminum-intensive industries it amounts to a small fraction of costs in the longer production value chains. Second, following Sec. 232 implementation, Chinese policymakers depreciated their currency 15 percent, making all their exports to the United States cheaper in dollar terms, and blunting the impact of tariffs on U.S. imports. Third, the measures themselves proved porous, with the Department of Commerce granting nearly 22,000 exclusions to U.S. aluminum importers, equivalent to nearly 20 MT per year.

Shifting overall consumption from services into goods since the start of the pandemic shows that any such statistically noticeable price changes did not dampen consumer enthusiasm for buying goods. But it also demonstrates that neither was the current bout of high inflation caused by Sec. 232 tariffs, nor would eliminating them have any meaningful impact on dampening or even offsetting current inflation. On the high end, one could expect a one-time nominal price decrease of 0.2% as a result of eliminating all tariffs—not just the Sec. 232 and Sec. 301 tariffs—right now. On the low end, one might expect no noticeable change in overall prices from eliminating tariffs, as any gains from change will be swallowed up disproportionately by corporate profits given the extent of concentrated market power in global supply chains. But even the high end would just be a drop in the bucket: on average, every month since January 2021, nominal consumer prices have risen by more than three times as much. The impact would not be negligible on the price of things for which families are hurting most: food, housing, and gas and energy.

5. Macroeconomic outlook suggests U.S. aluminum industry will face softening demand and increased growth uncertainty provides no source of relief from the long-term overcapacity pressures. A global economic slowdown is in the works, given the war in Ukraine, economic disruptions from China's Zero-Covid policies, and the U.S. fiscal contraction and monetary tightening. Though it may do little to slow the dominant sources of inflation, the Federal Reserve's monetary policy tightening cycle will further slow the U.S. economy and cause an appreciation of the dollar, thereby making imports relatively more appealing, and U.S. exports more expensive for foreign buyers. In the economic recovery of 2021, and as markets anticipated Federal Reserve interest rate tightening, the dollar appreciated again by 12%. These exchange rate effects dwarf any tariff effects on broader price changes, but keep U.S. aluminum producers perennially on the brink of economic unviability. Rising rates and dollar appreciation, in turn, will tighten financial constraints on developing and emerging market countries, putting the squeeze on potential foreign sources of growth. All this points to depressed near-term expectations of the demand for aluminum. In a market operating on commercial terms, these conditions would induce producers to refrain from investing in net new capacity. Yet, global overcapacity is even worse exiting the pandemic and remains a material threat to the ongoing viability of U.S. aluminum production.

Conclusion

The aluminum Section 232 trade measures imposed in 2018, including both tariffs and quotas on imports from selected countries, helped slow the flood of aluminum imports and stabilize the U.S. industry, which would have otherwise disappeared. Following imposition of these measures, U.S. aluminum production, employment, capital investment, and financial investment all improved. The policy achieved these outcomes with no economically significant impacts on the prices of downstream products, as shown by statistical analysis presented here.

The tariffs—implemented in 2018—had little effect on U.S. prices; inflation only spiked after the pandemic recession began in February 2020.—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 the tariffs will have no discernible beneficial impact on inflation, though it will add uncertainty to already unstable global metals supply chains.

The U.S. aluminum industry is hanging by a thread as it emerges from the depths of the COVID-19 recession; recovery in the industry faces a steep hill to climb. The current surge in energy costs is placing greater pressure on an already vulnerable industry that has not recovered from the devastating effects of more than a decade of the worst of the excess capacity crisis. Removing these import measures will jeopardize the U.S. aluminum industry's future prospects and increase domestic dependence on unstable supply chains and higher-polluting imported aluminum, resulting in job losses, plant closures, cancellations of planned investments, and further destabilization of the U.S. manufacturing base at a time of intensifying strategic importance for good jobs, national security, and the race to green industry.

