Statement

of

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before the

Committee on Energy & Commerce
Subcommittee on Consumer Protection & Commerce
United States House of Representatives

October 14, 2021

RE: "Investing in American Jobs: Legislation to Strengthen Manufacturing and Competitiveness"

Chair Schakowsky, Ranking Member Bilirakis, and Members of the Subcommittee:

My name is Scott Lincicome. I'm a senior fellow in economic studies at the Cato Institute, where my research has recently focused on manufacturing, industrial policy, and global supply chains. I want to thank you, Madam Chair, for inviting me to testify today; and I want to thank ranking member Bilirakis in particular for inviting me to offer a contrasting view on American manufacturing competitiveness, supply chains, innovation, and economic resilience – one that I hope will inform your consideration of this hearing's important topics. Importantly, I should note that the Cato Institute and its scholars do not endorse, oppose, or otherwise lobby on behalf of (or in opposition to) specific legislation. My comments are thus intended to be for educational purposes only.

Accompanying my written testimony are three recent studies that I have authored on the state of American manufacturing and its nexus with national security; on pandemic-related supply chain issues; and on the history of industrial policy, here and abroad.[1] Summarizing this research in a few short minutes would of course be impossible, so I instead want to leave you with several core themes that carry across my work and are relevant to this subcommittee's deliberations:

First, the United States manufacturing sector is far more competitive and resilient than is often claimed – especially in high-tech and capital-intensive industries. Data from the Bureau of Economic Analysis (BEA) and other sources show that the U.S. manufacturing sector remains among the most productive in the world and had enjoyed, prior to the pandemic, a long stretch of gains in output, investment, and financial performance. Like all sectors, manufacturing suffered when COVID-19 first hit, but it quickly rebounded: in both the first and second quarters of this year, for example, real value-added in manufacturing – overall and for durable goods – hit all-time highs, easily surpassing their pre-pandemic quarterly records.[2]

Particularly relevant for this hearing is domestic spending on capital expenditures and research and development (R&D). Here, the U.S. manufacturing sector again hit record levels before the pandemic, as did nonresidential fixed investment[3] and R&D spending for the nation as a whole. Indeed, the latest data from the National Science Foundation show that all forms of R&D expenditures – basic research, applied research, and experimental development – hit inflation-adjusted records in 2019, driven by the private sector.[4] Now, with the pandemic mostly in the rearview mirror, businesses' capital spending on software,

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[1] https://www.cato.org/publications/policy-analysis/manufactured-crisis-deindustrialization-free-markets-national-security; https://www.cato.org/pandemics-policy/pandemic-does-not-demand-government-micromanagement-global-supply-chains; https://www.cato.org/white-paper/questioning-industrial-policy.

[2] https://fred.stlouisfed.org/graph/?g=HCuS.

[3] https://apps.bea.gov/iTable/iTable.cfm?reqid=19&step=3&isuri=1&select_all_years=0&nipa_table_list=140&series=q&first_year=1967&last_year=2020&scale=-9&categories=survey&thetable=#reqid=19&step=3&isuri=1&select_all_years=0&nipa_table_list=140&series=q&first_year=1967&last_year=2020&scale=-9&categories=survey&thetable=

[4] https://www.cato.org/blog/us-rd-spending-continues-climb.

R&D, equipment, and other productivity-enhancing items has taken off again.[5] Economists with Morgan Stanley, for example, predict that U.S. capital spending will hit 116% of prerecession levels by 2024 – a rebound that took 10 years following the Great Recession.[6]

By contrast, both the declining number of U.S. manufacturing jobs and the manufacturing sector's shrinking share of Gross Domestic Product tell us almost nothing about the sector's health. This is because these trends primarily reflect long-term, global dynamics that are shared by most industrialized nations – including ones such as Germany and Japan with active industrial policies and trade surpluses – and are disconnected from specific federal economic policies, whether they are free market or interventionist. Instead, historical trends in U.S. manufacturing jobs and the sector's GDP share are a standard story of economic development that all countries eventually experience as their citizens get richer and devote more of their budgets to services.

Second, there is little to suggest that economic isolationism or industrial policy would durably benefit either American manufacturing or the economy more broadly. The history of U.S. industrial policy shows, for example, that government attempts to achieve strategic, market-beating commercial outcomes routinely suffer from a lack of knowledge about the future of a chosen product or industry; a lack of formal or practical checks on political influence; a lack of disciplines on project budget, scope, direction, or duration; a lack of consideration of pre-existing policies, such as Buy American rules or the National Environmental Policy Act, that slow or derail projects, turning theoretical successes into costly real-world failures; and a lack of a thorough and comprehensive accounting of a project's seen and unseen costs.

Even more troubling is evidence showing that U.S. industrial and other economic nationalist policies have *undermined* their very own objectives. In *The Technology Pork Barrel*, for example, the authors show that the failed Clinch River breeder reactor project "absorbed so much of the R&D budget for nuclear technology that it probably retarded overall technological progress." Decades later, similar concerns arose again: federal grants and loans to manufacture "green" goods, such as solar panels and electric vehicles, were found to have crowded out private investment in those same technologies, while other reports indicated that potential subsidy beneficiaries diverted resources from their actual businesses to obtaining federal benefits, thus undermining the former. In just the last few years, studies have shown that U.S. tariffs on metals and Chinese imports, allegedly implemented to boost American manufacturing, have deterred domestic investment and reduced U.S. industrial output and employment – a disappointing but entirely predictable result, given that roughly half of all imports into the United States are inputs and capital goods used by U.S. manufacturers to make globally-competitive products.[7]

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[5] https://fred.stlouisfed.org/series/PNFIC1; https://www.bea.gov/sites/default/files/2021-09/gdp2q21_3rd_fax.pdf.

[6] https://www.wsj.com/articles/capital-spending-surge-further-lifts-economic-recovery-11624798800?mod=searchresults_pos3&page=1.

[7] https://www.census.gov/foreign-trade/Press-Release/ft900/final_2019.pdf (Exhibit 9).

That the tariffs remain in place despite these and other problems (and statements from the Biden administration acknowledging some of them) is a cautionary tale regarding the unfortunate durability of industrial policy failures.

Third, the last 20 months of pandemic-induced turmoil show that there is no simple cure for global economic shocks, and *certainly* not ones that rely on reshoring supply chains or top-down economic planning by a new government agency. Global supply chains and a nation's openness to trade and investment inevitably involve a risk that a "shock"—war, pandemic, natural disaster—hits the world or certain key nations and roils domestic supplies. Such issues surely have arisen since last year, as has been widely reported.

Far *less* reported, on the other hand, is how the U.S. and global manufacturing sectors immediately began adjusting to whatever supply chain challenges arose. There is perhaps no better example than the medical goods in such short supply early last year. According to a December 2020 U.S. International Trade Commission (ITC) report, U.S. manufacturers and global suppliers acted quickly to procure or produce new drugs, medical devices, personal protective equipment (PPE), cleaning supplies, and other goods in high demand. (Particularly "resilient," in the ITC's own words, were the U.S. pharmaceutical, medical device, N95 mask, and cleaning products supply chains.) The Commission's findings have been supported by reams of anecdotal evidence of U.S. investors, producers, and importers jumping to produce medical and other essential goods during the pandemic. By January 2021, in fact, members of Congress were writing President Biden to complain of a potential *glut* of American-made PPE![8]

Such events are not only a testament to the tireless work of manufacturers, retailers, and logistics professionals throughout the pandemic, but also a cautionary tale for U.S. policymakers: by the time Congress decides to intervene in a certain market, it will look much different than the one on which that decision was based, *and* it will change again by the time any government-supported production comes online.

Furthermore, while reshoring supply chains might have insulated U.S. producers and consumers from external supply and demand shocks, those same policies can amplify domestic shocks and reduce overall economic growth and output to boot. Such a risk emerged earlier this year when unprecedented cold hit Texas: several U.S.-based semiconductor manufacturers were forced to idle production capacity, thus exacerbating the very chip shortage that is today often blamed on "globalization." A few months later, we learned from the *New York Times*[9] that Germany – a nation more focused on manufacturing than the service-oriented United States and often a model for a new American industrial policy – has suffered greater economic disruptions because of its "dependence" on manufacturing and goods exports. Both experiences are consistent with past research showing that manufacturing and mercantilism are not an easy recipe for economic resiliency; that domestic economic shocks can cause the same supply chain

[8] https://www.brown.senate.gov/newsroom/press/release/brown-manning-biden-american-ppe.
[9] https://www.nytimes.com/2021/10/05/business/germany-economy.html.

problems as foreign ones; *and* that the diverse U.S. economy is not nearly as vulnerable to global economic turmoil as is often claimed.

Finally, future government action on U.S. manufacturing competitiveness should focus not on trying to outsmart the market or deliver targeted federal grants or loans to privileged companies and workers, but instead on broadly emphasizing economic openness, diversification, and flexibility. Policies liberalizing trade and foreign investment would support U.S. manufacturing competitiveness and economic resiliency by improving companies' access to *and* production of essential goods. Reforms should go beyond simple tariff relief and instead focus on making it easier for businesses to locate and invest in the United States. Studies repeatedly show, for example, that foreign direct investment in the United States benefits not only targeted projects and workers, but also surrounding companies and communities. BEA data further show that U.S. affiliates of foreign multinationals spend hundreds of billions of dollars per year in the United States on research and development and capital expenditures, with the biggest shares going to manufacturing. Other analyses of foreign affiliates in the United States show that they pay more, export more, and are more productive, on average, than similarly situated domestic firms.[10]

Congress also should consider other "horizontal" economic reforms that would boost U.S. manufacturing competitiveness. Most notably, the federal government should significantly expand high-skill immigration, past U.S. restrictions of which have been shown to encourage multinational corporations to offshore jobs and R&D activities to affiliates in more welcoming countries *and* to benefit potential U.S. adversaries, especially China, in terms of new jobs, new businesses, and new innovations.[11] The government should also further lighten corporate tax and regulatory burdens to encourage innovation[12] and foreign investment and to ensure that businesses already here can remain globally competitive. This includes expanding and making permanent the 2017 Tax Cuts and Jobs Act's temporary "full expensing" provision ("100 percent bonus depreciation"), which allows U.S. businesses to write off certain business investments immediately and fully.

In conclusion, both recent experience and scholarly research show that federal government attempts to subsidize "essential" industries or reshore supply chains carry significant risks, and that open markets can bolster U.S. resiliency and competitiveness by increasing access to critical goods, services, and workers, mitigating the impact of domestic shocks, boosting economic growth, and facilitating rapid, market-based adjustment in times of severe economic uncertainty. This argues for a different approach to achieving real economic resiliency than the ones primarily under consideration today — an approach based not on China's state capitalist model but instead on the open and flexible policies that America does best.

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[10] https://www.cato.org/commentary/praise-foreign-direct-investment-almost-all-it.

[11] https://www.cato.org/blog/well-do-anything-american-innovation-we-wont-do; *see also* https://www.cato.org/blog/one-policy-proven-help-us-semiconductor-industry-hamstring-china-one-nobodys-mentioning.

[12] https://www.cato.org/research-briefs-economic-policy/do-corporate-taxes-hinder-innovation.

Policy Analysis

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Manufactured Crisis

"Deindustrialization," Free Markets, and National Security

By Scott Lincicome

EXECUTIVE SUMMARY

Both the American left and right often use "national security" to justify sweeping proposals for new U.S. protectionism and industrial policy. "Free markets" and a lack of government support for the manufacturing sector are alleged to have crippled the U.S. defense industrial base's ability to supply "essential" goods during war or other emergencies, thus imperiling national security and demanding a fundamental rethink of U.S. trade and manufacturing policy. The COVID-19 crisis and U.S.-China tensions have amplified these claims.

This resurgent "security nationalism," however, extends far beyond the limited theoretical scenarios in which national security might justify government action, and it suffers from several flaws.

First, reports of the demise of the U.S. manufacturing sector are exaggerated. Although U.S. manufacturing sector employment and share of national economic output (gross domestic product) have declined, these data are mostly irrelevant to national security and reflect macroeconomic trends affecting many other countries. By contrast, the most relevant data—on the U.S. manufacturing sector's output, exports, financial performance, and investment—show that the nation's total productive capacity and most of the industries typically associated with "national security" are still expanding.

Second, "security nationalism" assumes a need for broad and novel U.S. government interventions while ignoring the targeted federal policies intended to support the defense industrial base. In fact, many U.S. laws already authorize the federal government to support or protect discrete U.S. industries on national security grounds.

Third, several of these laws and policies provide a cautionary tale regarding the inefficacy of certain core "security nationalist" priorities. Case studies of past government support for steel, shipbuilding, semiconductors, and machine tools show that security-related protectionism and industrial policy in the United States often *undermines* national security.

Fourth, although the United States is not nearly as open (and thus allegedly "vulnerable") to external shocks as claimed, global integration and trade openness often bolster U.S. national security by encouraging peace among trading nations or mitigating the impact of domestic shocks.

Together, these points rebut the most common claims in support of "security nationalism" and show why skepticism of such initiatives is necessary when national security is involved. They also reveal market-oriented trade, immigration, tax, and regulatory policies that would generally benefit the U.S. economy while also supporting the defense industrial base and national security.

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"Free marketers largely reject the interventionist critique but do acknowledge the potential need for security-related protectionism and industrial policy."

THEORETICAL JUSTIFICATIONS FOR NATIONAL SECURITY PROTECTIONISM AND INDUSTRIAL POLICY

"National security" has long been invoked to justify government policies intended to support manufacturing in case of war or another emergency. The justification has been offered not only by trade skeptics and supporters of industrial policy (i.e., targeted and directed government efforts to plan for specific future industrial outputs and outcomes[1]) from Alexander Hamilton to Donald Trump but also by advocates of free markets.[2]

The general argument of each side is similar: open markets may be good in most cases, but ensuring the productive capacity of essential manufacturing sectors can warrant the imposition of tariffs, subsidies, or other types of industrial planning. Trade skeptics and industrial policy advocates go further, however, by arguing that American "deindustrialization" (and, by extension, "dependency" on foreign production) justifies interventionist U.S. trade and economic policy. Indeed, the absence of such policies is often alleged to have caused the manufacturing sector's demise. Related to the first point, the skeptics and industrial policy advocates are also trusting of the efficacy of protectionism and industrial policy to achieve national security objectives. These same individuals further assume that open trade is incompatible with national security and economic "resiliency."

An April 2020 op-ed from Sen. Marco Rubio (R-FL) is indicative of the interventionist case:

> Any prudent policymaker should recognize that both efficiency and resiliency are values we should prioritize and seek to balance. But that's not what we have done in recent decades. [U.S. economic policy] choices, from offshoring to building an economy based on finance and service, have produced one of the most efficient economic engines of all time. But a pendulum can swing too far in one direction. And when an economy lacks resiliency, it can be devastating in a crisis. . . .
>
> Today, the result of these failed policy choices is that our manufacturing base is severely diminished, and millions of productive jobs that relied on it are gone. The American domestic supply chain devoted to producing vital medical supplies like generic pharmaceuticals and respirators has withered.[3]

Rubio goes on to claim that these problems require "a new vision to create a more resilient economy" and proposes a "sweeping pro-American industrial policy" that involves "re-shoring of supply chains integral to our national interest—everything from basic medicines and equipment to vital rare-earth minerals and technologies of the future." And he is certainly not alone: prominent politicians and pundits on the right and left routinely lament the harms that "deindustrialization" has imposed on U.S. national and economic security and propose "sweeping" programs (protectionism, domestic procurement mandates, subsidies, etc.) to fix this alleged problem.

