



Economic and National Security Still Warrant Aluminum 232 Tariffs

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ALUMINUM★NOW

Executive Summary

The U.S. aluminum industry, the world's leading supplier just 25 years ago, produces a mere 1% of global output today.

With pricing support from tariffs, aluminum producers can position themselves to revitalize the U.S. industry, and they are doing so now with minimal impact on the prices of downstream aluminum-intensive goods.

Aluminum, a key component in the production of military goods, aircraft, spacecraft, energy systems, essential infrastructure, and a vast array of consumer goods, is a critical and irreplaceable commodity for economic and national security. Yet the U.S. aluminum industry, the world's leading supplier just 25 years ago, produces a mere 1% of global output today. Moreover, there are zero operating smelters in the United States—or in a NATO country—capable of producing the high-purity aluminum required for military applications; the only comparable sources—China, Russia, and the United Arab Emirates—are highly precarious.

In just a generation, unfair trade practices, particularly the subsidization of favored domestic enterprises by governments in China, India, nations across the Middle East and Southeast Asia, and even Canada have created a global supply glut, an alarming decline of U.S. production, and rising dependence by the United States on imported aluminum. And despite ongoing oversupply, countries continue to support a rapid expansion of aluminum capacity—particularly Chinese offshore investments in Indonesia, Angola, Saudi Arabia, and Vietnam—with the potential to overwhelm what's left of the U.S. industry.

The loss of domestic aluminum smelting capacity represents a massive market failure that leaves the U.S. economy and society at large exposed to the risk of supply chain disruptions, and the potential losses are substantial, largely uninsurable, and likely irreversible. Pricing these risks into aluminum sales on the U.S. market is a legitimate policy goal, and Section 232 (S232) tariffs on aluminum and derivative product imports serve this purpose. With pricing support from tariffs, aluminum producers can position themselves to revitalize the U.S. industry, and they are doing so now with minimal impact on the prices of downstream aluminum-intensive goods.

This report assesses how foreign-government subsidies and offshore manufacturing strategies have transformed the global aluminum landscape. It also provides an econometric assessment of the extent to which increased aluminum prices can impact the prices of downstream aluminum-consuming goods. The analysis finds:

Chinese state support for aluminum production growth has transformed the global landscape over the past generation, leading to chronic excess supply, depressed prices, and U.S. decline. China's share of global aluminum capacity surged to 56% in 2025, from just 11% in 2000. The United States, home to the world's largest aluminum industry in 2000, accounted for just 2% of world capacity in 2025. During this time, China *added* 41.7 million metric tons (MMT) of aluminum capacity—nearly 10 times that of the United States' early 2000s peak—while U.S. production fell nearly 82%.

Significant aluminum growth in other regions follows China's lead on state support. India and a range of countries across the Middle East and Southeast Asia have expanded their aluminum capacity by 583%, 491%, and 853%, respectively, since 2000. In total, these countries have added nearly 11 MMT to global aluminum supplies and captured an additional 10 percentage points of global market share.

Rapid capacity expansion from Chinese offshore investments in Indonesia, Angola, and Saudi Arabia skirts U.S. import measures. Although Chinese firms essentially stopped adding net new domestic aluminum capacity following the U.S. adoption of S232 tariffs in 2018, they are accelerating offshore direct investments in new capacity: 0.5 MMT each in Saudi Arabia and Vietnam, nearly 1 MMT in Angola, and 4.6 MMT in Indonesia. Indonesia, Vietnam, and Saudi Arabia have signed trade deals with the Trump administration, and Angola is eligible for preferential U.S. market access under the African Growth and Opportunity Act.

Subsidized Canadian aluminum undercuts U.S. industry. Support to the industry by federal and provincial governments has allowed Canadian aluminum to withstand the forces of global oversupply at the expense of the U.S. industry. Direct financial support of the industry, tax and export promotion policies, government procurement policies, zero-interest concessional credit, and subsidized electricity combine to rank Canada behind only China and Bahrain in the scale of support for their producers.

S232 aluminum tariffs are working to incentivize the U.S. aluminum industry, but coverage of the tariffs matters. When tariff coverage was curbed with more than 29,000 exclusions granted to importers along with exemptions for preferred countries, the initial resurgence of U.S. aluminum production and investment following the 2018 tariffs petered out. A strengthened approach to tariff enforcement, the elimination of exclusions and exemptions, and the extension of coverage to aluminum-containing downstream goods are working to restore pricing power, optimism, and production stability in the aluminum industry.

Downstream prices show minimal-to-no impact from higher primary aluminum prices. Econometric tests to evaluate whether and how much changes in aluminum prices cause changes in prices of leading aluminum-intensive downstream products find minimal effects from even significant changes in the price of aluminum. Six of the 11 goods tested, including beverage and beer manufacturing, wires and cables, nonresidential and residential construction goods, and commercial and office furniture, showed no significant relationship to aluminum input prices (zero effect). In those cases where there was a positive causal effect, the simulated impact of a 50% increase in aluminum prices ranged from 3% for boilers, tanks, and shipping container manufacturing at the high end to 0.3% for motor vehicle parts at the low end. These tests simulate the impact of a 50% increase on the all-in price of aluminum and thus overestimate the impact of the S232 tariffs. Because of how aluminum pricing works in the United States, the impact of the S232 tariffs is reflected only in the Midwest Premium portion of the all-in price, *i.e.*, the regional price of delivery in the United States. Even these generous estimates show a *de minimis* impact of the S232 tariffs.

0.2%

Industry analysts estimate that S232 tariffs added just \$135 to the average retail price for a new car, or 0.2% of the nearly \$50,000 price tag.

Beer and cars show consumers can afford the price for securing domestic aluminum. Industry analysts estimate that S232 tariffs added just \$135 to the average retail price for a new car, or 0.2% of the nearly \$50,000 price tag. S232 tariffs have added an estimated \$0.02 to the cost of a beer can, but since the tariffs began beer prices at the store are up more than 27%. That means a six-pack that cost \$10 in 2018 costs \$12.75 today, even though the aluminum cost is only up \$0.12. In beer, as in many other manufacturing industries, aluminum is a key input to production but a relatively minor share of the overall value chain. The total aluminum content of a typical car is only 2.8%, with additional costs from S232 tariffs amounting to just 0.3% of the average retail price. Aluminum prices are far from a leading cause of inflation in canned goods, cars, and other aluminum-intensive products.

S232 tariffs remain a critical tool for supporting U.S. aluminum rebuilding.

S232 tariffs are moving conditions toward financial feasibility for U.S. aluminum producers. Plant restarts and new investments are forthcoming, but they will not be sustained if policymakers allow the mounting pressures from subsidized foreign surplus aluminum to bury U.S. producers before this resurgence is able to take root. Policymakers should:

- ▶ Retain S232 tariffs at their current rate for all countries;
- ▶ Eliminate all exclusions and exemptions;
- ▶ Continue covering derivative products;
- ▶ Evaluate further actions as the situation evolves.

Introduction

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There are zero operating smelters in the United States—or in a NATO country—capable of producing the high-purity aluminum required for military applications.

Not all metals are created equal, and neither are all tariffs. This report focuses on the acute national security need to maintain a viable domestic aluminum industry. It finds that national security-based tariffs on aluminum and derivative products under Section 232 (S232) of the Trade Expansion Act of 1962 can work and are working to underpin revitalization of the U.S. aluminum industry. Moreover, they are doing so with minimal disruption to and increased costs for downstream industries and consumers.

Although aluminum is used widely in industrial applications and in products we use every day, in many applications there is no real substitute for aluminum. Aviation and aerospace, defense hardware, electrical systems, and other critical infrastructure all require the highest grades of aluminum. In 2023, the Department of Commerce concluded that aluminum is essential for critical infrastructure sectors, including power transmissions, transportation systems, manufacturing industries, and construction, that are central to the essential operations of the U.S. economy and government.¹ Moreover, high-quality aluminum is essential for satisfying the Department of Defense's requirements for maintaining effective military capabilities. Yet, the United States has steadily lost production capacity—through plant closures and mass layoffs—under decades of unfair trade practices and other U.S. policies that incentivized domestic deindustrialization and offshoring of manufacturing more generally.