Tables and Figures

Table 1: Changes in world aluminum production and capacity by country and regions, 2013-2021

World production of primary aluminium by region (1,000 metric tons)

	2013	2014	2015	2016	2017	2018	2019	2020	2021	Percent change 2013-2017	Percent change 2017-2020	Percent change 2021
U.S.	1948	1718	1589	826	744	904	1105	993	890	-62%	34%	-10%
World total	50607	54162	57059	58986	63623	63998	63272	64743	67406	26%	2%	4%
China	24884	28315	30752	32069	36382	36317	35352	36737	38581	46%	1%	5%
Asia (excl. China & India)	5390	6338	6600	6995	6966	7173	7474	7744	8074 0	11%	4%	11%
Russia	3690	3480	3550	3711	3726	3801	3896	3928	3935	1%	5%	0%
Middle East	4271	5244	5521	5611	5561	5748	6036	6320	6496	30%	14%	3%
India	1684	1923	2355	2722	3255	3703	3650	3559	3967	93%	9%	11%
Rest of world	14129	13483	13293	14048	13956	13526	13233	13206	13537	-1%	-5%	3%

World primary aluminium production capacity by region (1,000 metric tons)

	2013	2014	2015	2016	2017	2018	2019	2020	2021	Percent change 2013-2017	Percent change 2017-2020	Percent change 2021
U.S.	2748	2578	2453	1941	1841	1803	1803	1803	1803	-33%	-2%	0%
World total	62086	67171	70832	73713	76674	75903	73778	75167	76745	23%	-2%	2%
China	29512	34427	38200	41611	44682	43770	41168	42318	43348	51%	-5%	2%
Asia (excl. China & India)	6589	7178	7389	7653	7761	7934	8423	8615	9000	18%	11%	4%
Russia	4210	3993	3833	3815	3820	3825	3955	3982	4112	-9%	4%	3%
Middle East	5088	5615	5716	5790	5898	6064	6550	6717	6777	16%	14%	1%
India	3476	3913	4144	4144	4144	4144	4144	4144	4144	19%	0%	0%
Rest of world	17051	16646	16485	16413	16289	16297	16158	16203	16561	-4%	-1%	2%

Share of world capacity

	2013	2014	2015	2016	2017	2018	2019	2020	2021
U.S.	4%	3%	3%	1%	1%	1%	2%	2%	1%
China	49%	52%	54%	54%	57%	57%	56%	57%	57%
World ex. China	51%	48%	46%	46%	43%	43%	44%	43%	43%
Russia	7%	6%	6%	6%	6%	6%	6%	6%	6%
Middle East	8%	10%	10%	10%	9%	9%	10%	10%	10%
India	3%	4%	4%	5%	5%	6%	6%	5%	6%
Rest of world	28%	25%	23%	24%	22%	21%	21%	20%	20%

Note: *Middle East includes Bahrain, Oman, Qatar, and Saudi Arabia.

Source: Economic Policy Institute analysis of CRU Group data (2022).

Table 2, Granger causality test results: Effects of aluminum prices on end-use goods prices

End-use product	k-lags	Cointegrated r	Causal relationship	Primary aluminum content	Test statistic χ^2	Probability of statistical significance	Estimated effect of 1% aluminum price increase
Beverage industry				10%			
Beverage manufacturing (PCU31213121)	1	N	N		0.96937	68%	0%
Beverages and beverage materials (WPS026)	2	N	N		0.39307	47%	0%
Canned beer and ale case goods (PCU3121203121201)	1	N	N		0.89699	66%	0%
Aluminum cans (PCU3324313324313)	1	N	N		0.65035	58%	0%
Aluminum cans and can components (WPU10310331)	1	N	N		0.857	35%	0%
Architectural and structural metals				6%			
Nonresidential construction goods (WPUIP2312001)	1	N	N		0.55779	55%	0%
Kitchen utensils				4%			
Stamped and spun kitchen utensils, aluminum (WPU12680101)	1	N	N		2.1182	85%	0%
Motor vehicle parts							
Motor vehicle body manufacturing (PCU336211336211)	2	N	**Y**	14%	**6.904**	**99%**	**0.06%**
Motor vehicles parts (WPU1412)	3	N	**Y**	1%	**24.814**	**100%**	**0.07%**
Furniture				3%			
Commercial furniture (WPU122)	1	N	**Y**		**5.245**	**98%**	**0.07%**
Office furniture (WPU122)	1	N	N		0.056	19%	0%
Industrial production							
Secondary smelting and alloying of aluminum (NAICS = 331314) (IPN331314S)	1	N	N		1.9946	84%	0%