Free marketers largely reject the interventionist critique but do acknowledge the potential need for security-related protectionism and industrial policy. Adam Smith explained in *The Wealth of Nations* that one of the "two cases in which it will generally be advantageous to lay some burden upon foreign for the encouragement of domestic industry" is "when some particular sort of industry is necessary for the defence of the country."[4] Smith noted that Great Britain's military, for example, needed to maintain "the number of its sailors and shipping" and therefore supported measures to promote the domestic shipping industry at the expense of domestic consumers or other countries. Two centuries later, Milton and Rose Friedman noted that while "the argument that a thriving domestic steel industry, for example, is needed for defense . . . is more often a rationalization for particular tariffs than a valid reason for

them, it cannot be denied that on occasion it might justify the maintenance of otherwise uneconomical productive facilities."[5] To this day, stalwart defenders of open trade and free markets permit a "national security" exception to those policies.[6]

However, these same scholars are quick to limit the national security exception. After granting the "defence" basis for Britain's Navigation Acts, for example, Smith explained that it arose during a time of "violent animosity" between Britain and Holland—not merely in expectation of such hostilities—and was specifically needed to reduce "the naval power of Holland, the only naval power which could endanger the security of England." He added that it would "very seldom" be "reasonable" to pursue such protectionism ("to tax the industry of the great body of the people" so as not "to depend upon our neighbors for the supply").[7]

The Friedmans were more direct (and skeptical): "To go beyond this statement of possibility and establish in a specific case that a tariff or other trade restriction is justified in order to promote national security, it would be necessary to compare the cost of achieving the specific security objective in alternative ways and establish at least a prima facie case that a tariff is the least costly way. Such cost comparisons are seldom made in practice."[8] Contemporary economists and free marketers have reiterated such concerns: "Given the negative impact of tariffs on wealth, when they are proposed, even under the national defense justification, they should be carefully examined to see if there is a true national defense issue or if domestic firms are merely justifying tariffs for protection from competition."[9]

This skepticism—mostly absent from Washington—is indeed warranted: analyses of the U.S. manufacturing sector and the relationship between trade and national security, as well as the United States' long and checkered history of security-related protectionism, undermine the theoretical justifications for imposing protectionism and industrial policy in the name of national defense. Instead, open trade, freer markets, and global interdependence will in almost all cases produce better outcomes in terms of national security and, most importantly, preventing wars and other forms of armed conflict.

THE REALITY OF AMERICAN MANUFACTURING AND NATIONAL SECURITY

Today's security nationalists often emphasize two trends—declining U.S. manufacturing employment and the sector's declining share of U.S. economic output (as measured by gross domestic product [GDP])—when lamenting American industrial decline and proposing new policies to support domestic manufacturing and national security. Figure 1 shows that both trends have occurred.

However, these trends provide little insight into the state of the U.S. defense industrial base or government policies affecting it, because they primarily reflect secular, global macroeconomic forces mostly unaffected by domestic policy and say little about the productive capacity of the United States overall or of the industries that are most essential to U.S. national security.

Secular Trends Driving Changes to U.S. (and Global) Manufacturing

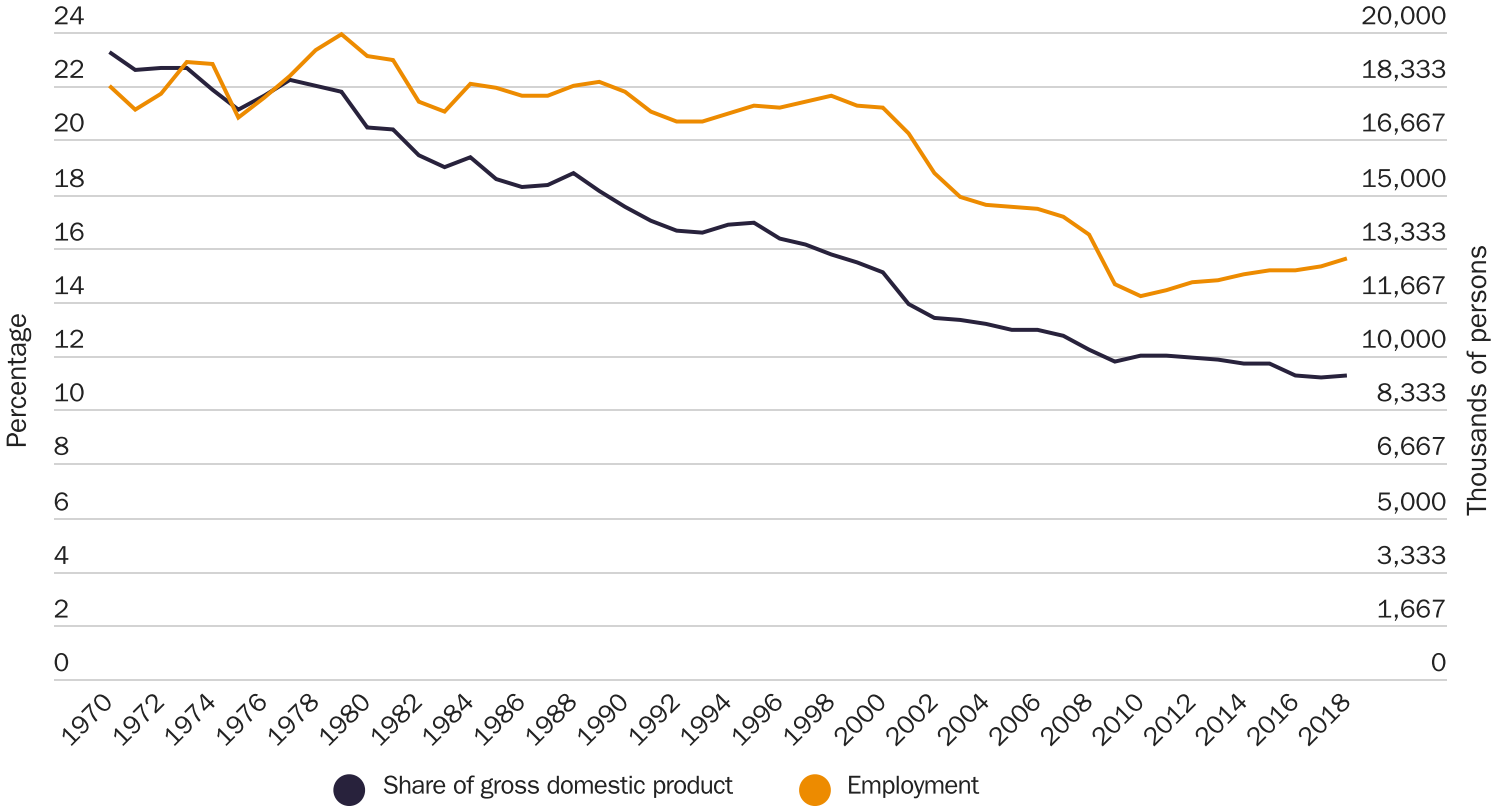
Both declining manufacturing jobs and the sector's declining share of GDP primarily reflect long-term global trends disconnected from specific economic policies, whether "free market" or "interventionist."

JOBS. The long-term decline in U.S. manufacturing jobs coincided with rising sector output and was mirrored in developed countries around the world—including those with economies more centered on manufacturing, with long-standing trade surpluses in goods, or with more aggressive industrial policies.[10] (See Table 1 and Figure 2.) In fact, Robert Lawrence's 2020 examination of 60 countries between 1995 and 2011 found that nations with manufacturing trade surpluses experienced slightly *larger* declines in manufacturing employment than those

"The decline in U.S. manufacturing jobs coincided with rising sector output and was mirrored around the world—including in countries more centered on manufacturing, with trade surpluses, or with industrial policies."

Figure 1

U.S. manufacturing employment and share of gross domestic product, 1970–2018



Sources: United Nations data, https://unstats.un.org/unsd/snaama/Downloads; and Conference Board.

Table 1

Share of employment in manufacturing, selected advanced economies (percentage)

Year	United States	Australia	Canada	France	Germany	Italy	Japan	Netherlands	United Kingdom
1973	24.75	23.35	22	28.88	36.74	27.86	27.78	25.29	32.06
1990	16.77	14.42	15.79	21.27	31.62	22.56	24.33	19.08	22.13
2000	14.35	12.05	15.26	17.87	23.86	22.91	20.66	14.85	14.82
2010	10.13	8.9	10.27	13.32	20.1	18.87	16.95	10.64	9.85
2016	10.17	7.51	9.37	12.15	19.15	18.23	16.1	9.52	9.46

Source: Robert Z. Lawrence, "Recent US Manufacturing Employment: The Exception That Proves the Rule," Peterson Institute for International Economics Working Paper no. 17-12, November 2017.

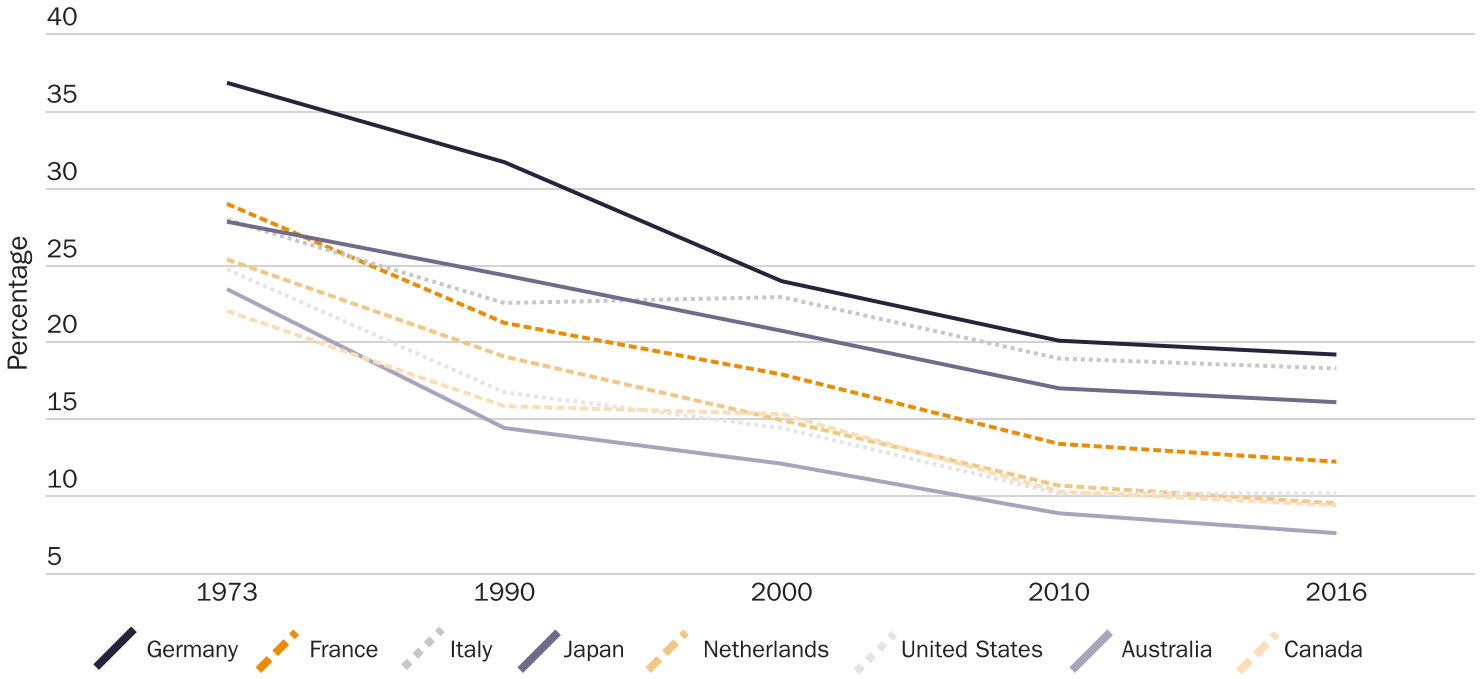
with manufacturing trade deficits and that manufacturing job losses were as large in countries with "improving" manufacturing trade balances over this period as those with "worsening" ones.[11]

As shown in Figure 3, countries generally follow the same inverted-U pattern of economic development, first adding and then losing manufacturing jobs as they develop.

Figures 1–3 establish that, though manufacturing in some countries represents a larger total share of a country's domestic workforce than in the United States, the *loss* of manufacturing jobs—and thus the basis for any "*de*industrialization" claim—is happening around the world. (Despite recent U.S. industrial job gains, the U.S. Bureau of Labor Statistics expects the longer-term downward trend to continue in the

Figure 2

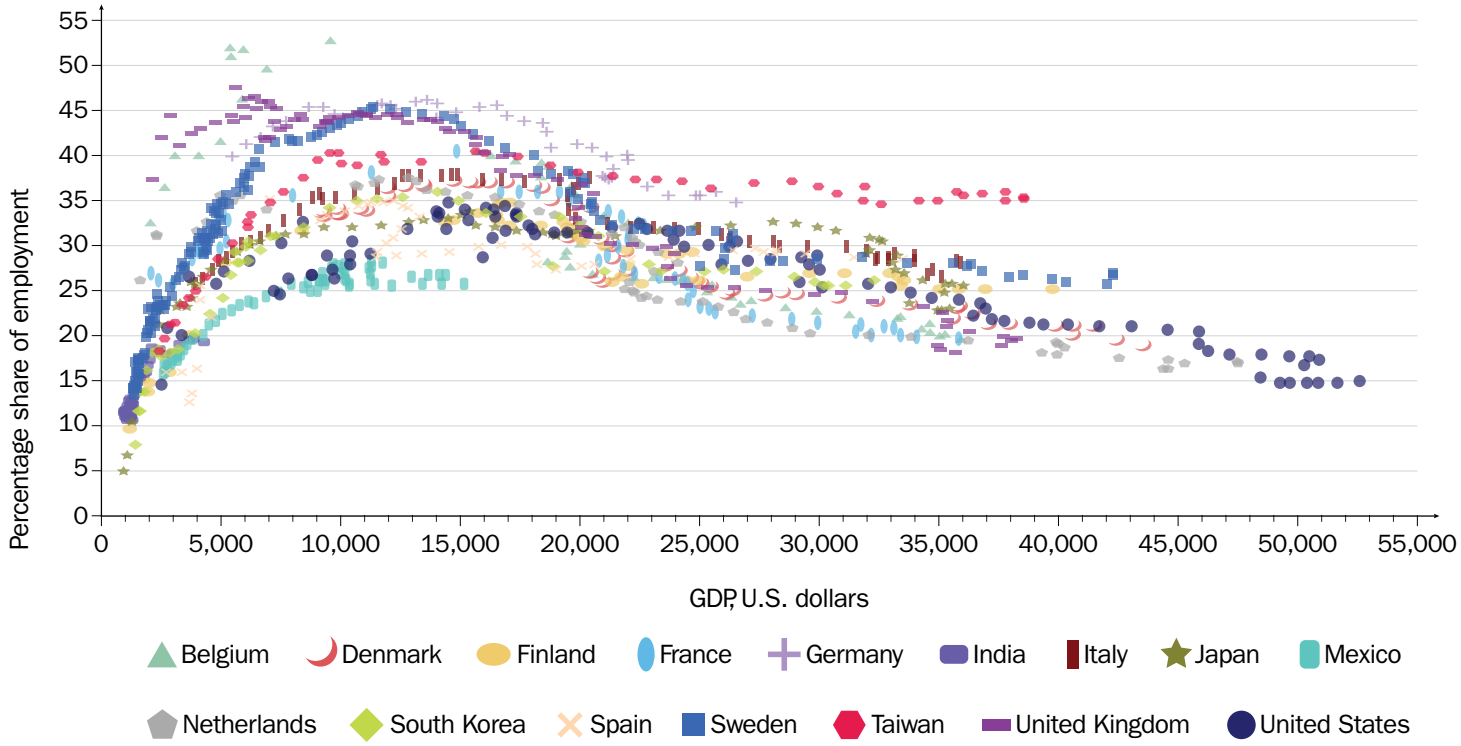
Share of employment in manufacturing in selected advanced economies



Source: Robert Z. Lawrence, "Recent US Manufacturing Employment: The Exception That Proves the Rule," Peterson Institute for International Economics Working Paper no. 17-12, November 2017.