While individual supply chain managers act rationally in seeking the lowest price on the aluminum they buy, doing so creates a macro-level market failure that exposes individual firms and U.S. society as a whole to the costly, largely uninsurable risks of aluminum supply disruptions for critical uses. Such disruptions will pose substantial if not catastrophic and irreversible costs to the United States, and those costs are not being factored into the aluminum prices a manager sees when making sourcing decisions. The resulting negative externality has produced a decades-long drain on the U.S. aluminum industry.

In 2000, the United States was the world's largest aluminum producer, with 23 smelters in operation. At present the U.S. stands at just 1% of world aluminum production and has zero operating smelters capable of producing the high-purity aluminum required for defense applications; for that, we now rely on China, Russia, and the United Arab Emirates. China's share of world production is now 59%.

Emaciated U.S. aluminum capacity also poses a risk to broader economic security: if defense needs crowd out nondefense uses and disrupt production chains in other sectors essential to economic activity and governance, the result will be rationing and shortages in areas like energy generation and transmission, telecommunications, transportation systems, manufacturing machinery, and construction. Recognizing the critical need for domestic aluminum capacity, President Trump enacted S232 tariffs on aluminum at 10% in March 2018.² A rebound in U.S. production and plant restarts and expansions followed, but the turnaround was short-lived as numerous product exclusions for importers

Emaciated U.S. aluminum capacity also poses a risk to broader economic security.

and exemptions for a range of countries undercut the efficacy of the measure. President Biden largely kept those tariffs intact, and further raised tariffs on Russian aluminum products, but he neglected to enforce the anti-surge mechanism in the new U.S.-Mexico-Canada Agreement (USMCA). As a result, Canadian imports flowed in, and the last remaining U.S. high-purity smelter closed in 2022, along with several other prominent smelters amounting to 30% of U.S. capacity.³ In February 2025, President Trump increased S232 aluminum tariffs to 25% and eliminated all exclusions and country exemptions—most significantly for Canada—while also expanding tariff coverage to more aluminum derivative products before raising the rate to 50% in June.⁴ Then, with several actions in 2026, President Trump restructured the scope of S232 tariffs to provide more favorable treatment to U.S. aluminum content in imported derivative products, while expanding the scope of covered derivative goods.⁵

Once again, policy and economic conditions are aligning to support a recasting of the U.S. primary aluminum industry. With help from a Department of Energy clean energy demonstrations grant of up to \$500 million and greenfield international co-investment, a new primary aluminum smelter is slated to break ground this year in Inola, OK. It will be the first new U.S. aluminum smelter since 1980, with a planned capacity of 750,000 metric tons—that would more than double current U.S. production⁶—and it will finally re-shore U.S. capacity to produce the high-purity aluminum necessary for critical defense and economic infrastructure needs in significant commercial quantities. But for such an investment to succeed, policies need to align on a number of dimensions in order to create the economic space to recast the U.S. aluminum industry. This will not be a simple task, for, as discussed below, success will mean keeping operating capacity at or above 80%, a high hurdle in an industry where subsidies and overinvestment are flooding the world with surplus production and keeping downward pressure on prices.

Indeed, a new surge of aluminum capacity from Chinese offshore investments in Indonesia, Angola, Saudi Arabia, and Vietnam threatens to bury U.S. producers in global aluminum surpluses. Against this challenge, S232 tariffs are more important than ever, and the research reported here shows that they are working to give more pricing power to U.S. aluminum manufacturers and having only negligible impacts on prices for downstream industries and consumers. To be certain, given aluminum's ubiquity across supply chains, it is only natural that price increases at the start of the chain will move down the line. However, even in the most aluminum-intensive products, the share of aluminum in the overall supply chain is a tiny fraction of the overall costs. As a result, even a sizable movement of prices in a primary input like aluminum can have minimal downstream effects.

This report presents the results of econometric analysis to evaluate the extent to which changes in the price of aluminum cause changes in the prices of downstream, aluminum-intensive goods. Unless otherwise noted, "aluminum" will refer to the primary aluminum in most dire scarcity in domestic production—not "secondary" aluminum produced by re-melting primary with aluminum scrap, or the range of semi-finished, rolled, extruded, and shaped aluminum products that serve

in an intermediate capacity between aluminum production and use of aluminum in downstream manufacturing.

These econometric tests find either no evidence of a statistically significant causal relationship between aluminum prices and prices of downstream products—beverage and beer manufacturing, electrical wiring, residential and nonresidential construction materials, and furniture—or a statistically significant but economically trivial effect (canned beer, motor vehicle parts, and boiler tanks). The case of beer puts “economically trivial” in context. Since S232 tariffs began in 2018, beer prices (at the store) rose more than 27%, so that a six-pack that cost \$10 in 2018 costs \$12.75 in 2026. But the increased aluminum cost from tariffs is approximately 2 cents per can, or \$0.12 of the extra \$2.75. Clearly, factors other than aluminum costs are driving beer inflation as well as inflation in other downstream goods and the broader economy. Not only can we afford to pay this cost, given the systemic risks of a disruption to aluminum supply we can’t afford not to.

This report begins by establishing the unique production economics of highly capital-intensive industries like primary aluminum, where huge facilities need to run at or near full capacity to realize economies of scale and a positive return on investment. Next, the report surveys the transformation of the global aluminum production landscape since 2000 under subsidy-driven policies in China, India, the Middle East, and Southeast Asia, which have flooded the world with excess supply, keeping prices and U.S. capacity utilization depressed. In the context of this global onslaught, Canadian production presents a particularly important challenge to relaunching the U.S. industry at sustainable levels of capacity utilization. Finally, we evaluate the key question of how S232 tariffs may be impacting prices of aluminum-intensive downstream goods. Despite generous thresholds for statistical significance and robustness checks, the answer is slim-to-no effect.

S232 aluminum tariffs are not like other tariffs unfolding in the second Trump administration. These national security-based tariffs are working to create the economic space for aluminum producers to compete in the global landscape with minimal impact on downstream industries. They should be continued, with no exclusions or exemptions, and cover downstream products with foreign aluminum content.

The Economics of Aluminum Production

Businesses in industries like aluminum operate on a set of economic rules different from those applied in other enterprises. A typical business incurs both variable costs, which change with the quantity a firm produces, and fixed costs, which the firm must incur no matter how much it produces. Aluminum stands out for its high degree of fixed costs—primarily those of building and maintaining a smelter—relative to the much smaller variable costs of labor, materials, and other inputs.

High capital intensity and fixed costs in aluminum production have several economic consequences shaping incentives and constraints for producers. Most importantly, it is almost always desirable to operate at or near full capacity in order to minimize the average cost of production. Producers also experience increasing returns to scale, meaning that the more aluminum produced, the more efficient it is to produce more aluminum. As such, the minimum efficient scale needed to compete is big enough to comprise a nontrivial addition to global capacity.⁷ But once production is humming along, finding consistent demand for the output is not easy. For producers in most countries, production exceeds what can be consumed in domestic markets, and the excess must be disposed of through exports—either of aluminum directly or of aluminum-intensive derivative products.

In aluminum, then, the market mechanism of price competition and creative destruction—where firms that can't compete exit the market—does not work well to self-regulate excess capacity. On top of that, many foreign governments maintain policies and create barriers to prevent the closure or contraction of primary metals manufacturing capacity while subsidizing expansions.⁸ As a result, individual producers are incentivized to build big and run at full tilt, no matter the global market conditions. When all producers follow the same logic, the effect in aggregate is chronic overcapacity that drives down prices and makes it hard for a potential new entrant or unsubsidized business to justify the substantial capital outlays required to produce aluminum.

Of course, individual firms in aluminum-consuming industries care little about where their aluminum comes from, so long as it gets there at the lowest possible price. But this micro-rational individualistic approach creates a critical market coordination failure at the macro level. The low aluminum price importers pay does not internalize the risk of uninsurable social costs that we will bear from potential disruptions to aluminum supply chains. This is the unpaid price for access to a U.S. supply of aluminum that policymakers must work to internalize by giving more structure to the market.