Source: Economic Policy Institute analysis of BLS (2022) and Federal Reserve (2022) data.

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[i] This analysis, throughout, updates to the most recently available data and refers to analysis presented in the report by Adam S. Hersh and Robert E. Scott. (2021). "Aluminum producing and consuming industries have thrived under U.S. Section 232 import measures." *Economic Policy Institute*. May 25, 2021.

[ii] Sudden and significant surges in energy prices have caused the idling of production at U.S. smelters and threaten further investments. According to the U.S. Energy Information Administration (USEIA), in May 2022, the natural gas price at the Henry Hub averaged $8.14 per million British thermal units (MMBtu), compared to $2.91/MMBtu in May 2021. On June 16, 2022, the USEIA projected that the price of natural gas delivered to electric generators this summer would average $8.81/MMBtu, over double the price last summer of $3.93/MMBtu. See, USEIA. 2022. "EIA expects significant increases in wholesale electricity prices this summer." June 16, 2022.

[iii] Department of Defense. 2021. *Department of Defense Climate Risk Analysis*. October 2021. [PDF] Accessed July 1, 2022.

[iv] EPI analysis of CRU Group data (2021). See Adam S. Hersh and Robert E. Scott. (2021). "Aluminum producing and consuming industries have thrived under U.S. Section 232 import measures." *Economic Policy Institute*. May 25, 2021.

[v] World Trade Organization (WTO). 2017a. "DS519: China — Subsidies to Producers of Primary Aluminum." January 12, 2017; World Trade Organization (WTO). 2017b. "Role of Subsidies in Creating Overcapacity and Options for Addressing This Issue in the Agreement on Subsidies and Countervailing Measures." G/SCM/W/572/Rev.1, April 24, 2017.

[vi] Organisation for Economic Co-operation and Development (OECD). 2019. "Measuring Distortions in International Markets: The Aluminum Value Chain.," *OECD Trade Policy Papers No. 218*. January 2019.

[vii] Economic Policy Institute analysis of CRU Group (2022) data.

[viii] Organisation for Economic Co-operation and Development (OECD). 2019. "Measuring Distortions in International Markets: The Aluminum Value Chain.," *OECD Trade Policy Papers No. 218*. January 2019.

[ix] This includes at least 55 new and expansion projects are in downstream aluminum industries producing extruded (rod and bar, pipe and tube, and extruded shapes) and rolled (sheet and plate) products. See Adam S. Hersh and Robert E. Scott. (2021). "Aluminum producing and consuming industries have thrived under U.S. Section 232 import measures." *Economic Policy Institute*. May 25, 2021.

[x] See Adam S. Hersh and Robert E. Scott. (2021). "Aluminum producing and consuming industries have thrived under U.S. Section 232 import measures." *Economic Policy Institute*. May 25, 2021.

[xi] Economic Policy Institute analysis of Federal Reserve Board of Governors (Federal Reserve). 2021. Industrial Production and Capacity Utilization–G.17. Last updated July 1, 2021.

[xii] This method estimates a "vector autoregression" (VAR), a statistical method for modeling a system of variables and their interrelationship and co-evolution over time. In this case, I model (1) the price of primary aluminum inputs, (2) the price of aluminum-consuming products, and (3) the effective federal funds rate.

[xiii] Data and Stata code are available from the author.