Figure 3

Manufacturing share of total employment vs. gross domestic product (GDP) per capita



Source: "GDP per Head vs Share of Industry in Employment, 1801 to 2015," Our World in Data, https://ourworldindata.org/grapher/gdp-vs-manufacturing-employment?time=1801..2015.

> "In reality, neither job gains nor job losses demonstrate a vibrant (or lagging) American industrial sector."

next decade, projecting a loss of almost 445,000 U.S. manufacturing jobs from 2019 to 2029.[12]) Thus, for example, U.S. policy might have been able to increase overall manufacturing employment at some point, but the trends—including the significant decline in jobs from the late 1990s to the late 2000s—would have remained essentially unchanged.[13] Therefore, the changes in manufacturing jobs alone provide little insight into the state of American manufacturing or related U.S. policies.

Aggregate employment trends also say little about the ability of U.S. workers to produce essential goods during a national emergency. For example, U.S. manufacturing employment increased by almost 1 million jobs between 2010 and 2018, "outperforming" Germany, Japan, and China in the process. However, over the same period, real manufacturing value-added per worker and per hour worked in the United States increased by only 0.3 percent per year and 0.1 percent per year, respectively, as compared to 5.6 percent and 5.7 percent per year between 2000 and 2008—a time of significant manufacturing job *loss* in the United States.[14] In other words, American workers were improving their ability to produce manufactured goods (and thus to supply the economy in times of war or other emergency) at a much more rapid pace during the height of "deindustrialization" than during the subsequent period of "reindustrialization." In reality, neither job gains nor job losses demonstrate a vibrant (or lagging) American industrial sector. There also is little to indicate that U.S. manufacturing jobs deserve special government support.[15]

GDP SHARE. Manufacturing's declining share of total U.S. GDP also reflects secular trends largely disconnected from U.S. government policy. First, the change in the industrial sector's GDP share reflects the relative strength of the U.S. services sector instead of the weakness of American manufacturing. Indeed, between 1997 and 2019, real gross output and real value-added of private services–producing industries increased by 87 percent and 77.4 percent, respectively, while the same metrics for U.S. manufacturing increased by a slower-but-still-respectable 18.7 percent and 52.8 percent—continuing long-term trends in these U.S. sectors dating back to the 1940s.[16]

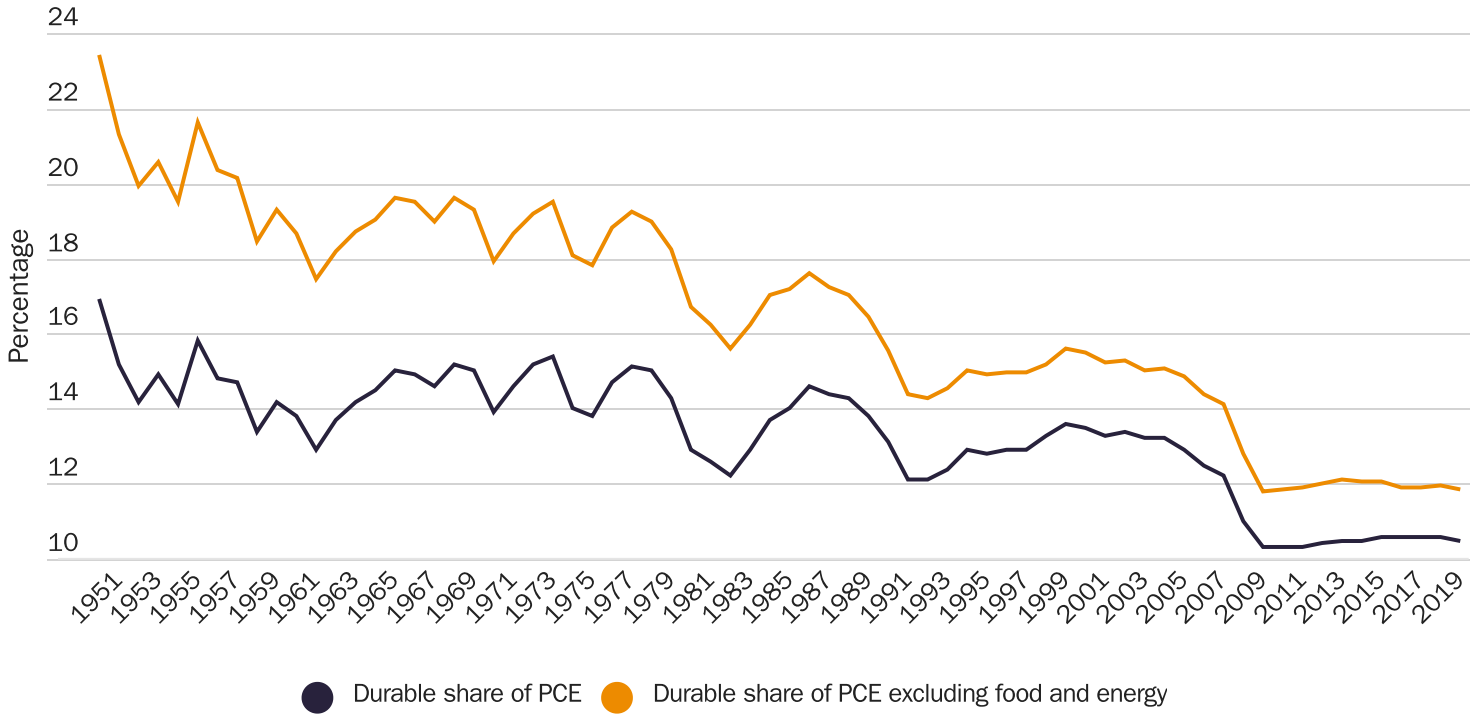
Second, the relative growth of services versus manufacturing reflects fundamental shifts in consumption patterns in the United States and other countries away from goods and toward services.[17] In the United States, "consumers, government, and investors have been devoting declining shares of nominal spending to goods relative to services" since the 1960s, and "the overall impact, inclusive of investment expenditure on equipment and software, was a decline in nominal US spending on goods relative to services by 1.47 log points (percent) per year over the entire period."[18] Thus, U.S. consumers were allocating half of all their spending on consumption to goods—50.3 percent—in 1960 but only 33 percent by 2010. Over the same period, U.S. government consumption and investment expenditure on goods dropped from 61 percent to 42 percent.[19] As shown in Figure 4, Americans' consumption of durable goods as a share of total consumption has similarly declined since the 1950s.

These relative consumption trends coincide with the U.S. manufacturing sector's declining share of U.S. GDP (see Figure 1), and these factors have coincided over time: documenting trends in U.S. consumption and manufacturing value-added between 1900 and 2000, for example, economists Francisco Buera and Joseph Kaboski found a "strong connection" between the two.[20] The onset of COVID-19 in the United States again showed the link between consumer spending and manufacturing sector performance: U.S. manufacturers during the summer of 2020 *outperformed* domestic service providers because several factors—including "catch-up" purchases that were delayed in the spring; continued restrictions on many services; consumer unease about public exposure; and stimulus payments—had pushed homebound Americans to increase their relative consumption of goods over this period.[21]

Nor are the consumption and output trends limited to the United States or even other developed countries.[22] Lawrence Edwards and

Figure 4

Durable goods share of U.S. personal consumption, 1950–2019



Source: "Table 2.3.5. Personal Consumption Expenditures by Major Type of Product," National Income and Product Accounts, National Data, Bureau of Economic Analysis, last revised November 25, 2020, https://apps.bea.gov/iTable/iTable.cfmreqid=19&step=2&isuri=1&1921=survey#reqid=19&step=2&isuri=1&1921=survey.

Note: PCE = personal consumption expenditures.

Robert Lawrence found that the share of national spending on goods between 1970 and 2010 declined at a similar rate in Australia, Canada, Denmark, France, Italy, South Korea, the Netherlands, the United Kingdom, and the United States (though the United States had the lowest total share [34 percent] by 2010).[23] As shown in Figure 5, advanced economies' manufacturing-GDP shares followed suit.

The declining role of manufacturing in a nation's economy is a standard story of economic development, not cause for alarm or criticism of national economic policy. As shown in Buera and Kaboski's 2012 examination of 31 countries representing 68 percent of world population and 80 percent of 2000 GDP (reproduced in Figures 6a, 6b, 6c, and 7), both the manufacturing sector's share of total value-added (Figure 6a) and its relationship to services value-added (see Figure 7) follow the same inverted-U pattern (increasing then decreasing) as *every* nation develops.[24] Each country's experience with services (see Figure 6b) and agriculture (see Figure 6c) is also similar to those of other countries.

In sum, both the manufacturing employment and GDP-share trends occurring in the United States reflect macroeconomic forces affecting most industrialized countries around the world in the same way and thus cannot be a proxy for the state of the U.S. manufacturing sector or an indicator of the success or failure of previous U.S. policy.

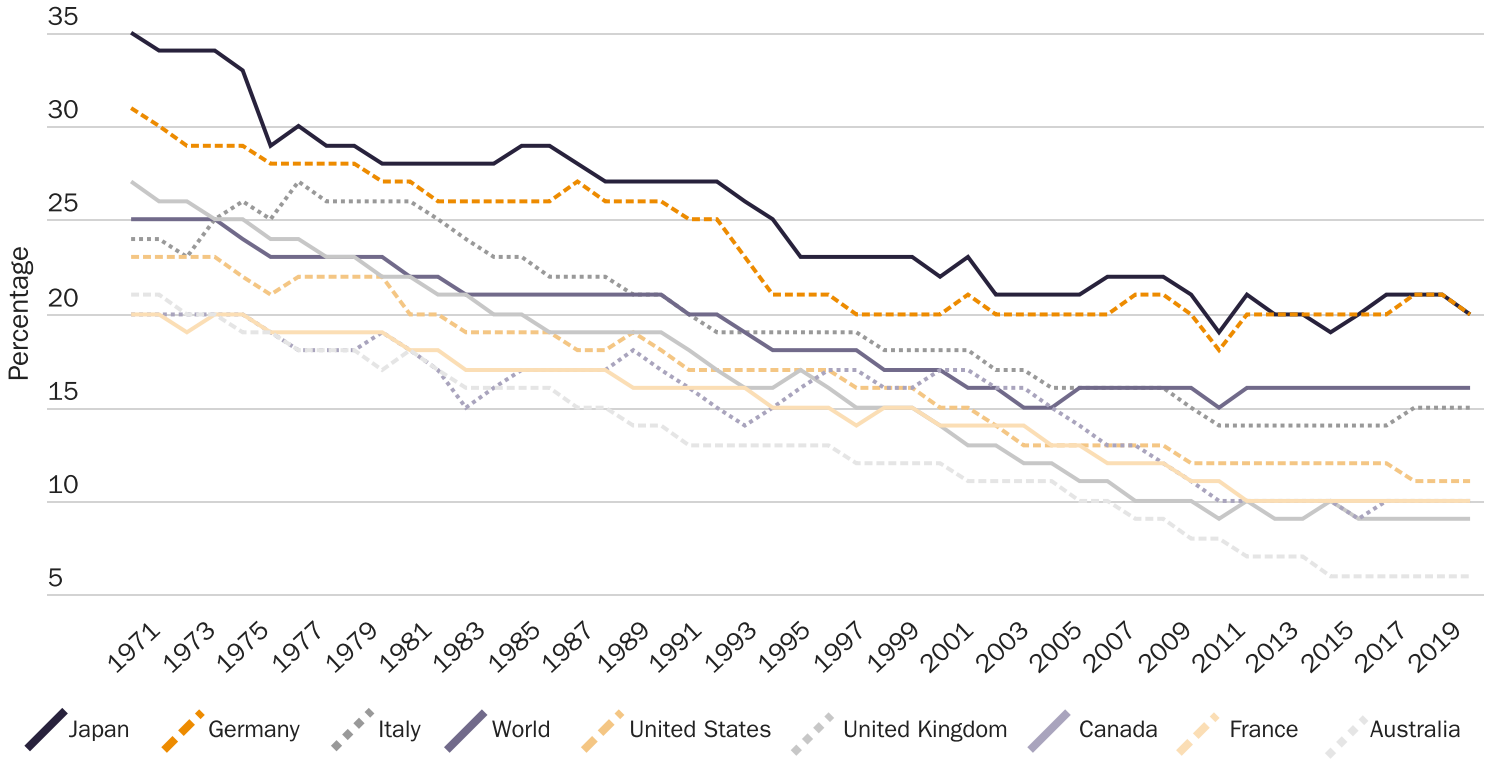
U.S. Productive Capacity Remains High Both Overall and in Security-Related Industries

Furthermore, employment and GDP share trends say little about the nation's "industrial capabilities" (i.e., its ability to produce the goods that the country needs in times of war or other national emergencies), which along with access to similar capabilities abroad is what the U.S. Department of Defense (DOD) considers critical for national security.[25] By this metric, the United States shows little weakness. Despite

> "The industrial sector's declining GDP share reflects the relative strength of the U.S. services sector instead of the weakness of American manufacturing."