In order to maintain the viability of national aluminum industries in the face of economic incentives that promote global surplus capacity, many countries have turned to policy supports designed to maintain and expand aluminum production on noncommercial terms or terms that are otherwise impermissible under

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international trade rules like the World Trade Organization (WTO)'s Agreement on Subsidies and Countervailing Measures. The Commerce Department, the U.S. International Trade Commission (ITC), and the WTO regularly find such measures do significant material harm to U.S. producers that operate on commercial terms. At the time of the 2018 S232 report, the ITC and the Commerce Department concluded that foreign firms were illegally dumping aluminum products or receiving illegal, trade-distorting subsidies in repeated cases, mainly involving China.⁹ Some foreign producers are also benefiting from other policies favorable to domestic industries but not explicitly prohibited by international agreements, such as discretionary regulatory forbearance of environmental, labor, and other standards.

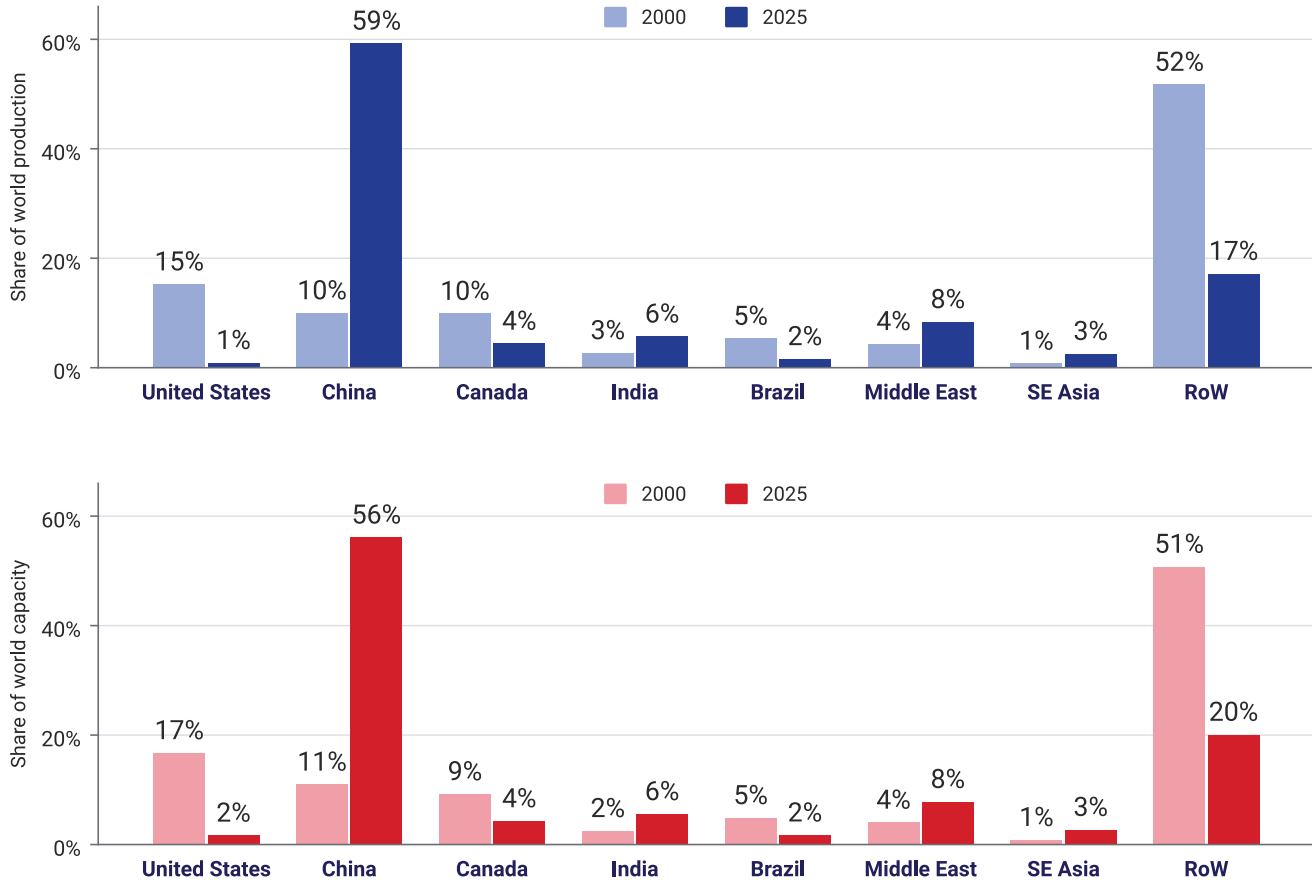
By 2025, the U.S. shares of global production and capacity had fallen to 1% and 2% while China's shares had shot up to 59% and 56%.

The global aluminum landscape remade: 2000-2025

As a result of these forces, the global landscape for aluminum production has completely transformed over less than a generation. In 2000, the United States was the world's largest aluminum producer and had the world's largest capacity, accounting for 15% and 17% shares (**Figure 1**). But by 2025, the U.S. shares of global production and capacity had fallen to 1% and 2% while China's shares had shot up to 59% and 56%. While others have also lost global market shares, a group of countries across the Middle East and Southeast Asia as well as India have all gained significant shares, too—notably following the implementation of U.S. S232 tariffs in 2018. With the help of Chinese foreign direct investment, they are now poised to vastly expand global capacity for the foreseeable future.

FIGURE 1

Share of world aluminum production and capacity, 2000 vs. 2025



Source: Author's analysis of CRU Group (2026) data. Middle East includes Bahrain, Oman, Qatar, Saudi Arabia, and United Arab Emirates. SE Asia includes Indonesia, Malaysia, and Vietnam.

The ascent of China's aluminum industry is a story of a successful, coordinated industrial strategy to establish aluminum supply security and the economic benefits that flow from it. From 2000 to 2017, Chinese capacity to produce primary aluminum increased by 1,458% to more than 44.5 million metric tons (MMT) annually. UN Comtrade data show that China exports little aluminum to the world market, a mere 0.5 MMT. Instead, China's aluminum strategy is designed to capture domestically as much of the value chain as necessary to have a reliable supply of the critical material. Chinese measures that restrict the export of primary aluminum and subsidize downstream semi-finished aluminum products with export rebates run afoul of WTO rules but achieve China's goals of having an inviolable domestic supply to fuel domestic growth and export of downstream manufactures. This is the key link between China's excess aluminum capacity and production and global prices for aluminum on the London Metal Exchange (LME), despite so little Chinese aluminum being sold directly to world markets.

\$20-70B

Governments delivered \$20-70 billion in subsidies along the aluminum value chain between 2013 and 2017.

The Chinese aluminum industry benefits from a wide range of policy supports providing concessional financing, tax and environmental regulatory forbearance, and access to key inputs like bauxite ore and electricity at below-market prices—

in addition to direct subsidies.¹⁰ What is known about the scale and scope of support for aluminum in China—where government budgets and corporate financial data are far from transparent—is not comprehensive, but the support is nonetheless staggering and yields clear rewards for Chinese aluminum and its broader domestic economy. In a 2019 study examining 17 of the largest aluminum firms, the Organization for Economic Cooperation and Development (OECD) discovered that governments delivered \$20-70 billion in subsidies along the aluminum value chain between 2013 and 2017.¹¹ Government support for aluminum is, the OECD said, “mostly a Chinese trait,” of which Chinese firms were “by far the largest recipients of subsidies in the sector,” followed by firms from Gulf Cooperation Council countries. Chinese firms were not unique in only receiving support from their home government, but the only others that could not garner multinational support were from Russia, India, and Bahrain. In more recent research on government subsidies, the OECD found aluminum to be the third-most-heavily subsidized industry from 2005 to 2024, behind only solar panels and semiconductors.¹²

The OECD also singled out Canada for an array of state supports, ranking it behind only China and Bahrain.

The OECD also singled out Canada for an array of state supports, ranking it behind only China and Bahrain.¹³ Canadian government supports have included long-term concessional lending at zero interest, leveraging of government procurement requirements, and provision of C\$33 million through investment and export promotion supports in phase one of a multiyear plan. Government support for Canadian industry has also extended to subsidized electricity prices. These supports have allowed Canadian producers to now provide nearly two-thirds of all U.S. aluminum imports.

The OECD studies also provide evidence supporting the argument that China’s massive expansion of aluminum capacity is being driven by noncommercial goals. In the 2019 survey, Chinese firms ranked highest in terms of their investment rate but ranked among the lowest in their return on assets. In other words, they keep expanding production capacity even though those assets are underperforming. Not only does this expansion account for the vast majority of net additions to global capacity, but it is financed overwhelmingly with preferential lending at below-market rates.¹⁴ Downstream Chinese manufacturers also benefit from reliable access to artificially cheap aluminum that can be fabricated and incorporated as components into more complicated manufactured goods. A study by the International Monetary Fund evaluating the impact of Chinese subsidies found that increased subsidies to the broad metals industry were associated with a 3.5% increase in Chinese automotive exports.¹⁵ It is not a big stretch to infer commensurate benefits flowing from policy supports to other metals- and aluminum-intensive manufactures.

Because of Chinese export restrictions on primary and lower-stage aluminum products, export of aluminum in more finished products is the main channel through which Chinese aluminum finds its way onto global markets and influences global aluminum pricing. This practice underscores the importance of covering derivative products as part of the policy response to internalizing the social costs of lost domestic aluminum capacity. But direct importation of Chinese aluminum and aluminum-embodied goods is not the only way that Chinese aluminum is

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4.6 MMT

In Indonesia alone, new and near-term planned capacity expansion from Chinese firms is expected to reach 4.6 MMT annually, or 3.5 times current U.S. capacity.

getting into U.S. and world markets. Surveys from the Dallas Federal Reserve find that Chinese producers are using transshipment—the movement of goods through third countries—to evade S232 import measures.¹⁶ But transshipment is only a temporary strategy while Chinese producers move more production offshore.

Since the imposition of the S232 tariffs in 2018, Chinese aluminum producers have essentially pivoted from building net new domestic capacity to expanding their offshore production footprint in places like Angola, Saudi Arabia, and especially Indonesia. In Indonesia alone, new and near-term planned capacity expansion from Chinese firms is expected to reach 4.6 MMT annually, or 3.5 times current U.S. capacity.¹⁷ And Chinese aluminum firms are also expanding operations in Saudi Arabia (0.5 MMT) and Angola (1 MMT). As noted above, most Chinese aluminum enters the world market not as a raw material but as semi-processed aluminum products or fabricated components in the wide range of downstream industrial, commercial, and consumer goods. Disposal of aluminum through manufactured content is aided by porous rules of origin in trade agreements like the USMCA. These rules determine what counts as a locally produced good for the purposes of gaining access to an agreement's tariff-free benefits. However, the rules allow foreign content to qualify as duty-free North America-originating with only minimal transformation, or by being "rolled-up" with actual North American-made content in production chains. In this way, foreign content gains duty-free access to the U.S. market without the partner country making reciprocal market-opening concessions. This backdoor to U.S. markets under the flag of the USMCA has led to a surge in Chinese direct manufacturing investment in Mexico that effectively funnels Chinese-originating content into North American supply chains.¹⁸

Though the explosion of China's aluminum industry since 2000 is the most significant development remaking the global landscape, it is not the only one. Figure 1 also highlights the growth of significant new aluminum production in India, the Middle East, and Southeast Asia, where government support for the industry emulates China's approach in scope, if not at the same scale. Producers in these countries expanded capacity by 583%, 491%, and 853%, respectively, over this time, and tripled, doubled, and tripled their shares of global production. Combined, capacity expansions from India, the Middle East, and Southeast Asia added nearly 11 MMT to global supply. This volume may pale beside China's addition of 41.7 MMT, but it still represents more than double U.S. capacity at its early 2000s peak and signifies these countries' successes in creating the necessary industrial capabilities to attract Chinese offshore investment.

The general impacts of this massive buildup in Chinese—and others'—aluminum capacity since 2000 have been twofold. First, the buildup created a global aluminum glut that depresses prices to the point where unsupported firms can't maintain sufficient capacity utilization of at least 80% to operate on commercial terms. Second, it has transformed the competitive dynamics of global aluminum production, creating incentives for others to follow suit in supporting their aluminum industries or risk being cast to the scrap heap. Given vast existing global surplus along with massive existing and on-deck expansions of capacity in new production centers like Indonesia, U.S. aluminum is poised to face challenges maintaining pricing and capacity utilization at levels that can sustain, let alone grow, domestic production and investment.

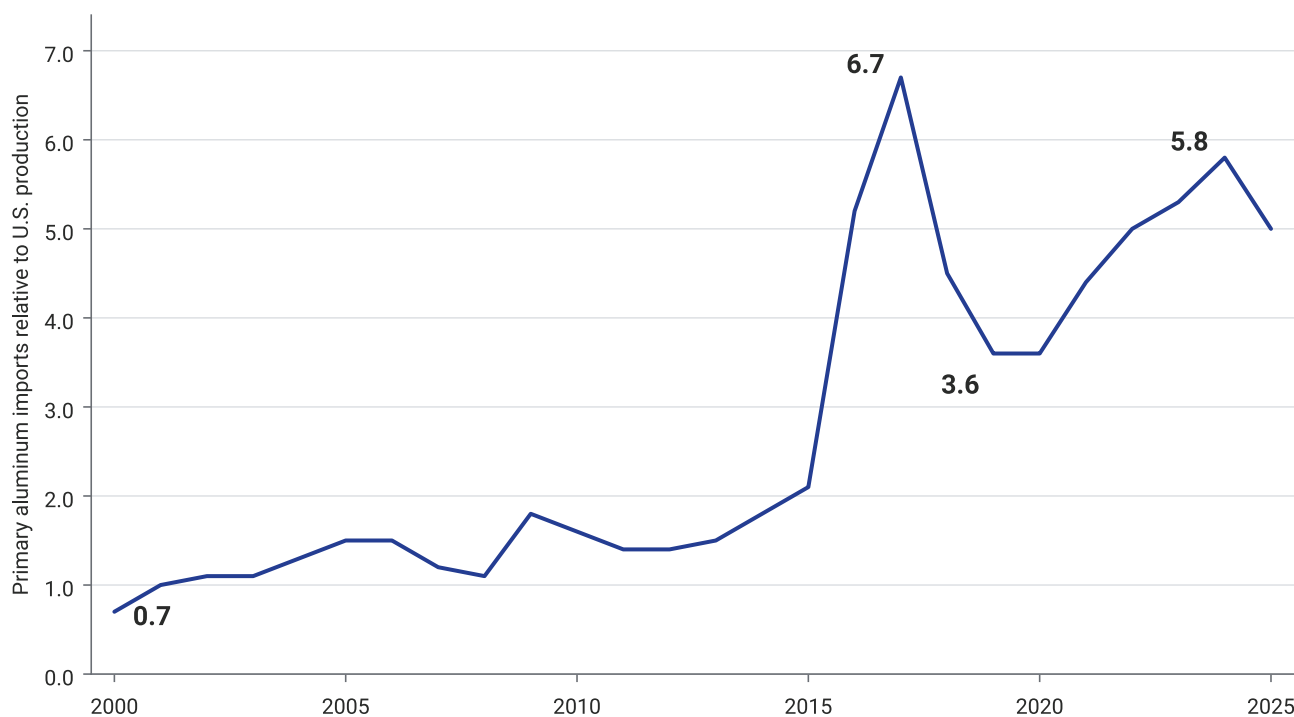
Surging imports of aluminum and aluminum-intensive goods not only displaced U.S. production but made the U.S. economy increasingly dependent on imported aluminum.

The alarming decline of U.S. aluminum

U.S. aluminum producers have largely been on the receiving end of China's and others' rapid aluminum expansion since 2000; production, industry capacity, and employment have been in decline ever since, driven down to alarmingly low levels. Surging global capacity and production depress the global LME aluminum price as well as the Midwest Premium (MWP) price. Because the LME price encompasses global supply and demand conditions, global surpluses of both primary unwrought aluminum and semi-finished aluminum products transmit to the U.S. market, even if that aluminum is not directly imported into the United States. Producers can maintain production at financially viable levels of capacity utilization (generally above 80%) only in a limited range of prices, and downward pressure on prices has caused U.S. producers to shut down.

While the United States was once the world's largest aluminum producer, today it produces a mere 1% of total world output. Surging imports of aluminum and aluminum-intensive goods not only displaced U.S. production but made the U.S. economy increasingly dependent on imported aluminum (**Figure 2**). In 2000, the United States imported 0.7 MT of aluminum for every 1 MT it produced; by 2017, it imported 6.7 MT for every 1 MT produced. S232 tariffs in 2018 allowed U.S. producers to regain a foothold for several years, but eventually tariff exclusions granted to U.S. importers and country-level exemptions pulled the rug out from under the fledgling rebound.¹⁹ By 2024, aluminum imports were back up to 5.8 MT for every 1 MT smelted domestically.