Figure 5

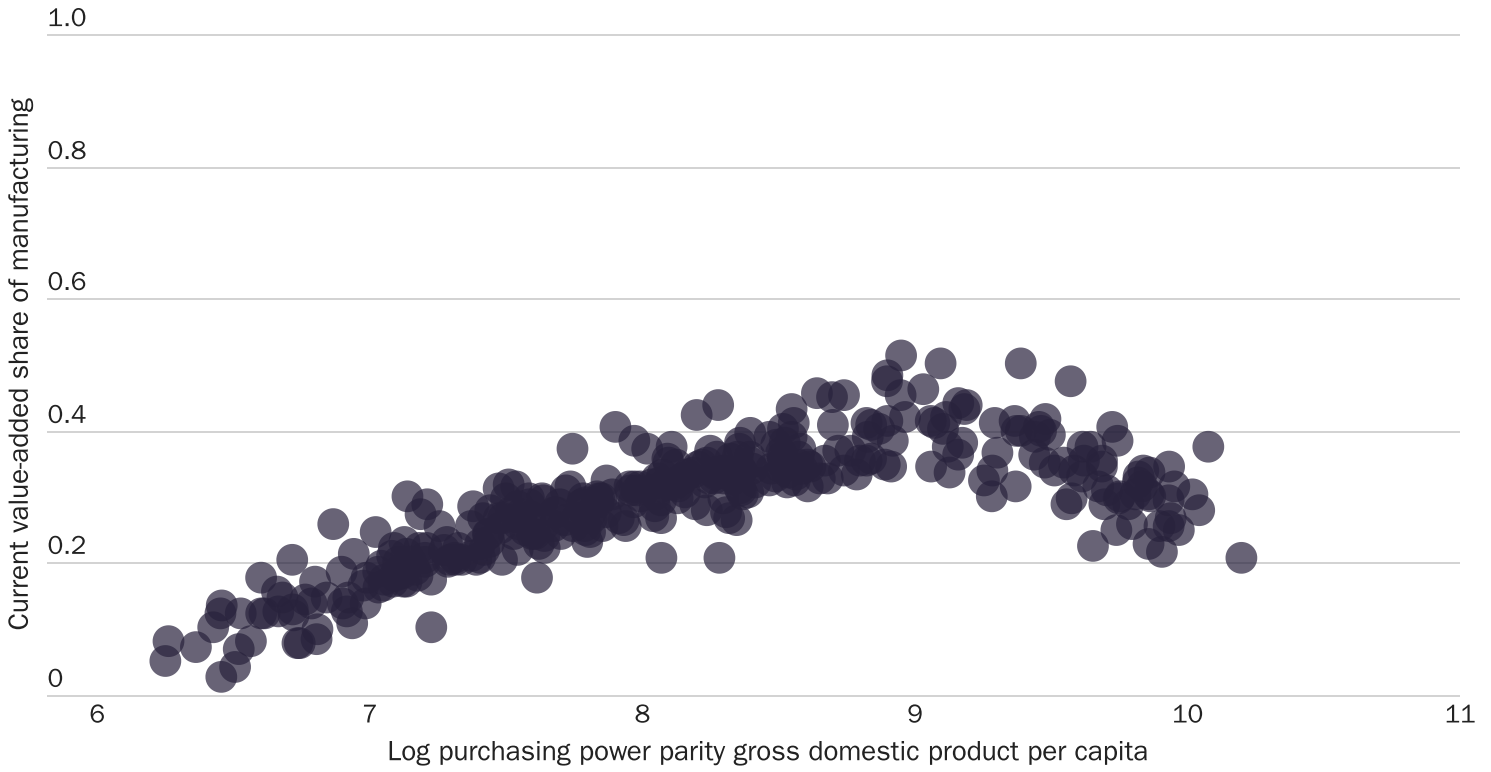
Manufacturing share of gross domestic product in selected advanced economies



Source: United Nations data, https://unstats.un.org/unsd/snaama/Downloads.

Figure 6a

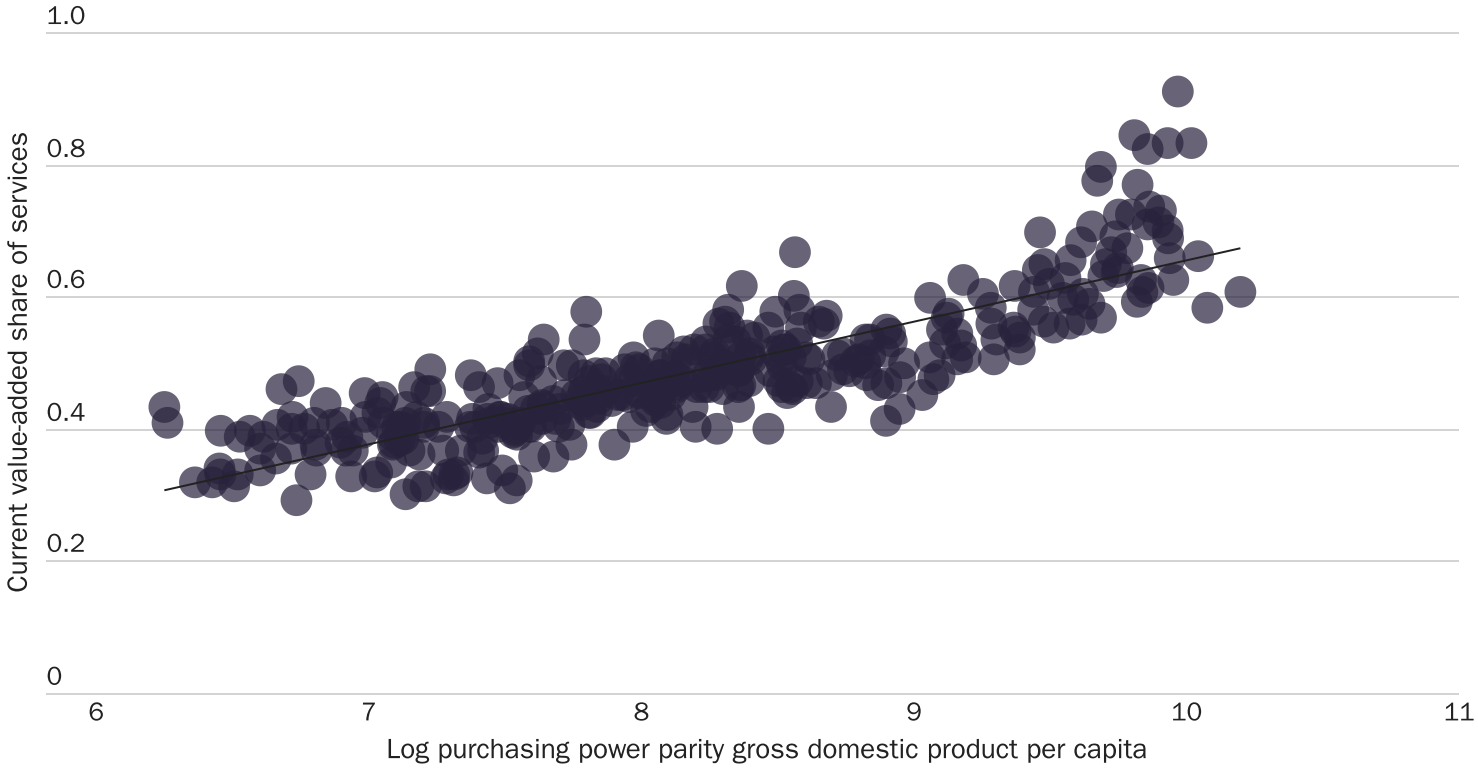
Manufacturing share vs. per capita income (country panels)



Source: Francisco J. Buera and Joseph P. Kaboski, "Scale and the Origins of Structural Change," *Journal of Economic Theory* 147, no. 2 (March 2012).

Figure 6b

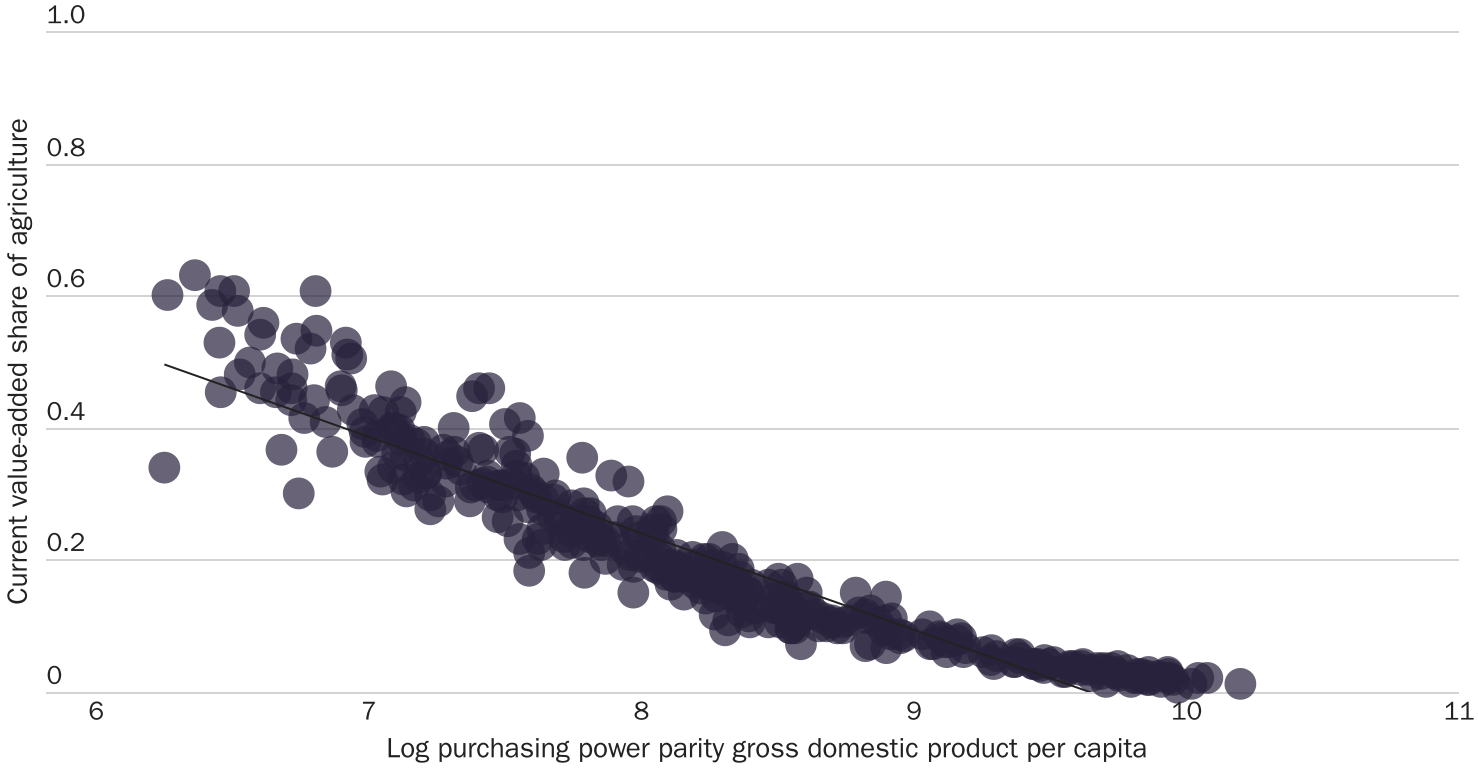
Services share vs. per capita income (country panels)



Source: Francisco J. Buera and Joseph P. Kaboski, "Scale and the Origins of Structural Change," *Journal of Economic Theory* 147, no. 2 (March 2012).

Figure 6c

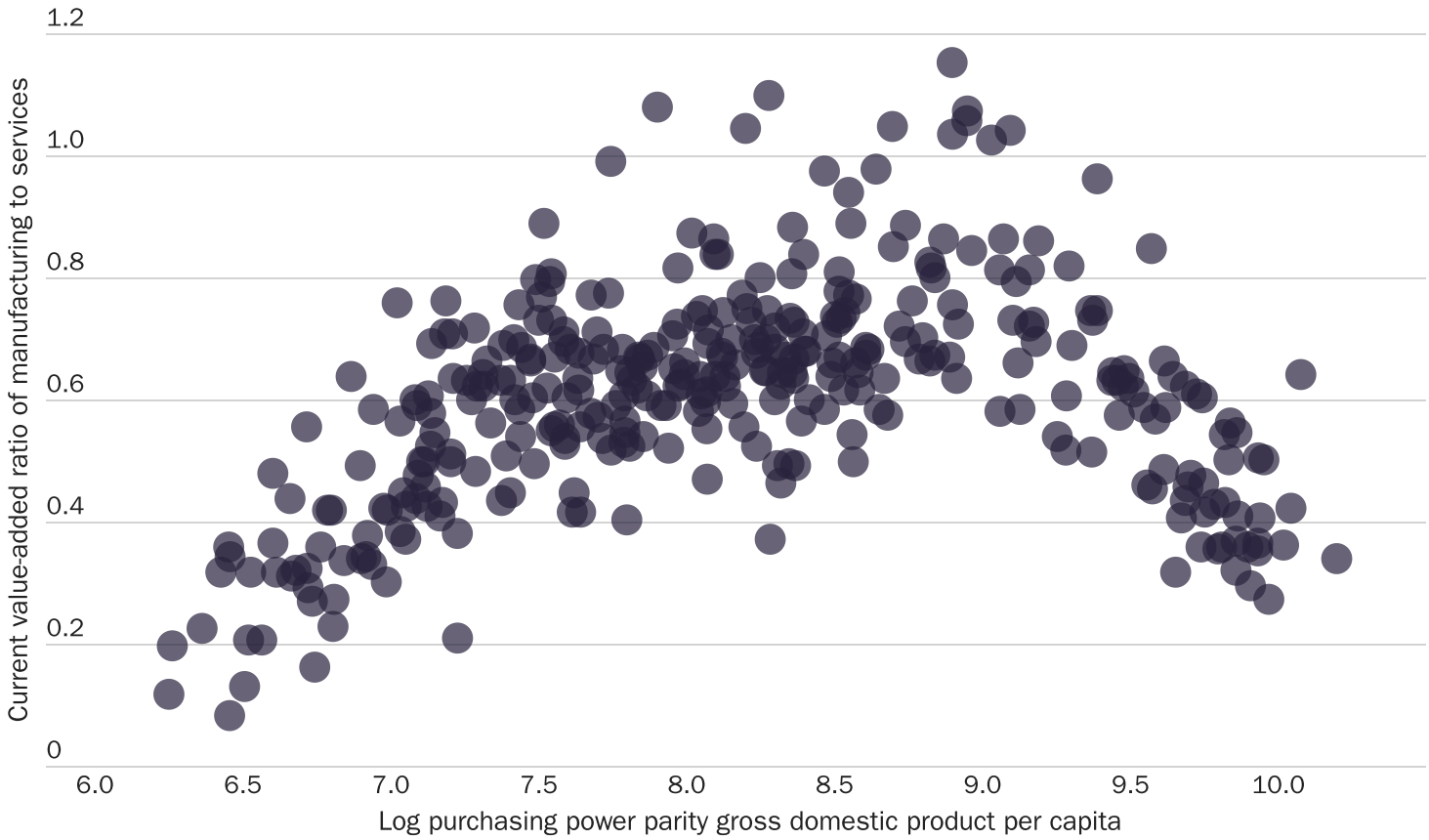
Agriculture share vs. per capita income (country panels)



Source: Francisco J. Buera and Joseph P. Kaboski, "Scale and the Origins of Structural Change," *Journal of Economic Theory* 147, no. 2 (March 2012).

Figure 7

Ratio of manufacturing to services value-added vs. per capita income (country panels)



Source: Francisco J. Buera and Joseph P. Kaboski, "Scale and the Origins of Structural Change," *Journal of Economic Theory* 147, no. 2 (March 2012).

> "The manufacturing industries most closely associated with 'national security' have prospered."

popular claims that the United States has suffered a broad decline in productive capacity, the U.S. manufacturing sector actually remains among the most productive in the world and has expanded since the 1990s—continuing earlier period trends in output, investment, and profitability that the Cato Institute's Daniel Ikenson documented in 2007.[26] Also, the manufacturing industries most closely associated with "national security" (e.g., metals, transportation, defense, computers and electronics, pharmaceuticals, and medical goods) have prospered.