FIGURE 2
U.S. increasingly dependent on imported aluminum



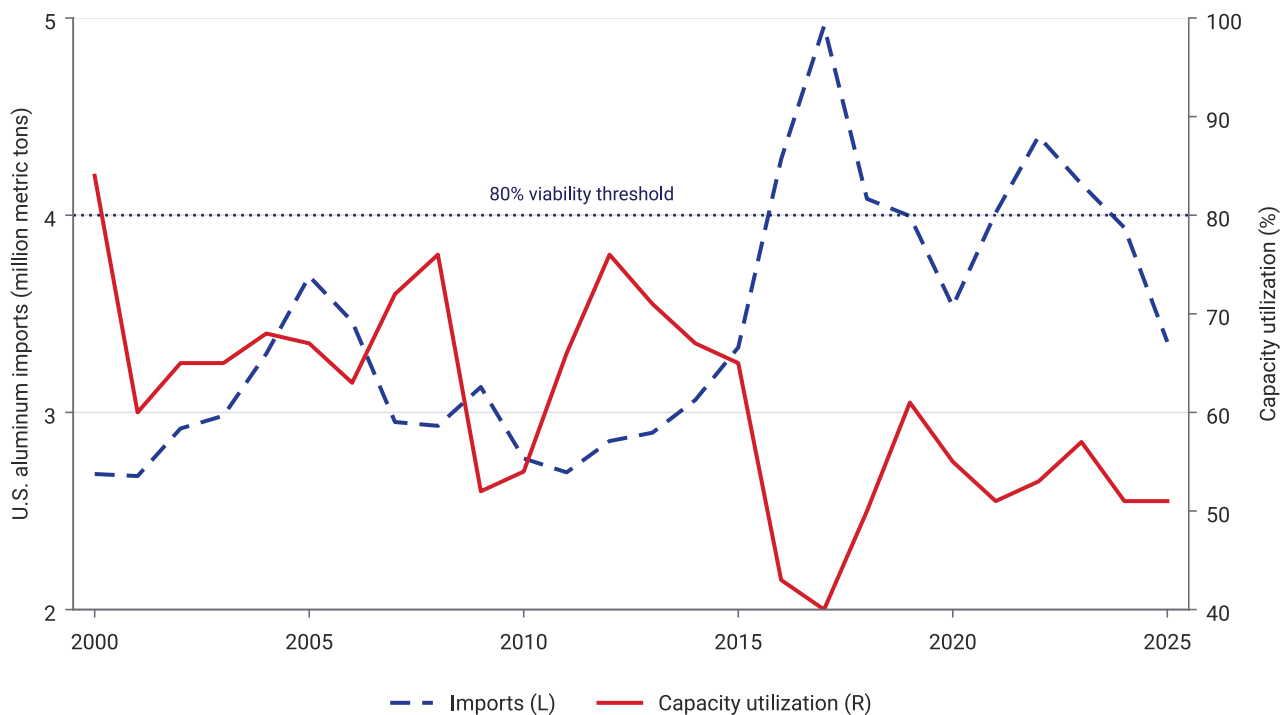
Source: Author's analysis of Aluminum Association (2026) and USITC (2026) Dataweb data.

40%

By 2017, capacity utilization had fallen to 40% as 18 of 23 operating U.S. aluminum smelters shuttered.

Managing the level of imports is a necessary condition for ensuring long-term viability of the U.S. aluminum industry. **Figure 3** shows that when imports go up, U.S. aluminum production goes down. Particularly damaging was the import surge driven by recovery from the global financial crisis in 2008-2009. More importantly, Figure 3 shows that after 2000, the U.S. aluminum industry struggled to approach the 80% capacity utilization threshold for financial sustainability.²⁰ By 2017, capacity utilization had fallen to 40% as 18 of 23 operating U.S. aluminum smelters shuttered. Implementation of S232 tariffs in 2018 helped spur capacity utilization back up to 61% before exclusions and exemptions eroded the efficacy of the measures. Thereafter, increased demand from U.S. investments in renewable energy and electric vehicles along with impacts of the Russia-Ukraine war helped sustain U.S. production, but at nowhere near the requisite 80% mark.

FIGURE 3
Capacity utilization rises when aluminum imports fall



Source: Author's analysis of USITC (2026) and CRU Group (2026) data.

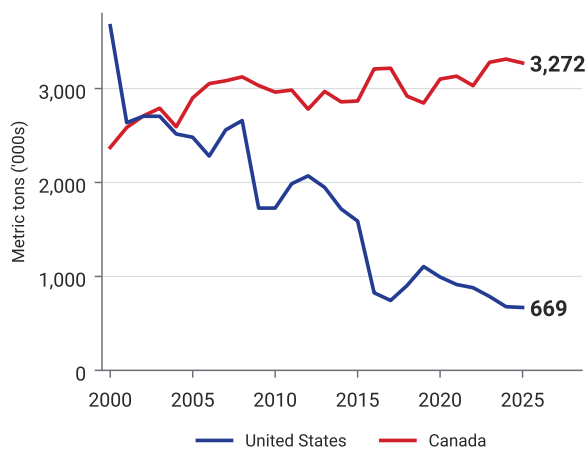
It is instructive to look at the path of U.S. aluminum production alongside that of Canada's (**Figure 4A**). In 2000, U.S. producers turned out nearly 3.7 MMT of aluminum, but by 2025 production was down to less than 670,000 MT. Canada faced the same pressures from the global supply glut created by Chinese and others' rapid expansion under industrial policies but benefited from a range of government supports designed to make Canada a low-cost aluminum producer. This cost wedge allowed Canadian producers to expand market share as global

conditions of overcapacity displaced more marginal U.S. producers—those operating near or below 80% capacity. As a result, Canadian production expanded from 2.4 MMT to nearly 3.3 MMT by 2025. Both would be substantially larger were it not for the growing field of state-supported firms operating on noncommercial terms and distorting global markets.

While both U.S. and Canadian producers have suffered under conditions of subsidy-driven excess global supply, Canada occupies a market position as the marginal supplier sitting between Chinese and U.S. producers (**Figure 4B**). Indexed to 2017 production levels, the figure shows U.S. production climbing sharply and Canadian output dipping slightly in 2018-2019 as U.S. producers gained pricing power under S232 tariffs. But when Canadian aluminum was exempted from tariffs in 2019, and codified under the 2020 USMCA, U.S. production quickly fell back and Canadian production recovered. As a result, many aluminum restarts and expansions planned with the 2018 S232 tariffs were shelved and by 2025 U.S. output was 10% below its 2017 level.

FIGURE 4A

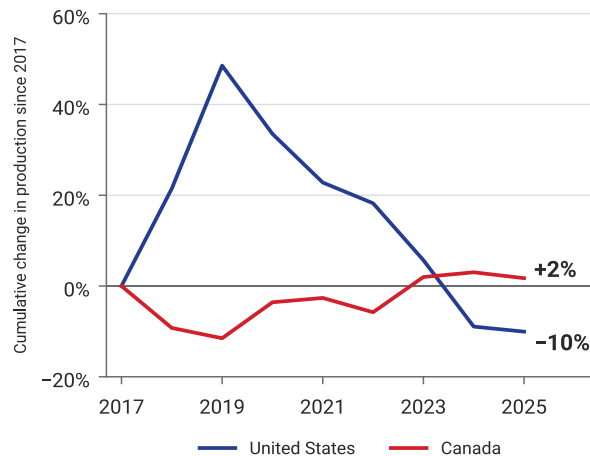
U.S. and Canadian (primary) aluminum production, 2000-2025



Source: Author's analysis of CRU Group (2026) data.

FIGURE 4B

The end of Canadian restrictions undercut U.S. aluminum rebuilding



Source: Author's analysis of CRU Group (2026) data.

Assessing aluminum tariffs and prices

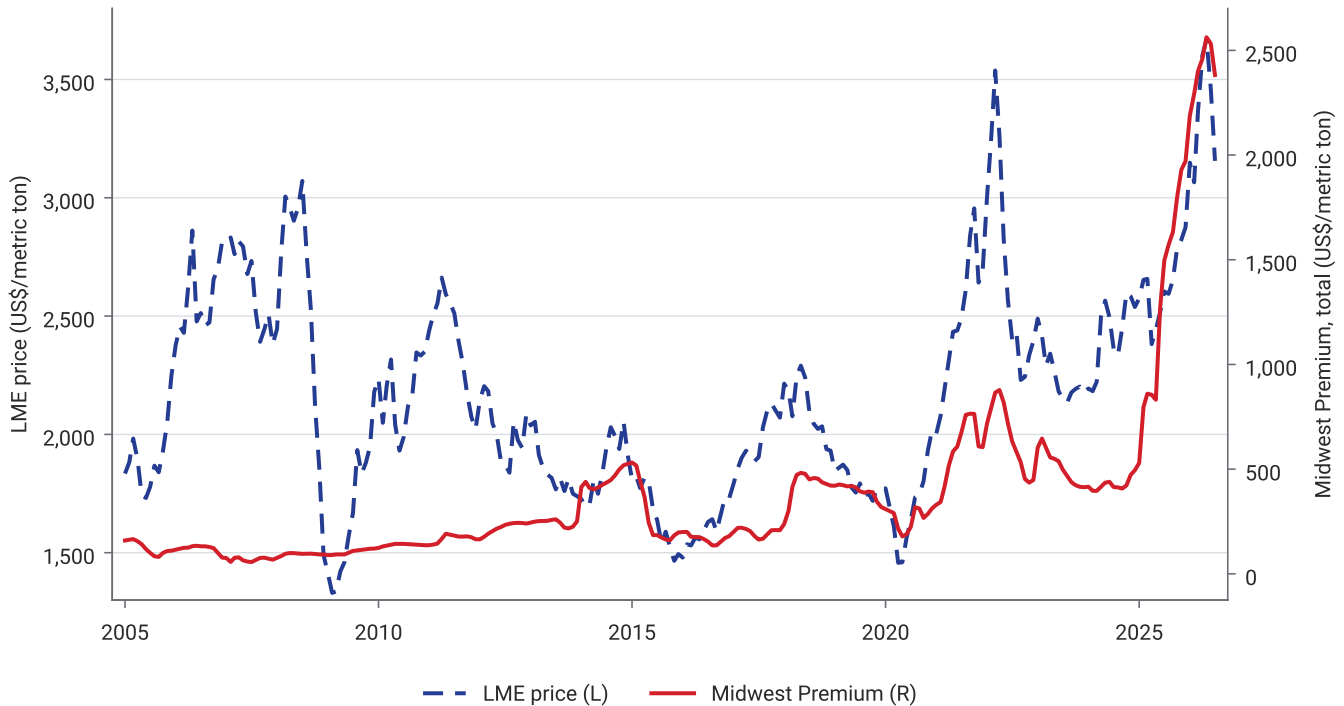
Certainly, tariffs on aluminum should increase aluminum prices and spur investment. If they do not, they are not working to create pricing power and deliver the incentive to support U.S. aluminum production. **Appendix 1** compiles new U.S. aluminum plant openings, restarts, and expanded investment since new S232 tariffs began. Since just 2025, producers have announced plant restarts, investments, and new capacity expansions amounting to nearly 1 MMT, supporting more than 3,600 production jobs.

The next key question is how an increase in aluminum prices affects the prices of downstream products. Disentangling the effects of tariffs on aluminum prices from other concurrent and confounding events driving global markets—such as shifting demand and supply conditions due to the Russia-Ukraine war and the U.S.-Israel-Iran war as well as global shifts of investment in renewable energy generation and electric vehicles—remains impractical, especially where tariff coverage varied so widely due to exclusions and exemptions.

With regard to prices, **Figure 5** shows their wide fluctuations coinciding with various policy measures and supply and demand developments; specifically, it plots the price on the London Metal Exchange—the global benchmark—and the Midwest Premium—a regional benchmark price used in supply contracts that reflects the additional costs for delivery of LME-priced aluminum to U.S. buyers as well as local conditions for aluminum supply beyond logistical costs. Most notable in Figure 5 is that the MWP closely follows movements in the LME price—which is set by global market conditions, rather than changes in the coverage of S232 tariffs. Even after the Russian annexation of the Crimea in 2014 and the pandemic-era demand boom, and during the current spate of international conflicts, the MWP's relationship to the global price has remained remarkably stable. On the other hand, the LME's volatility is more indicative of speculative trading in LME securities and boom-and-bust commodity cycles driven by global macroeconomic factors.²¹ In any case, Figure 5 shows that the most recent spike in LME prices began in December 2023 and that for the MWP in September 2024, well before the escalation of S232 tariffs.

FIGURE 5

LME aluminum price and U.S. Midwest Premium, 2005–2026



Source: Author's analysis of LME and platform-reported Midwest Premium data.

An overwhelming rise in aluminum input prices would be required to move downstream prices even a modest amount.

Instead of pulling at the Gordian knot of factors driving global aluminum prices, this analysis applies a cleaner approach to assess how a change in primary aluminum prices—from any source—translates to prices of downstream goods. This approach allows calibration of the potential shock from aluminum tariffs without having to control for confounding factors affecting global aluminum prices. To assess this linkage, we employ standard, related, and time-tested econometric techniques known as Granger causality analysis and vector autoregression.²² More technical details are available in **Appendix 2**.

We test this relationship for a selection of downstream goods with the highest levels of aluminum content, based on Bureau of Economic Analysis input-output use tables (**Table A2**).²³ Some uses, like manufacturing military armored vehicles, have a 34% content. But for most industries outside of metals production, the aluminum content amounts to a small share of costs in the overall value chain. Aluminum makes up a mere 0.2% of costs in aircraft manufacturing, for example, and for other heavy manufactured goods—from industrial fabrications to motor vehicle parts—aluminum ranges from under 1% to 15% of the total costs of production. Bureau of Labor Statistics data confirm this estimate of aluminum content: aluminum prices make up only 0.069% of the producer price index and are diluted further in consumer prices. These amounts imply that an overwhelming rise in aluminum input prices would be required to move downstream prices even a modest amount.

\$0.02

Harbor estimates that S232 tariffs have added \$0.02 per can.

Changes in aluminum prices show little to no statistical evidence of a causal relationship with the price series tested.

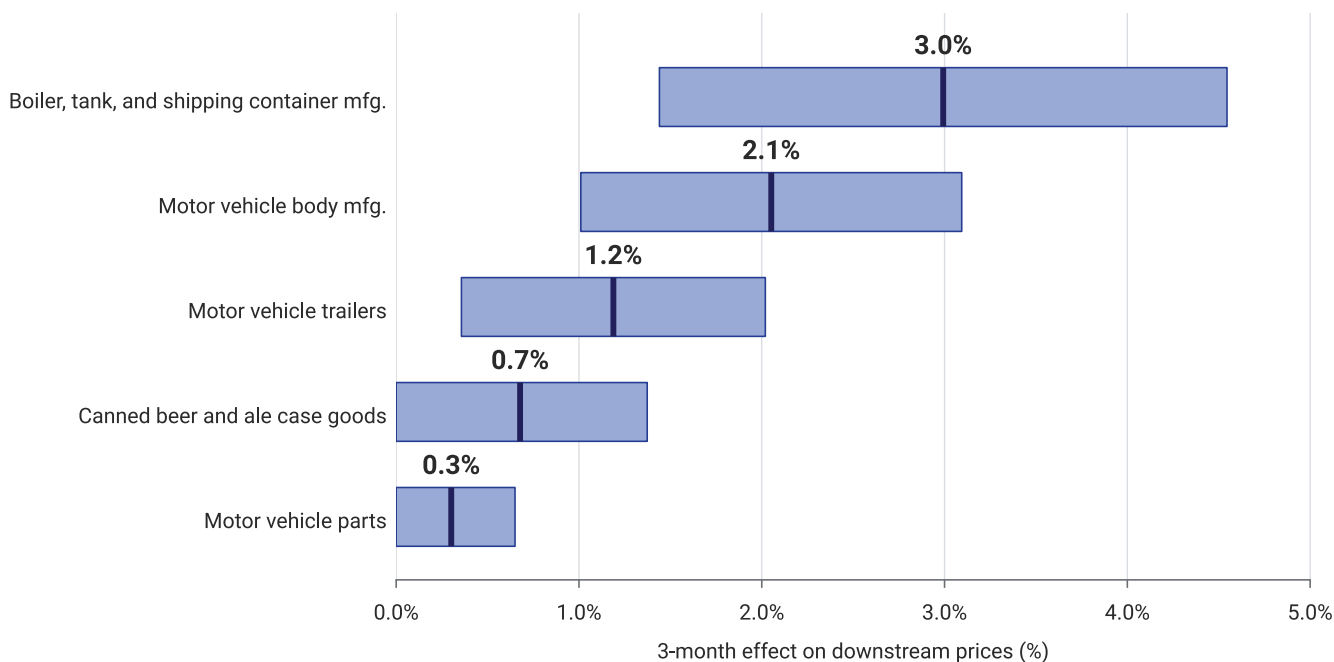
Separate analysis from consultancy Harbor Aluminum finds that since 2024 increased aluminum prices have raised the average retail price of a new car by \$135, or 0.2% of the average \$50,000 price—less than add-on floor mats for many models.²⁴ A similar scenario can be seen in canned beer. Harbor estimates that S232 tariffs have added \$0.02 per can. With beer prices up 27% since the start of S232 tariffs in 2018, aluminum prices are far from a leading factor in beer price increases. What's more, the price changes do not reciprocate: when aluminum prices fall, brewers do not seem to lower the price of a six-pack of beer.