THE UNITED STATES REMAINS A GLOBAL MANUFACTURING LEADER. Comparisons of U.S. manufacturing with other countries' sectors (see Table 2) show that the United States continues to be at or near the top of most categories, including output, exports, and investment.

As shown in Table 2, the United States in 2018 ranked second in the world in total real manufacturing value-added and merchandise exports. The United States ranked third globally for exports of "manufactures"; however, this category excludes important U.S. manufactured goods such as fuels and certain foods, and European Union (EU) bloc and country numbers are inflated because they include intra-EU trade (e.g., German exports to France).[27] The U.S. manufacturing sector's performance is also strong on a per capita or per manufacturing worker basis, outperforming China and several other top manufacturing countries. Among Organisation for Economic Co-operation and Development nations, moreover, the United States is the top recipient of manufacturing foreign direct investment (FDI)—more than doubling the second-place nation. In 2018, FDI inflows into the U.S. manufacturing sector alone (almost $167 billion) were larger than *total* FDI inflows into China for the same year ($138 billion). Inward FDI stocks in the U.S. manufacturing sector reached $1.77 *trillion* that same year.[28]

Table 2

Top manufacturing countries, 2018 (millions of dollars, unless otherwise noted)

Country	Manufacturing value-added	Merchandise exports	Manufactures exports	FDI inflows (total)	FDI inflows (manufacturing)	Manufacturing value-added per worker (dollars)
China	$3,884,451	$2,486,695	$2,318,153	$138,305	n/a	$29,188
United States	$2,300,398	$1,663,982	$1,176,498	$253,561	$166,889	$177,127
Japan	$959,243	$738,143	$641,106	$9,858	$13,242	$92,448
Germany	$746,485	$1,560,539	$1,364,575	$73,570	$12,826*	$96,632
South Korea	$427,724	$604,860	$528,991	$12,183	$5,245	$94,841
India	$409,087	$324,778	$223,265	$42,156	n/a	$7,169
Italy	$289,160	$549,527	$452,134	$32,886	$8,481	$73,292
United Kingdom	$279,298	$486,439	$468,817	$65,299	$4,058*	$108,223
France	$260,321	$581,774	$462,086	$38,185	$20,128	$100,938
Mexico	$214,789	$450,685	$362,608	$34,745	$16,318	$29,931

Sources: United Nations Conference on Trade and Development; World Trade Organization; Conference Board; Organisation for Economic Co-operation and Development; and author's calculations.

Notes: FDI = foreign direct investment. Gross domestic product value-added figures were provided in 2015 dollars and have not been adjusted. All other figures are in 2018 dollars. Organisation for Economic Co-operation and Development data were not provided for "n/a" countries. Germany FDI inflows (manufacturing) is 2017, and UK FDI (manufacturing) is 2015 (the latest data available).

In short, the United States remains a major global manufacturer and a top destination for manufacturing investment.

THE UNITED STATES' INDUSTRIAL CAPABILITIES KEEP EXPANDING. Second, historical data on the U.S. manufacturing sector show it to be growing. As shown in Figure 8, real (inflation-adjusted) U.S. manufacturing value-added and gross output were up significantly between 1997 and 2018.

Furthermore, investment in the manufacturing sector—capital expenditures, research and development (R&D), and FDI—has been consistent and strong. (See Figures 9 and 10.) Finally, as shown in Figure 11, the sector has also experienced improved financial performance since 2001 (the first year of data available), with inflation-adjusted gains in revenues, post-tax income, and assets.

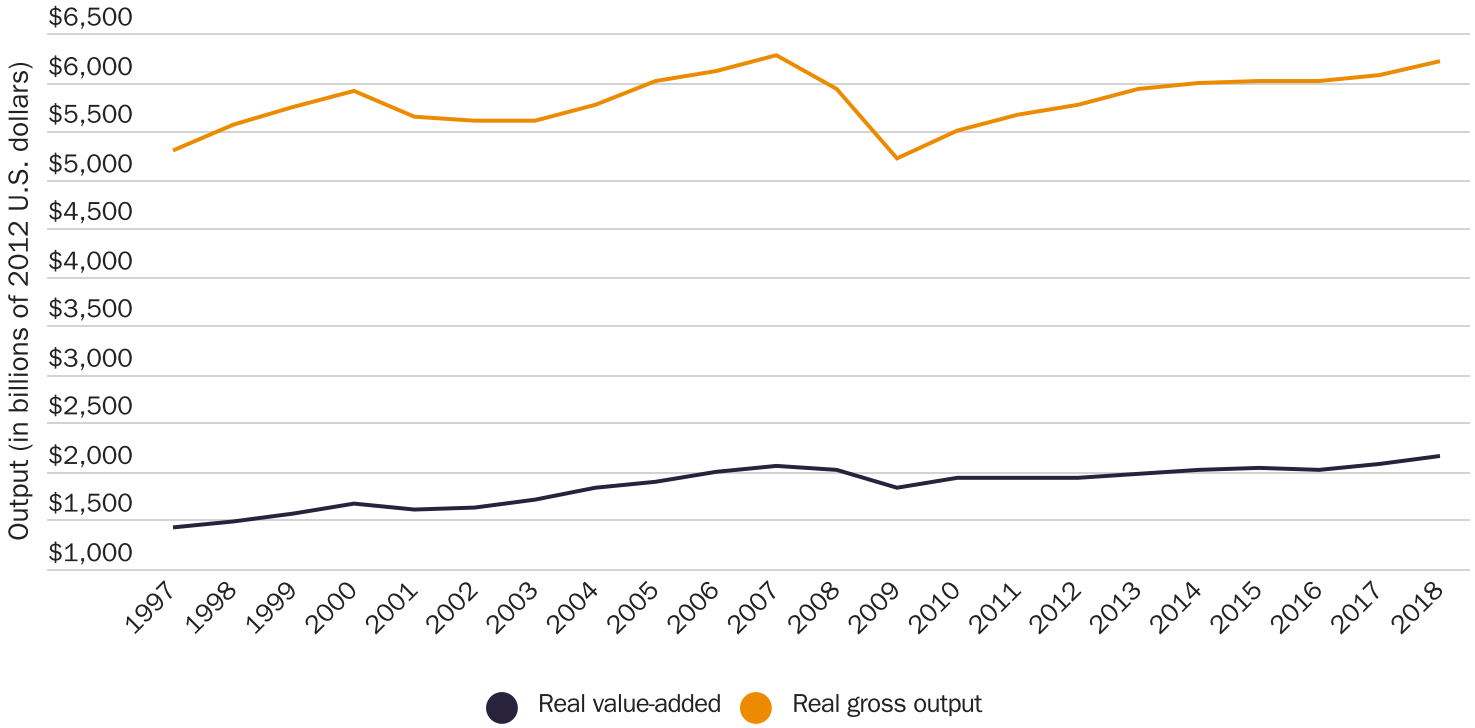
Based on these and other data, the last two DOD reports on the U.S. defense industrial base concluded that it is "profitable and expanding" overall. In fact, the latest report for fiscal year 2019 (issued June 23, 2020) states that the largest six prime defense suppliers (Lockheed Martin, Boeing, Northrop Grumman, Raytheon, General Dynamics, and BAE Systems) "are financially healthy and continue to expand in market share" and that their "investments hit a six year high in 2018 at $33.9 billion with firms investing largely in acquisition of subsidiaries, R&D, and capital expenditures."[29]

A longer-term view of these data is essential to evaluating the sector's performance. Some of the more negative analyses of U.S. manufacturing provide an incomplete view because they fail to account for either the Great Recession, which collapsed global output and employment, or the manufacturing "mini-recession" in 2015–16, caused by an unexpected collapse in global oil prices—issues clarified by updating the data through 2018 (when U.S. trade conflicts halted the sector's improvement).[30] Indeed, the problems with taking a narrow snapshot are revealed by examining employment trends in the United States and other top manufacturing countries

> "The United States remains a major global manufacturer and a top destination for manufacturing investment."

Figure 8

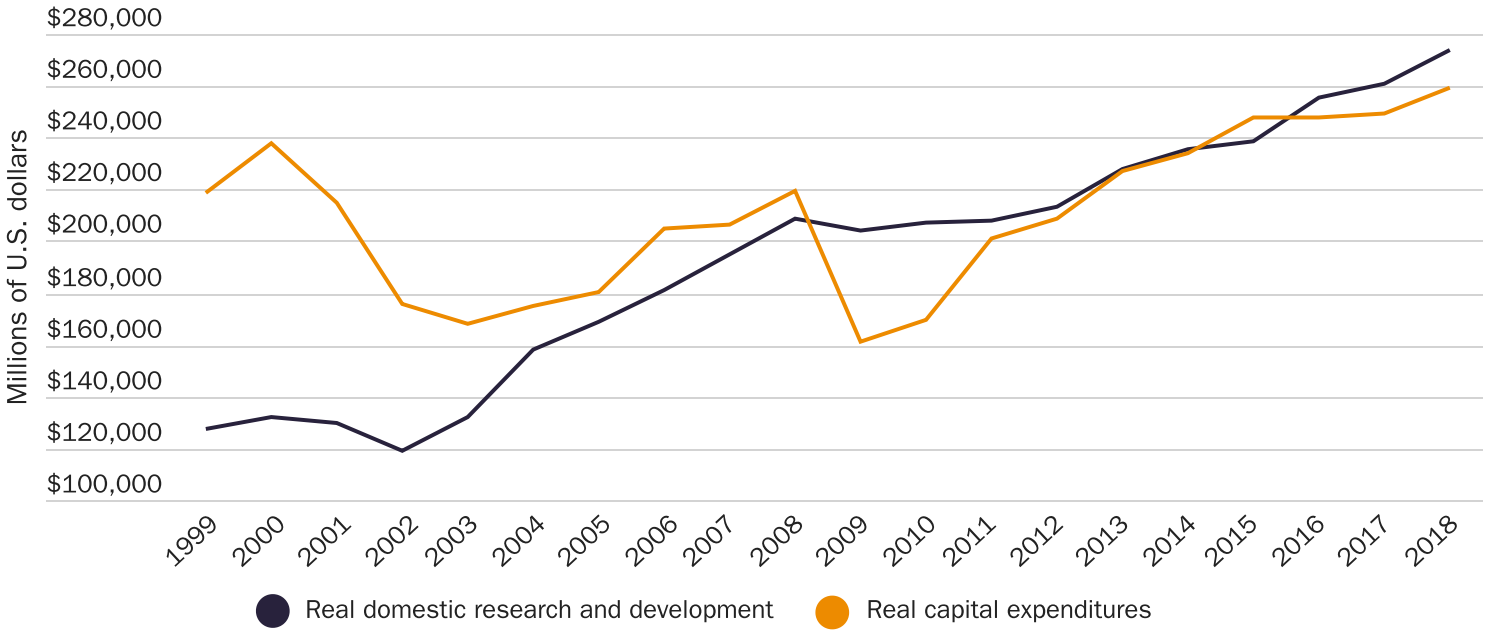
U.S. manufacturing output and value-added, 1997–2018



Source: "GDP-by-Industry," Bureau of Economic Analysis, updated December 10, 2020, https://apps.bea.gov/iTable/index_industry_gdpIndy.cfm.

Figure 9

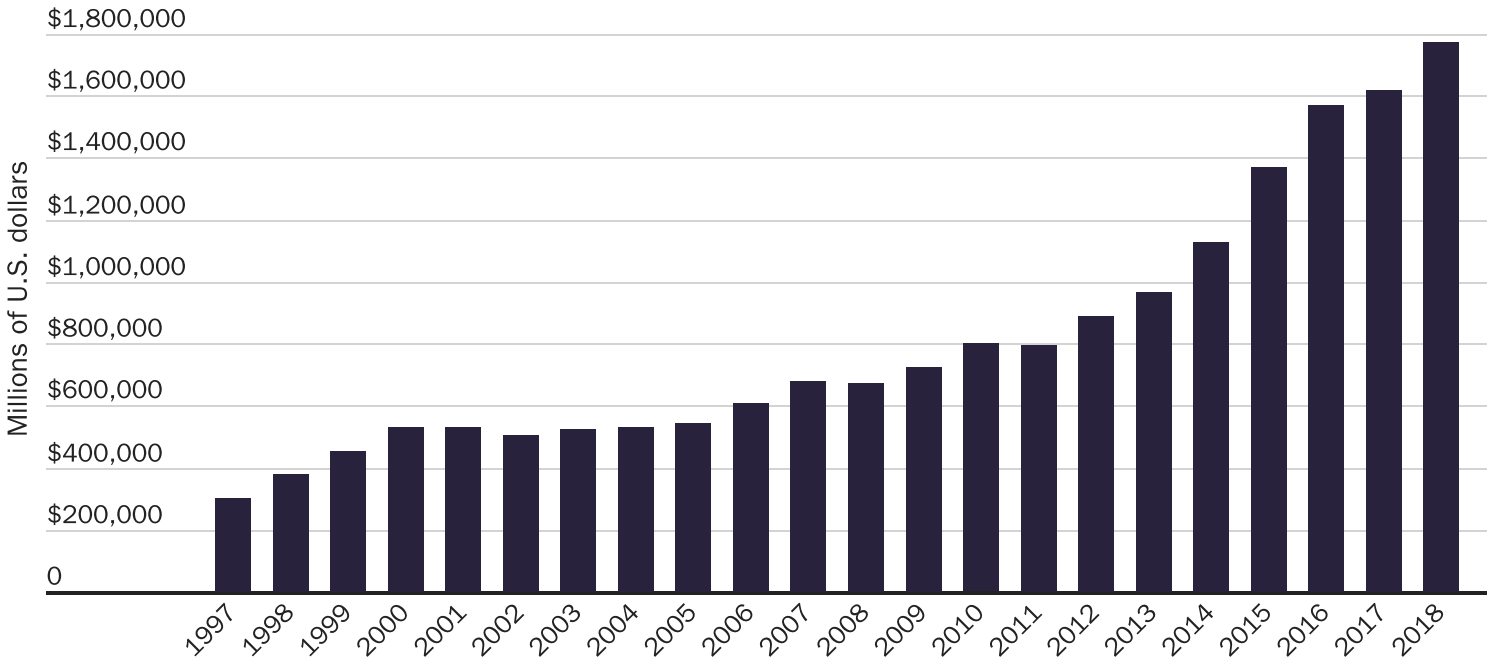
U.S. manufacturing investment, 1999–2018



Sources: "Research and Development: U.S. Trends and International Comparisons," Science and Engineering Indicators, National Science Board, https://ncses.nsf.gov/pubs/nsb20203/u-s-business-r-d; and "2019 Annual Capital Expenditures Survey Tables," U.S. Census Bureau, December 16, 2020, https://www.census.gov/data/tables/2019/econ/aces/2019-aces-summary.html.
Deflator: "Table 1.1.9. Implicit Price Deflators for Gross Domestic Product," National Income and Product Accounts, National Data, Bureau of Economic Analysis, https://apps.bea.gov/iTable/iTable.cfm?reqid=19&step=3&isuri=1&1921=survey&1903=13#reqid=19&step=3&isuri=1&1921=survey&1903=13.

Figure 10

Real foreign direct investment position in the United States: manufacturing, 1997–2018

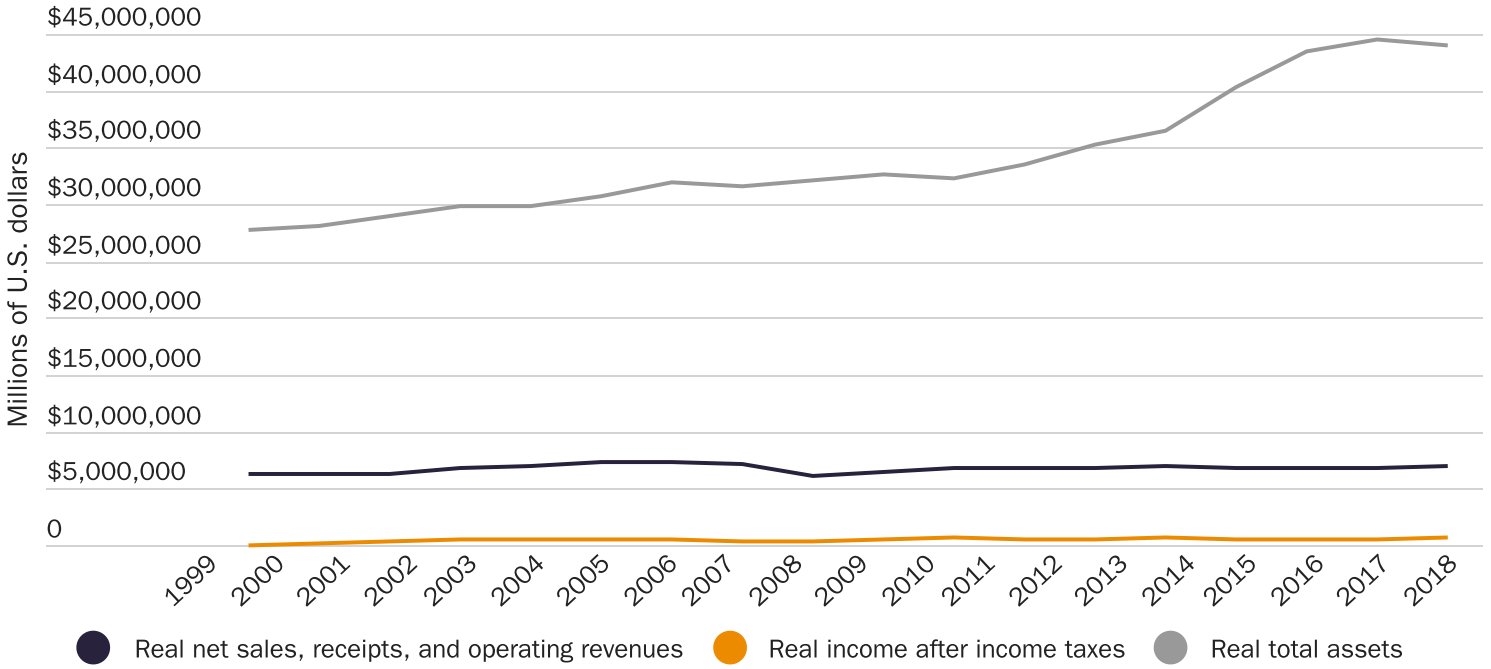


Source: "Foreign Direct Investment in the U.S.: Balance of Payments and Direct Investment Position Data," Bureau of Economic Analysis, https://www.bea.gov/international/di1fdibal.

Deflator: "Table 1.1.9. Implicit Price Deflators for Gross Domestic Product," National Income and Product Accounts, National Data, Bureau of Economic Analysis, https://apps.bea.gov/iTable/iTable.cfm?reqid=19&step=3&isuri=1&1921=survey&1903=13#reqid=19&step=3&isuri=1&1921=survey&1903=13.

Figure 11

U.S. manufacturing sector financial performance, 2001–2018



Source: "Quarterly Financial Report (QFR): Manufacturing, Mining, Trade, and Selected Service Industries," U.S. Census Bureau, https://www.census.gov/econ/qfr/.

Deflator: "Table 1.1.9. Implicit Price Deflators for Gross Domestic Product," National Income and Products Accounts, National Data, Bureau of Economic Analysis, https://apps.bea.gov/iTable/iTable.cfm?reqid=19&step=3&isuri=1&1921=survey&1903=13#reqid=19&step=3&isuri=1&1921=survey&1903=13.

> "Topline data hide significant changes in the manufacturing sector over the past two decades in response to various economic forces."

between 2010 and 2018. These data show that the United States (1.1 percent annual growth; 956,000 jobs gained) has had stronger employment growth than Germany (1.0 percent; 440,000 jobs), Japan (–0.4 percent; –229,000 jobs), and China (–0.5 percent; –9.5 million jobs).[31] Just as it would be inappropriate to claim that this single datapoint captures the true state of these diverse, multitrillion dollar manufacturing sectors (or the national policies affecting them), so does using other short-term snapshots to argue the same.[32]

The topline data do, however, hide significant changes in the manufacturing sector over the past two decades in response to various economic forces. Some industries have indeed contracted since the 1990s, but often these changes reflect fundamental shifts in U.S. and global markets as opposed to a weak manufacturing sector. They are also often offset by gains in other, related industries. For example, as shown in Table 3, automobile manufacturing output dropped by almost 60 percent between 1997 and 2018, but light truck and SUV production grew by 175 percent over the same period.

This shift speaks to evolving U.S. consumer tastes (away from cars to SUVs) instead of American "deindustrialization" (though offshoring of some car production, especially to Mexico, has occurred). Furthermore, the high U.S. tariff on light trucks cannot explain increased U.S. SUV production, as only two-door SUVs are covered by the tariff. (The tariff also does not apply to imports from certain U.S. trade agreement partners.)[33]

These and other U.S. manufacturing data (see the Annex at URL) also reveal a flexible and dynamic sector that is generally responsive to market forces—a flexibility that can prove critical in times of unexpected national emergency. For example, high demand for hand sanitizer, cleaning products, and face masks in

Table 3
U.S. automotive production by industry

Industry segment	2018 real gross output (billions of U.S. dollars)	Percentage change (1997–2018)
Motor vehicles, bodies and trailers, and parts	711.7	53.4%
Automobile manufacturing	40.6	–58.7%
Light truck and utility vehicle manufacturing	311	175.0%
Heavy duty truck manufacturing	30.9	46.4%
Motor vehicle body, trailer, and parts manufacturing	326.1	41.5%
Motor vehicle body manufacturing	15.3	26.4%
Truck trailer manufacturing	9.7	19.8%
Motor home manufacturing	4.9	0.0%
Travel trailer and camper manufacturing	13.1	101.5%
Motor vehicle gasoline engine and engine parts manufacturing	36.6	11.2%
Motor vehicle electrical and electronic equipment manufacturing	26.4	22.8%
Motor vehicle transmission and power train parts manufacturing	40.2	17.5%
Motor vehicle seating and interior trim manufacturing	34.1	189.0%
Motor vehicle metal stamping	43.2	58.8%
Other motor vehicle parts manufacturing	74.3	54.1%
Motor vehicle steering, suspension component (except spring), brake systems manufacturing	28.5	19.2%

Source: "Gross Output by Industry," Bureau of Economic Analysis, September 30, 2020, https://www.bea.gov/data/industries/gross-output-by-industry#:~:text=What%20is%20Gross%20Output%20by,inputs%20not%20counted%20in%20GDP).

the wake of COVID-19 caused small and large manufacturers across the country to retool their operations and thereby meet Americans' essential material needs.[34] This rapid transition is a testament to not only the hard work and ingenuity of U.S. retailers and manufacturers but also the United States' economic dynamism and industrial capabilities more broadly.

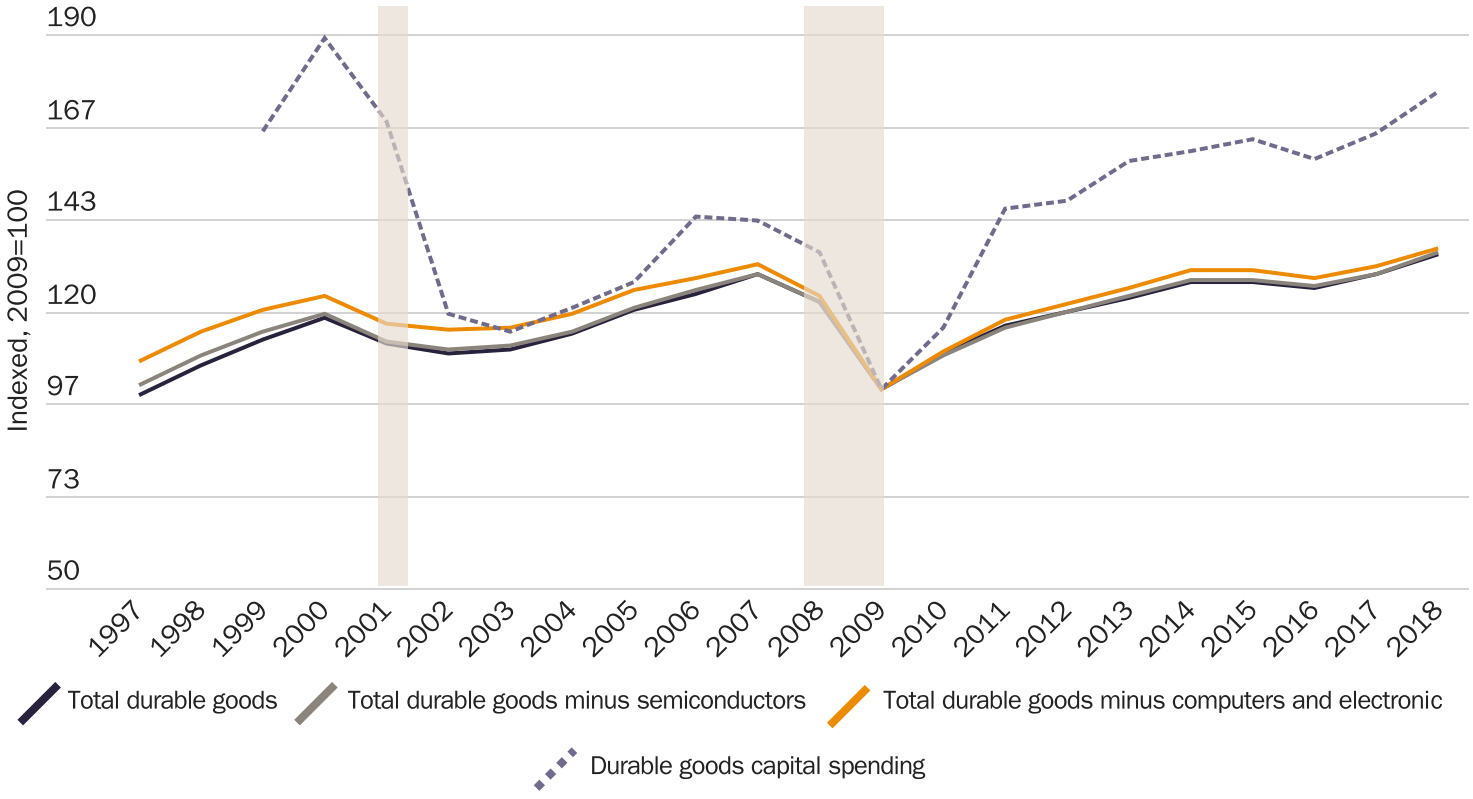
INDUSTRY-SPECIFIC DATA REVEAL STRENGTH WHERE IT COUNTS. Detailed breakdowns of U.S. manufacturing data also show a stark divide between durable goods (i.e., the goods such as metals, planes, and machinery that we most commonly associate with "national security") and nondurable goods (e.g., food and textiles). In particular, U.S. durable goods production (real gross output and real value-added) has increased significantly—by 35.9 percent and 109 percent, respectively—since 1997 (see Figure 12), while nondurable goods output has sagged (see Table 4). The durable-goods gains are not, as some have claimed, merely the result of adjustments for increases in computing power.[35] Excluding the entire computers and electronics industry (including semiconductors), U.S. durable goods' real gross output and real value-added still increased by more than 26 percent and 60 percent, respectively, since 1997 and, excluding only semiconductors, 109.1 percent and 35 percent.

Eliminating these thriving sectors, of course, *overcompensates* for any technical adjustment issues, as U.S. computer, electronics, and semiconductor firms undoubtedly produce important and globally competitive products and employ hundreds of thousands of American workers. Doing so also raises questions about what *other sectors* may need to

> "U.S. durable goods production has increased significantly since 1997, while nondurable goods output has sagged."

Figure 12

Real U.S. durable goods manufacturing output and investment



Sources: "Gross Output by Industry," Bureau of Economic Analysis, September 30, 2020, https://www.bea.gov/data/industries/gross-output-by-industry#:~:text=What%20is%20Gross%20Output%20by,inputs%20not%20counted%20in%20GDP); and "Annual Capital Expenditures: 2017," U.S. Census Bureau, March 13, 2019, https://www.census.gov/library/publications/2019/econ/2017-aces-summary.html.
Deflator: "Table 1.1.9. Implicit Price Deflators for Gross Domestic Product," National Income and Product Accounts, National Data, Bureau of Economic Analysis, https://apps.bea.gov/iTable/iTable.cfm?reqid=19&step=3&isuri=1&1921=survey&1903=13#reqid=19&step=3&isuri=1&1921=survey&1903=13.

Table 4

Change in U.S. nondurable goods manufacturing output, total and select industries

Industry	Percentage change in real value-added (1997–2018)	Percentage change in real gross output (1997–2018)
Total nondurable goods	0.2%	3.53%
Food and beverage and tobacco products	8.3%	12.5%
Food manufacturing	45.6%	27.9%
Beverage manufacturing	86.2%	22.2%
Tobacco product manufacturing	–72.7%	–70.1%
Textile mills and textile product mills	–38.9%	–51.5%
Apparel and leather and allied products	–65.4%	–81.6%
Paper products	–36.3%	–22.4%
Printing and related support activities	5.6%	–30.1%
Petroleum and coal products	13.0%	21.5%
Chemical products	14.2%	4.9%
Nondurable goods (excluding textiles, apparel, paper, printing, tobacco)	22.9%	10.3%

Source: "GDP-by-Industry," Bureau of Economic Analysis, updated December 10, 2020, https://apps.bea.gov/iTable/index_industry_gdpIndy.cfm.

> "The industries that are most closely tied to national security—including those now prioritized due to COVID-19—have not experienced significant historical declines and in most cases have expanded."

be discounted or excluded when evaluating the "true" state of the nation's overall productive capacity. For example, should we also exclude the data for the paper and printing, tobacco, and magnetic and optical media (e.g., cassette tapes and CDs) industries—which have declined due to fundamental market changes and are thus unrelated to any "deindustrialization" concerns? Eliminating these industries would reveal even more impressive manufacturing sector gains since the late 1990s.

As shown in Table 4, moreover, declines in nondurable goods production have been driven by basic, low-margin consumables such as textiles and apparel; by tobacco; or by "dematerialized" goods such as paper—*not* other nondurables such as chemicals (including pharmaceuticals) and energy that might have a national security nexus.[36] Remove the aforementioned decliners, and nondurable goods' real value-added and gross output increase by 22.9 percent and 10.3 percent, respectively, between 1997 and 2018.