The selection of goods for econometric testing includes: beverage manufacturing; canned beer and ale case goods; boiler, tank, and shipping container manufacturing; communications and energy wire and cable; nonresidential and multifamily residential construction goods (excluding food and energy); commercial and office furniture excluding wood; and motor vehicle parts, bodies, and trailers. All price series are drawn from components of the producer price index. The relationship between aluminum prices and those of downstream goods is modeled from February 2018 to July 2026, following statistical tests that confirm a structural change in price relations after implementation of the initial S232 tariffs. Given the strong prior expectation of a relationship between aluminum input and downstream prices, we relax the normal threshold of 95% probability for statistical significance to 90% in giving more generous consideration to the significance of estimates.²⁵ Even so, six of the 11 price series tested—beverage manufacturing and materials, wires, nonresidential and residential construction goods, and office and commercial furniture—show no statistical evidence of a causal relationship between aluminum and downstream prices.

Five of our downstream goods do show statistically significant causal impacts from aluminum prices, albeit with economically small responses. **Figure 6** plots the range of estimates for these effects, cumulative over a three-month period, from a simulated shock of 50% to aluminum prices as well as the potential range of this effect at a 90% confidence interval. Recall that this relationship is estimated independent of any particular cause of the price shock, be it tariffs or other factors. At the high end, a 50% aluminum price shock is associated with a 3.0% increase in boiler, tank, and shipping container manufacturing prices. The next largest effect was on motor vehicle body manufacturing, where a 50% aluminum price shock is associated with a 2.1% price increase. Canned beer and motor vehicle parts exhibited the lowest price pass-through from an aluminum price shock. For canned beer, a 50% increase in aluminum prices was associated with a 0.7% increase in beer prices, in line with the Harbor results noted above. For motor vehicle parts, the simulated shock is associated with a 0.3% increase in prices. For both, the lower bound of the confidence interval includes 0—normally a disqualification for significance because, statistically speaking, the effect is not different from 0.

FIGURE 6

Estimated effect of a 50% aluminum price increase (90% confidence interval)



Source: Author's analysis of U.S. Bureau of Labor Statistics (2026) data.

The conclusion that the impact of aluminum prices on downstream products has been minimal at first seems counterintuitive, but the lack of evidence for a causal relationship makes perfect sense considering the fact that aluminum content amounts to a small share of much wider downstream production chains. It is possible that the rather benign relationships assessed here could change at significantly larger price shocks than we've seen with the current S232 tariffs. However, this analysis makes clear that there is much more room available for S232 tariffs and other import measures to provide support for U.S. aluminum without causing a drag on the economy downstream.

Conclusion

The U.S. aluminum industry is a critical asset for economic and national security that is at real risk of extinction under the unrelenting forces of state-supported foreign industries. The resulting chronic global supply glut creates microeconomic incentives for aluminum consumers to chase the lowest price, whoever may supply it. But these individual behaviors constitute a widespread coordination failure that externalizes the potential negative risks of disruptions to aluminum supplies that are critical for economic and national security. That risk has not been factored into the price downstream consumers pay for aluminum. Fixing the negative externality requires putting that risk back into the price.

While the United States has fallen from being the world's aluminum leader in 2000 to a minor player today, the response of industry to expectations of pricing power at financially sustainable levels has been promising. In particular, planned greenfield construction in Oklahoma of the largest aluminum smelter in U.S. history that would more than double current national output shows that capital and industry will still be forthcoming if policymakers can help rebalance the scales tipped by foreign aluminum subsidies.

S232 tariffs can work and are working to create space for U.S. domestic aluminum production to regain footing, and they should not be conflated with the more generalized approach to global tariffs in the Trump administration. To secure this path forward for U.S. aluminum production, policymakers need to continue S232 tariffs with no exclusions or exemptions and include coverage of downstream products containing significant aluminum content.

Appendix I

TABLE A1

New openings, restarts, reinvestments in U.S. aluminum production since 2025

Company	Location	Date (Announcement or Start)	Investment (\$)	Capacity	New/Retained FTE Jobs
Century Aluminum	Mt. Holly, SC	August 7, 2025	~\$50 million	50,000+ MT	100
Century Aluminum / Emirates Global Aluminium (JV: Oklahoma Primary Aluminum)	Inola, OK	January 26, 2026	~\$4 billion	750,000 MT	1,000
Magnitude 7 Metals	Marston, MO	July 1, 2026	n/a	75,000 tons	n/a
Alcoa Corp.	Massena, NY	October 22, 2025	~\$60 million	Anode baking furnace rebuild	n/a
Novelis Inc.	Bay Minette, AL	July 14, 2026	\$5 billion	600 MT	1,000
EGA Spectro Alloys	Rosemount, MN	July 9, 2025	\$71 million	~54,400 MT	50
Arconic Corp.	Davenport, IA	September 25, 2025	\$57.5 million	~41 MT	20
Arconic Corp.	Bettendorf, IA	February 1, 2026	\$175 million	Not disclosed	40
Kaiser Aluminum	Trentwood, WA	November 7, 2025	\$25 million	+5% output capacity	n/a
Southwire Co.	Youngsville, NC	January 23, 2025	\$1.5B	n/a	200
Kibar Americas	Fairmont, WV	September 15, 2026	Restart of former Novelis plant	n/a	300
ALUKO Group	Lauderdale County, TN	January 7, 2026	\$107.7 million	156,000 tons	285
AKFA Aluminum Solutions	Bowling Green, KY	January 14, 2026	\$80 million	n/a	331
Aluminum Dynamics (SDI)	Columbus, MS	November 2, 2022	\$1.9 billion	650,000 MT	250
Taber Extrusions	Russellville, AK	September 16, 2026	\$70 million	n/a	70

Appendix 2:

Technical Notes

This appendix outlines the methodological approach for assessing how changes in primary aluminum prices are related to changes in prices for downstream aluminum-intensive products. The methodology takes a clean approach to identifying this relationship rather than using limited data to disentangle the effects of multiple tariffs and other factors affecting prices for aluminum (such as the Russia-Ukraine war, the U.S.-Israel-Iran war, and global shifts in demand from renewable energy and electric vehicle investment). This allows for a two-step approach:

1. Do changes in aluminum prices have a causal effect on downstream prices?
2. If so, what is the size of the effect of a 50% increase in prices?

To evaluate these questions, we estimate reduced-form vector autoregressions (VARs) that model the variables of interest as an interrelated system that co-evolves over time.²⁶ Use of the VAR does not force an assumed structural form onto the data. Rather, each variable in the system is modeled jointly as a function of its past values

and the past values of the other related variables in the system. In this case, (1) prices for primary aluminum, (2) prices for downstream products, and (3) the effective federal funds rate—the interest rate at which depository institutions borrow and lend reserve balances held at Federal Reserve Banks. This interest rate is the primary target for Federal Reserve monetary policy actions and is linked both in theory and in practice to changes in general price levels, as well as to the level of demand for goods and services across the economy via the Taylor Rule.²⁷

With each system modeled, we can then evaluate whether causal relationships exist between the variables of the system by way of a Granger causality test.²⁸ This statistical test evaluates whether past values of one variable are statistically significant in determining the current value of another variable. For those where a statistically significant causal relationship is observed, we use the model to simulate the effect on downstream prices from a 50% increase in the price of primary aluminum—the central question of concern.