By contrast, the industries that are most closely tied to national security—including those now prioritized due to COVID-19—have not experienced significant historical declines and in most cases have expanded. (See Table 5.) This category includes the goods directly involved in national defense (e.g., tanks, missiles, and munitions), as well as those indirectly related, including metals, computer and electronic products (including or excluding semiconductors), motor vehicles, aerospace products, ships medical equipment, energy, chemicals, and pharmaceuticals. Although certain sub-industries' output has risen and fallen over different periods (to be expected given business cycles, changing U.S. military operations, and other factors), the overall picture is one of stability and health, not decline.

These data also refute a common myth that industries unrelated to national security have driven gains in U.S. manufacturing output—the well-worn "we make potato chips, not microchips" argument. They also underscore why tying U.S. national security to trends in manufacturing employment or GDP share is so misguided.

Industry-level analyses corroborate these data in the two industries—semiconductors and medical goods—that Washington policymakers are now targeting for security-related support.

Table 5

Performance of select U.S. manufacturing industries related to national security (billions of U.S. dollars)

Industry	Real gross output			Real value-added		
	2018 total	Percentage change (1997–2018)	Percentage change in (2009–2018)	2018 total	Percentage change (1997–2018)	Percentage change in (2009–2018)
Iron and steel mills and manufacturing from purchased steel	$106.40	6.0%	29.0%			
Ammunition, arms, ordnance, and accessories manufacturing	$22.10	172.8%	104.6%			
Semiconductor machinery manufacturing	$8.80	–9.3%	44.3%			
Turbine and turbine generator set units manufacturing	$13.60	44.7%	14.3%			
Speed changer, industrial high-speed drive, and gear manufacturing	$3.60	–5.3%	16.1%			
Mechanical power transmission equipment manufacturing	$4.60	–6.1%	35.3%			
Other engine equipment manufacturing	$27.90	19.2%	65.1%			
Computer and peripheral equipment manufacturing	$42.60	258.0%	–17.8%	$34.50	4828.6%	32.2%
Electronic computer manufacturing	$22.80	570.6%	–28.5%			
Computer storage device manufacturing	$5.90	18.0%	–9.2%			
Computer terminals and other computer peripheral equipment manufacturing	$14.30	27.7%	24.3%			
Communications equipment manufacturing	$80.40	226.8%	87.4%	$66.20	1906.1%	148.9%
Telephone apparatus manufacturing	$16.90	70.7%	85.7%			
Broadcast and wireless communications equipment	$59.50	404.2%	111.0%			
Other communications equipment manufacturing	$5.70	7.5%	1.8%			
Semiconductor and other electronic component manufacturing	$113.40	184.2%	24.9%	$87.90	1658.0%	47.7%
Semiconductor and related device manufacturing	$64.90	654.7%	36.6%			
Printed circuit assembly (electronic assembly) manufacturing	$19.30	–1.5%	9.0%			
Electromedical and electrotherapeutic apparatus manufacturing	$43.00	418.1%	100.0%			
Search, detection, and navigation instruments manufacturing	$49.90	9.4%	–8.8%			
Analytical laboratory instrument manufacturing	$19.30	121.8%	43.0%			
Irradiation apparatus manufacturing	$14.20	468.0%	264.1%			
Light truck and utility vehicle manufacturing	$311.00	175.0%	196.5%	$34.60	27.7%	507.0%
Heavy duty truck manufacturing	$30.90	46.4%	45.1%	$6.90	–16.9%	137.9%

Table 5 (continued)

Industry	Real gross output			Real value-added		
	2018 total	Percentage change (1997–2018)	Percentage change in (2009–2018)	2018 total	Percentage change (1997–2018)	Percentage change in (2009–2018)
Motor vehicle body, trailer, and parts manufacturing	$326.10	41.5%	76.8%	$82.20	94.8%	184.4%
Aerospace product and parts manufacturing	$248.20	47.6%	31.5%	$121.40	54.3%	20.7%
Aircraft manufacturing	$129.60	52.8%	27.8%			
Aircraft engine and engine parts manufacturing	$51.10	43.5%	46.8%			
Other aircraft parts and auxiliary equipment manufacturing	$33.80	35.7%	4.3%			
Guided missile and space vehicle manufacturing	$27.50	62.7%	100.7%			
Propulsion units and parts for space vehicles and guided missiles	$6.40	6.7%	–1.5%			
All other transportation equipment manufacturing	$73.70	59.5%	2.6%	$25.60	53.3%	24.3%
Railroad rolling stock manufacturing	$13.10	22.4%	9.2%			
Ship building and repairing	$26.60	71.6%	4.3%			
Motorcycle, bicycle, and parts manufacturing	$8.90	117.1%	50.8%			
Military armored vehicle, tank, and tank component manufacturing	$5.90	181.0%	–61.9%			
All other transportation equipment manufacturing	$11.20	107.4%	55.6%			
Medical equipment and supplies manufacturing	$101.90	84.9%	6.9%	$62.00	103.3%	7.6%
Petroleum refineries	$848.50	23.4%	8.6%			
Petrochemical manufacturing	$62.60	20.4%	–21.9%			
Other basic organic chemical manufacturing	$128.30	0.3%	36.8%			
Medicinal and botanical manufacturing	$16.50	–3.5%	20.4%			
Pharmaceutical preparation manufacturing	$178.50	23.7%	1.5%			
In-vitro diagnostic substance manufacturing	$16.70	32.5%	36.9%			
Biological product (except diagnostic) manufacturing	$32.00	223.2%	11.1%			

Source: "GDP-by-Industry," Bureau of Economic Analysis, updated December 10, 2020, https://apps.bea.gov/iTable/index_industry_gdpIndy.cfm.
Note: BEA value-added figures not provided at the sub-industry level.

Semiconductors. Shortly before the end of the 116th Congress, both chambers approved by wide margins the National Defense Authorization Act for Fiscal Year 2021 (NDAA), which includes billions of dollars in federal support for the construction of domestic semiconductor manufacturing facilities and an R&D consortium. According to the Bureau of Economic Analysis (BEA), however, U.S. "semiconductor and other electronic component manufacturing" production reached $113.4 billion in real gross output and $88 billion in real value-added in 2018.[37] Real gross output for "semiconductor and related device manufacturing" alone reached $64.9 billion (more detailed value-added data are not available). The Semiconductor Industry of America (SIA) further notes that there are

commercial semiconductor manufacturing facilities in 18 states, employing more than 240,000 Americans, and that the United States has 12.5 percent of global semiconductor manufacturing capacity.[38] Furthermore, the largest share (44.3 percent) of U.S. companies' production occurs in the United States (while only 5.6 percent is in China, whose alleged dominance was the stated justification for the subsidies).

The United States is also a top-five global exporter of semiconductors and related equipment, shipping almost $47 billion of those goods in 2019.[39] These and other data led the SIA to conclude in its *2020 State of the U.S. Semiconductor Industry* report that "the semiconductor manufacturing base in the United States remains on solid footing."[40]

The SIA also reports that the U.S. industry has "nearly half" of all global semiconductor sales—a market share that has been steady (ranging from the mid-40s to low 50s) since the late 1990s—and is the top seller in every major regional market, including China. Sales by U.S. semiconductor firms also grew from $76.7 billion in 1999 to $192.8 billion in 2019—a compound annual growth rate of almost 5 percent.

Beyond output and sales, the U.S. semiconductor industry has been a global leader in capital spending (capex) and R&D. The SIA notes that total R&D and capex by U.S. semiconductor firms, including "fabless" companies that specialize in R&D but outsource actual chip manufacturing, was $71.7 billion in 2019, growing steadily between 1999 and 2019 at a 6.2 percent annual rate. R&D expenditures hit $39.8 billion last year, constituting 16.4 percent of the industry's total sales last year—an "R&D intensity" second only to pharmaceuticals in the United States and the highest of any semiconductor industry in the world. Capex has been similarly world-class: SIA reports that 2018 capital expenditures reached "an all-time high of $32.7 billion" and constituted 12.5 percent of sales in 2019, with only South Korea having a larger global share of semiconductor capex that year.

Other data corroborate these findings. (See Table 6.) According to the U.S. National Science Board's 2020 report on R&D trends, U.S. computer and electronic (including semiconductor) companies spent more on R&D in 2016 (the last year available) than any other country surveyed—often many times more—with only South Korea's sector having a greater share of total or manufacturing R&D than the United States.[41]

The BEA further calculates that foreign multinational corporations in 2017 spent $7.3 billion and $2.2 billion on R&D and capex, respectively, for their U.S. affiliates in the "semiconductors and other electronic components" sector, up from $4.4 billion and $1.9 billion in 2007.[42] U.S. semiconductor companies' stock prices also have climbed steadily over the past decade.[43]

As a result of this investment, the SIA notes that in 2019 the United States remained at or near the "leading edge" of current semiconductor technology. Although U.S.-based Intel announced delays to its 7 nm chip production (reportedly competitive with the 5 nm chips from Taiwan's TSMC), Intel also remained financially healthy as of July 2020: "Even with $15 billion projected for capital expenditures this year, on a non-GAAP basis, Intel is looking at free cash flow of $17.5 billion."[44]

In short, the U.S. semiconductor industry is profitable and expanding—in many ways still globally dominant—and is investing billions of its own dollars to stay that way. None of this indicates a significant long-term "national security" threat—*particularly* not one that could be solved via subsidies for commercial fab construction (which takes years to complete).

Medical Goods (Non-Pharmaceutical). The U.S. medical goods industry is also large and productive.[45] For example, a 2020 study from the St. Louis Federal Reserve of "essential medical equipment" (hand sanitizer, masks, personal protective equipment, ventilators, etc.) found that *American* producers supplied the vast majority (more than 70 percent) of these products in 2018.[46] The World Trade Organization (WTO) further notes that

"The U.S. semiconductor industry is profitable and expanding—in many ways still globally dominant—and is investing billions of its own dollars to stay that way."

Table 6

Business expenditures for R&D: 2016 or most recent year (purchasing power parity, millions of current dollars and percentage share)

	United States (2016)	France (2016)	Germany (2016)	United Kingdom (2016)	China (2016)	Japan (2016)	South Korea (2015)
Total business enterprise R&D	$374,685	$40,495	$81,739	$31,812	$349,685	$129,752	$59,644
Manufacturing R&D	$250,533	$20,242	$69,422	$13,166	$304,342	$112,766	$53,446
Computer, electronic, and optical products R&D	**$77,385**	**$4,836**	**$9,936**	**$1,560**	**$57,494**	**$25,599**	**$29,893**
Share of total business R&D	20.7%	11.9%	12.2%	4.9%	16.4%	19.7%	50.1%
Share of total manufacturing R&D	30.9%	23.9%	14.3%	11.8%	18.9%	22.7%	55.9%

Source: "Research and Development: U.S. Trends and International Comparisons," Science & Engineering Indicators, National Science Foundation, https://ncses.nsf.gov/pubs/nsb20203/u-s-business-r-d.
Note: R&D = research and development.

> "The United States is a top global producer, importer, and exporter of medical goods."

the United States not only is a top global producer and importer of medical goods but also is a top exporter (second overall, right behind Germany).[47]

Data from the BEA on domestic production of medical equipment and supplies also show a healthy industry with expanding real output and value-added between 1997 and 2018. This includes the broader "medical equipment and supplies manufacturing" industry, which had $102 billion in gross output and $62 billion in value-added in 2018, and the two most important subcategories, "surgical and medical instrument manufacturing" ($45.9 billion) and "surgical appliance and supplies manufacturing" ($37.4 billion). Indeed, real output in the latter category—which contains ventilators, masks, and many other "essential" medical goods—increased by almost 90 percent over the period examined.[48] Other categories, such as "analytical laboratory instrument manufacturing" (121.8 percent), "irradiation apparatus manufacturing" (468.0 percent), and "electromedical and electrotherapeutic apparatus manufacturing" (418.1 percent) also experienced substantial gains in real output.

The only domestic medical goods industry that has contracted is basic personal protective equipment (i.e., textiles, apparel, or paper products), but even there, the concern is overblown. For example, BEA data show that the domestic textile industry in 2018 generated approximately $54 billion and $17.6 billion in real gross output and value-added, respectively—significant increases (4.7 percent and 5.4 percent) since the end of the Great Recession. Also, the apparel and sanitary paper industries produced more than $10 billion in output in 2018. Many of these companies shifted operations to produce high-demand personal protective equipment (PPE) during the pandemic—another example of the U.S. manufacturing sector's flexibility.[49] Finally, foreign producers and domestic stockpiles can fill in remaining gaps in PPE supply, as they have done throughout the pandemic. These facts belie the need for costly new government policies to subsidize or protect new and inefficient PPE capacity in the United States.

Pharmaceuticals. As shown in Tables 7a, 7b, and 7c, U.S. government data on output, R&D, and capital expenditures show that American pharmaceutical manufacturers have performed well in recent years.

A 2020 report from the McKinsey Global Institute notes that the United States is home to more than 500 pharmaceutical manufacturing facilities—among the highest concentrations in the world.[50] The WTO adds that the United States is both a major importer *and* exporter of pharmaceutical products, having shipped

almost $41 billion in medicines (35 percent of total U.S. medical goods exports) in 2019.[51]

With respect to pharmaceutical inputs (i.e., active pharmaceutical ingredients, or APIs), available public data on domestic and global API production do not indicate a need for urgent government funding (such as that proposed for Eastman Kodak Company). According to the Food and Drug Administration (FDA), of the roughly 2,000 global API manufacturing facilities, 13 percent are in China; 28 percent are in the United States; 26 percent are in the EU; and 18 percent are in India. For the APIs of World Health Organization "essential medicines" on the U.S. market, 21 percent of manufacturing facilities are located in the United States; 15 percent are in China; and the rest are in the EU, India, and Canada.[52] The FDA further notes that the United States was home to 510 API facilities in 2019, 221 of which supply the aforementioned "essential medicines."[53]

Table 7a

Real gross output by industry (billions of U.S. dollars)

Industry	2018 output	Change 1997–2018	Percentage change 1997–2018	Change 2000–2018	Percentage change 2000–2018	Change 2009–2018	Percentage change 2009–2018
Pharmaceutical and medicine manufacturing (total)	$242.8	$58.7	31.9%	$39.1	16.1%	$12.6	5.5%
Medicinal and botanical manufacturing	$16.5	$(0.6)	–3.5%	$(0.5)	–2.9%	$2.8	20.4%
Pharmaceutical preparation manufacturing	$178.5	$34.2	23.7%	$17.7	11.0%	$2.7	1.5%
In-vitro diagnostic substance manufacturing	$16.7	$4.1	32.5%	$2.1	14.4%	$4.5	36.9%
Biological product (except diagnostic) manufacturing	$32.0	$22.1	223.2%	$20.7	183.2%	$3.2	11.1%

Source: "GDP-by-Industry," Bureau of Economic Analysis, updated December 10, 2020, https://apps.bea.gov/iTable/index_industry_gdpIndy.cfm.

Table 7b

Domestic research and development (millions of current U.S. dollars)

Industry	2001	2017	Percentage change
Pharmaceuticals and medicines	$10,137	$66,202	553.1%

Source: "Business and Industry R&D," National Science Foundation, https://www.nsf.gov/statistics/industry/.