Monthly data are drawn from the Federal Reserve Bank of St. Louis’s FRED Economic Data, shown in **Table A2**. A variety of independent statistical tests, as well as prior expectations given the onset of S232 tariffs, indicate structural breaks in the data at February 2018; thus, we limit our sample to February 2018 to July 2026.²⁹

TABLE A2
Data sources

Variable	Series Code	Aluminum Share of Value-added	Actual inflation, Feb. 2025-Aug. 2026
Alumina and Aluminum Production and Processing	PCU3313133131	-	48.5%
Motor Vehicle Body and Trailer Manufacturing	PCU33623362	13%	7.7%
Motor Vehicle Body Manufacturing	PCU336211336211	4%	0.9%
Canned Beer and Ale Case Goods	PCU3121203121201	6%	-0.5%
Communication and Energy Wire and Cable Manufacturing	PCU3359233592	8%	-5.4%
Motor Vehicle Parts Manufacturing	PCU33633363	1%	4.8%
Commercial Furniture	WPU122	6%	6.7%
Office Furniture, Except Wood, Manufacturing	PCU337214337214	6%	6.7%
Boiler, Tank and Shipping Container Manufacturing	PCU33243324	12%	15.5%
Beverage Manufacturing	PCU31213121	6%	3.4%
Net Inputs to Nonresidential Construction, Goods Less Foods and Energy	WPU1P23120013	6%	7.6%
Net Inputs to Multifamily Residential Construction, Goods Less Foods and Energy	WPU1P23112013	6%	7.6%
Federal Funds Effective Rate	FEDFUNDS	-	-

Univariate analysis with a modified Dickey-Fuller test fails to reject the null hypothesis of a unit root for each variable under consideration.³⁰ While the individual variables are nonstationary (integrated of order one, or first-difference stationary), tests with Johansen's procedure show that there is no cointegration—or, a stable, long-run relationship—between the variables, and the system can be modeled with a VAR, as opposed to a vector error correction model.³¹ The VAR model consists of:

$$\begin{bmatrix} \Delta p_t^1 \\ \Delta p_t^2 \\ \Delta i_t \end{bmatrix} = \alpha_0 + \mathbf{A}_1 \begin{bmatrix} \Delta p_{t-1}^1 \\ \Delta p_{t-1}^2 \\ \Delta i_{t-1} \end{bmatrix} + \cdots + \mathbf{A}_k \begin{bmatrix} \Delta p_{t-k}^1 \\ \Delta p_{t-k}^2 \\ \Delta i_{t-k} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \\ \varepsilon_{3,t} \end{bmatrix}$$

where p_t^1 is the natural log of price at time t of primary aluminum, p_t^2 is the natural log of the price of the aluminum-using product, and i_t is the effective federal funds interest rate. The model estimates parameters α_0 , $\mathbf{A}_1$ to $\mathbf{A}_k$, and ε_t which are, respectively, a vector of constant terms, 3×3 matrices of coefficients relating the current dependent variable to past values of the independent variables, and a vector of randomly distributed residuals with mean zero and uncorrelated across time. The specific parameters estimated that

define the structures of VARs are typically of less concern than how the system behaves when there is an exogenous change in one of the variables.

The specific number of lags k of the dependent and independent variables specified varies for each downstream product modeled and is chosen with some subjectivity, though guided by minimizing a battery of statistical criterion tests.³² Results were robust to alternative lag-length specifications. The VAR parameters were estimated simultaneously by the “seemingly unrelated regression” method.³³ Post-estimation, the statistical assumptions were tested to confirm that the VAR parameters are stable (with eigenvalues lying within the unit circle) and that the residual is normally distributed and not serially correlated, indicating that the models are well specified. Given the reasonably small number of observations supporting this modeling, as a robustness check, each model was re-estimated using the Bayesian VAR method.³⁴ Bayesian VAR is known to perform better on smaller sample sizes and can be less prone to overfitting than conventional VARs. However, in no case did Bayesian VAR analysis find credible effects of changes in aluminum prices on downstream prices.

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¹⁹ More than 29,000 exclusions from S232 tariffs were granted from 2018–2025. Canada, Mexico, the European Union, the United Kingdom, Australia, and Argentina all received country-level exemptions or conversion to absolute or tariff rate quotas.

²⁰ Bureau of Industry and Security, U.S. Department of Commerce, *The Effect of Imports of Aluminum on the National Security: An Investigation Conducted Under Section 232 of the Trade Expansion Act of 1962, as Amended*, January 17, 2018.

²¹ Yılmaz Akyüz, "Managing Boom-Bust Cycles in Commodity Dependent Economies" (slide presentation), UNCTAD Global Commodities Forum, Geneva, April 13–14, 2015.

²² As a robustness check, models were also estimated with Bayesian vector autoregression, which can yield more stable estimates with small sample sizes. In no case did Bayesian VAR find a credible effect of aluminum prices on prices for downstream products. Gary Koop and Dimitris Korobilis, "Bayesian Multivariate Time Series Methods for Empirical Macroeconomics," *Foundations and Trends in Econometrics* 3, no. 4 (2010): 267–358; Clive W. J. Granger, "Investigating Causal Relations by Econometric Models and Cross-Spectral Methods," *Econometrica* 37, no. 3 (August 1969): 424–438; Christopher A. Sims, "Macroeconomics and Reality," *Econometrica* 48, no. 1 (January 1980): 1–48.

²³ Bureau of Economic Analysis, "Use of Commodities by Industries, After Redefinitions, Purchasers' Prices—Detail Level, 2017" [Excel file], Input-Output Accounts Data, accessed August 27, 2026.

²⁴ Jorge Vazquez, "S232.2 Tariff Impact on MWTP & The World Premium Outlook 2026–27" (slide presentation), The Aluminum Summit, Chicago, Ill., June 3, 2026.

²⁵ For example, by considering the joint, as well as the individual, significance of model terms, or treating near non-zero bounds on confidence intervals around a point estimate as still significant.

²⁶ Christopher A. Sims, "Macroeconomics and Reality," *Econometrica* 48, no. 1 (January 1980): 1–48.

²⁷ John B. Taylor, "Discretion versus Policy Rules in Practice," *Carnegie-Rochester Conference Series on Public Policy* 39 (December 1993): 195–214.

²⁸ Clive W. J. Granger, "Investigating Causal Relations by Econometric Models and Cross-Spectral Methods," *Econometrica* 37, no. 3 (August 1969): 424–438.

²⁹ Chow tests as well as Markov-switching models with 2 regimes independently confirm the timing of structural breaks in the data.

³⁰ Yin-Wong Cheung and Kon S. Lai, "Lag Order

and Critical Values of the Augmented Dickey-Fuller Test," *Journal of Business & Economic Statistics* 13, no. 3 (July 1995): 277–280.

³¹ Søren Johansen, *Likelihood-Based Inference in Cointegrated Vector Autoregressive Models* (Oxford: Oxford University Press, 1995).

³² These include the likelihood ratio test, the final prediction error, Akaike's information criterion, Schwarz's Bayesian information criterion, and the Hannan and Quinn information criterion. See Bent Nielsen, "Order Determination in General Vector Autoregressions," working paper, Nuffield College, University of Oxford, August 2001; Helmut Lütkepohl, *New Introduction to Multiple Time Series Analysis* (Berlin: Springer, 2005).

³³ Arnold Zellner and Henri Theil, "Three-Stage Least Squares: Simultaneous Estimation of Simultaneous Equations," *Econometrica* 30, no. 1 (January 1962): 54–78.

³⁴ Gary Koop and Dimitris Korobilis, "Bayesian Multivariate Time Series Methods for Empirical Macroeconomics," *Foundations and Trends in Econometrics* 3, no. 4 (2010): 267–358; Jamie L. Cross and Herman K. van Dijk, "Forecasting with Bayesian Vector Autoregressions Revisited," in *Recent Developments in Bayesian Econometrics and Their Applications*, ed. Stepan Mazur and Pär Österholm (Cham, Switzerland: Springer, 2025), 7–22.