Table 7c

Capital expenditure in pharmaceutical and medicine manufacturing (billions of current U.S. dollars)

Year	Industry	Total expenditures	Total new expenditures	Expenditures for structures	Expenditures for equipment
2017	Pharmaceutical and medicine manufacturing	$16,196	$15,917	$5,846	$10,350
2018	Pharmaceutical and medicine manufacturing	$15,096	$14,450	$6,099	$8,998

Source: "Annual Capital Expenditures: 2018," U.S. Census Bureau, January 16, 2020.

"'Security nationalism' also assumes a need for broad and novel U.S. government interventions while ignoring the current, targeted federal policies intended to support the defense industrial base."

THE "DEFENSE INDUSTRIAL BASE" ALREADY ENJOYS TARGETED POLICY SUPPORT

"Security nationalism" also assumes a need for broad and novel U.S. government interventions while ignoring the current, targeted federal policies intended to support the defense industrial base. As documented in the Appendix, this includes policies intended to diversify potential sources of essential supplies beyond U.S. borders; to subsidize, procure, and stockpile domestically produced items deemed essential for national defense; or to protect domestic companies from import competition.

These laws, central to past DOD recommendations and actions to support the U.S. defense industrial base, are summarized as follows:

- **International policies intended to support the defense industrial base:** the "National Technology and Industrial Base" (NTIB), which includes Canada, the UK, and Australia and is intended to enhance national security by eliminating restrictions on trade and R&D collaboration among NTIB partner countries, thereby expanding the United States' industrial capacity beyond U.S. borders; reciprocal defense procurement agreements between the DOD and its counterparts in 27 foreign governments, under which each country agrees to remove barriers to national security–related purchases of supplies and services of the other country;[54] and "security of supply" arrangements with eight countries that "allow the DOD to request priority delivery for DOD contracts, subcontracts, or orders from companies in these countries."[55]
- **Domestic laws intended to support the defense industrial base on express national security grounds**, including: NTIB provisions that require the DOD to assess annually the defense industrial base (published in an annual industrial capabilities report) and to work to mitigate any potential concerns; the Defense Production Act of 1950, which allows the DOD to identify priority sectors for government contracting and enter into those contracts (Title I), and to support, through purchases or loans/loan guarantees, "essential" domestic industrial base capabilities that are found to be nonexistent, at risk of loss, or insufficient to meet government needs (Title III); numerous other programs (see the Appendix) providing the DOD with the authority and funding to support other parts of the industrial base; and the National Defense Stockpile Transaction Fund and Strategic and Critical Materials Stock Piling Act of 1939, which authorize the National Defense Stockpile Manager to fund R&D projects to develop new materials for the stockpile and require the president to encourage the development and conservation of domestic sources of "strategic and critical materials" through procurement.
- **Laws intended to protect U.S. manufacturers via the imposition of restrictions on foreign imports**, including: Section 232 of the Trade Expansion Act of 1962, which authorizes the executive branch to take action (e.g., through tariffs or quotas) against imports found to have been "imported into the United States in such quantities or under such circumstances as to threaten to impair the national security";[56] U.S. "trade remedy" laws, which allow for the imposition of antidumping or anti-subsidy duties on imports from specific countries that are found to have injured or threatened to injure the U.S. industry making a directly competitive product; and various "Buy American" laws, which require the federal government to purchase or contract for domestically produced industrial goods.

As explained in the Appendix and the following sections, many of these policies have proven to be ineffective, unused, or even counterproductive, and several reforms are proposed. Regardless, these measures' mere existence rebuts the current caricature of a U.S. defense industrial base ravaged by free markets and government inattention. These policies also show that the federal government, particularly the DOD, has legal tools to address discrete and legitimate weaknesses in essential supply chains (e.g., for weapons). Also, the government's implementation of some of these laws shows the weaknesses of security nationalism in practice.

"SECURITY NATIONALISM" MAKES THE UNITED STATES LESS SECURE

Because economic nationalist policies weaken the U.S. economy and manufacturing sector, the government should not pursue "security nationalism" to bolster national security.

Closed Markets Make Economies Less Secure

Protectionism often undermines national security by weakening a country's economy and manufacturing sector, thus making it less resilient in the face of war or other shocks. Restrictions on international trade and investment not only reduce economic growth (and thus tax revenue) and output but also can distort the economy and divert resources from sectors (e.g., high-tech, high-productivity industries such as information technology) that are also essential to national security.

Decades of research bear this out. For example, International Monetary Fund (IMF) economists in 2018 examined data for 151 countries over 51 years (1963–2014) and found that "tariff increases lead, in the medium term, to economically and statistically significant declines in domestic output and productivity" as well as more unemployment and higher inequality.[57] Numerous analyses of U.S. protectionism reveal that these policies impose economic harms that far outweigh possible short-term benefits, fail to protect American firms and workers over the longer term, and breed political dysfunction.[58]

Furthermore, protectionism's harms are typically amplified for the U.S. manufacturing sector—the target of current security nationalist demands. The IMF paper, for example, found that increased tariffs on manufacturing inputs (e.g., steel) resulted in a statistically significant decline in manufacturing sector-wide output (6.4 percent) and productivity (3.9 percent) five years after the tariff hikes in question. These findings are particularly relevant for the United States, given the diversity and complexity of the domestic manufacturing sector; the consistently high percentage of manufacturing inputs as a share of total imports; the concentration of "trade remedy" (antidumping, countervailing duty, safeguard) duties on manufacturing inputs; and relatively new "national security" tariffs on almost all primary steel and aluminum imports into the United States.

Other papers have confirmed these harms. For example, a 2020 paper from Alessandro Barattieri and Matteo Cacciatore found that U.S. "trade remedy" duties were concentrated in a few upstream industries (base metals and metal products, chemicals, plastics, and rubber products) and therefore resulted in substantial employment losses for downstream manufacturing industries, along with modest and short-lived employment gains in the industries that won protection. The authors further determined that these downstream industries suffered because they lost competitiveness (and therefore jobs) after raising prices to cover higher input costs.[59] Examinations of President Trump's "national security" tariffs on steel and aluminum found that the measures' costs were mostly borne by domestic manufacturers that consume these metals—including in industries most closely associated with national security (e.g., transportation and weapons)—and resulted in foreign retaliation against U.S. goods exports. As a result, the import protection harmed these firms in terms of increased costs and reduced output, jobs, exports, and investment.[60]

"Protectionism often undermines national security by weakening a country's economy and manufacturing sector, thus making it less resilient in the face of war or other shocks."

> "The United States' implementation of 'security nationalist' policies reveals a long track record of costs, risks, failed objectives, and unintended consequences."

Finally, extensive literature ties trade openness to improved economic performance more broadly. A 2018 paper from Robert Feenstra summarized the studies on the long-run, overall gains from trade for the United States, calculating total average GDP gains of 1.1 percent per year due to increased product variety arising from imports, the productivity-enhancing effects of trade-induced creative destruction, and pro-competitive effects on domestic prices.[61] A 2017 Peterson Institute for International Economics paper calculated the payoff to the United States from expanded trade between 1950 and 2016 to be $2.1 trillion, increasing U.S. GDP per capita and per household by $7,000 and $18,000, respectively.[62] The U.S. International Trade Commission (ITC) found in 2016 that U.S. trade agreements produced small but significant gains in U.S. exports, real GDP, employment, and wages and saved American consumers $13.4 billion in 2014.[63] Several other papers have found similar gains.[64]

Overall, the evidence and analysis refute current arguments that economic nationalism would bolster the U.S. defense industrial base (and thus national security). Instead, American protectionism has been repeatedly found to weaken the U.S. manufacturing sector and the economy more broadly.

"Security Nationalism" Fails in Practice

Regardless of the theory supporting "security nationalism," the United States' implementation of these policies—for steel, ships, machine tools, semiconductors, and other "essential" goods—reveals a long track record of costs, risks, failed objectives, and unintended consequences. This checkered history must be considered when evaluating new proposals to support certain industries on national security grounds.

SECTION 232 TARIFFS ON STEEL. President Trump's tariffs on steel imports under Section 232 is a powerful example of the perils of American security nationalism. Prior to the tariffs' imposition, the U.S. steel industry had already won billions of dollars in government subsidies and import protection through dozens of U.S. trade remedy measures covering almost 61 percent of all steel product imports in 2017, the year before the Section 232 tariffs took effect.[65] Public data for that same year also showed that the industry was at no risk of collapse: according to the Commerce Department's Section 232 report, for example, annual U.S. steel output (around 80 million metric tons) and production capacity (around 115 million metric tons) were steady between 1998 and 2016, and the domestic industry's U.S. market share remained dominant at around 70 percent between 2011 and 2016.[66] Furthermore, in the months leading up to the Section 232 investigation, domestic crude steel output and shipments of steel mill products also remained stable;[67] five of the six largest domestic steelmakers were profitable, posting a combined net income of $491 million in the first quarter of 2017; and Standard and Poor's credit ratings showed eight major U.S. producers to be financially viable.[68] This was not an industry in crisis.

Nor did imports pose an immediate threat to the United States' ability to procure steel (and aluminum) for national defense needs, as judged by the same standards that the Commerce Department applied in a 2001 Section 232 investigation that concluded that imports of iron and steel did not pose a national security threat.[69] As previously noted, imports constituted less than one-third of all domestic steel consumption, and the majority of those steel imports came from "reliable" (in Commerce Department parlance) U.S. allies, such as Canada (the largest source country), Brazil (2), South Korea (3), Mexico (4), Japan (7), and various EU countries, including Germany (8), the Netherlands (13), Italy (14), Spain (16), and the UK (17). As the Commerce Department noted in 2001, none of these countries—most of which were U.S. treaty, free trade agreement, and/or defense procurement agreement partners and home to companies with major U.S. investments—would realistically deny the United States steel in a time of war or other emergency:

> The Department found that iron ore and semi-finished steel are imported from reliable foreign sources. Accordingly, even if the United States were dependent on imports of iron ore and semi-finished steel, imports would not threaten to impair national security. . . .
>
> Imports of iron ore and semi-finished steel come from diverse and reliable trading partners. More than a dozen countries exported iron ore to the United States in 2000; many of these countries are in the Western Hemisphere. Over the past ten years, Canada—with which the United States shares a 3,987-mile border—has been the source of more than 50 percent of U.S. iron ore imports. Canada is a North Atlantic Treaty Organization ("NATO") ally, the United States' largest trading partner, and also a party to NAFTA.[70]

Meanwhile, China—the repeated excuse for the Section 232 tariffs—was only the 11th largest U.S. supplier of steel in 2017, suffering a 31 percent drop since 2011 (due in part to the dozens of U.S. trade remedy measures).[71]

The absence of a national security threat in 2017 was established in a statutorily required assessment from then-Secretary of Defense James Mattis that agreed with the Commerce Department that the "systematic use of unfair trade practices . . . poses a risk to our national security" *but* explained that because "the U.S. military requirements for steel and aluminum each only represent about three percent of U.S. production . . . DoD does not believe that the findings in the [Commerce Section 232] reports impact the ability of DoD programs to acquire the steel . . . necessary to meet national defense requirements." For this reason, Mattis recommended only "targeted tariffs" focused on "correcting Chinese overproduction and countering their attempts to circumvent existing antidumping tariffs" instead of "a global quota or global tariff," as well as a dialogue with "key allies" to emphasize the United States' commitment to these countries' "bilateral U.S. relationship."[72]

Mattis' recommendations—as well as the Commerce Department's findings and standards in the 2001 Section 232 investigation—were ignored. Instead, President Trump, surrounded by U.S. steel company chief executive officers and union leaders at a March 2018 White House press event, announced blanket 25 percent tariffs—inexplicably 1 percentage point higher than what the Commerce Department recommended—on all types of steel.[73] This included commodity products (e.g., rebar) with little national security nexus and semifinished products (e.g., slab) that *American steel companies* needed to maintain their domestic operations. It also included steel from close U.S. allies such as Canada, Japan, and the EU (including the UK).[74]

Numerous studies have documented the tariffs' high economic costs for U.S. consumers (particularly manufacturing firms). In particular, the tariffs caused higher steel prices that in turn hurt other U.S. manufacturers in terms of higher input costs, lower exports, and lost competitiveness at home and abroad; created an opaque, costly, and uncertain "exclusion" bureaucracy, under which more than 100,000 requests have been filed by U.S. manufacturers seeking relief; resulted in approximately 75,000 fewer manufacturing jobs than would have otherwise existed in the absence of the tariffs; depressed global demand for steel (thereby dampening prices); bred global market uncertainty, which hurt investment in manufacturing; and caused numerous U.S. trading partners to retaliate against American exporters.[75]

At the same time, the steel tariffs were found to have a minimal impact on U.S. steelworker jobs and to do nothing to address global steel overcapacity—the primary long-term driver of the U.S. steel industry's weakened financial position in 2018.[76] Given these and other market dynamics (e.g., steelmakers bringing back inefficient capacity to capture rents and subsequently flooding the U.S. market), industry stocks tanked in late 2018 and early 2019, and steel companies were actually

"President Trump's tariffs on steel imports under Section 232 are a powerful example of the perils of American security nationalism."

> "A century of evidence reveals that the Jones Act has failed to achieve its main national security objectives while imposing substantial economic costs."

laying off workers and curtailing investments by the end of 2019.[77] In extending the tariffs to downstream "derivative" products in early 2020, the Trump administration tacitly admitted that the steel tariffs had not achieved their primary goal of increasing and stabilizing the industry's capacity utilization.[78] As one *Los Angeles Times* story put it, "Trump's steel tariffs were supposed to save the industry. They made things worse."[79]

Finally, the president's baseless invocation of "national security" in this (and other) Section 232 cases has likely harmed U.S. national security in other important ways, including by antagonizing allies and thereby undermining U.S. credibility and complicating efforts to build international coalitions on other, more legitimate security threats (e.g., China); eroding the rule of law in the United States via the clear abuse of constitutional trade powers delegated to the executive branch by Congress; and undermining U.S. leadership at the WTO by exploiting the body's rarely invoked exceptions for the protection of "essential security interests."

THE JONES ACT. The Merchant Marine Act of 1920 was presented as a plan to ensure adequate domestic shipbuilding capacity and a ready supply of merchant mariners in times of war or other national emergencies. Section 27 of the law—the "Jones Act"—purportedly supports those objectives by restricting domestic shipping services to vessels that are U.S.-built, U.S.-owned, U.S.-flagged, and U.S.-staffed. As a result, the United States has one of the most (if not *the* most[80]) restrictive shipping systems in the world, as shown in Figure 13.

A century of evidence—summarized in a 2018 Cato Institute policy analysis[81]—reveals that the Jones Act has failed in its main national security objectives while imposing substantial economic costs. First, Jones Act restrictions inflated U.S. shipping costs because the transport of cargo between U.S. ports and on inland waterways is off-limits to foreign competition. Higher shipping rates for waterborne transportation reduced demand for shipping services, thereby leading U.S. companies to purchase fewer vessels. Producers, in turn, build fewer ships, thus retarding both output (ships) and production facilities (shipyards).

The trends shown in Figure 14 are especially bleak for oceangoing vessels (i.e., the ships that the U.S. military would need in wartime):

> Nearly 9 of every 10 commercial vessels produced in U.S. shipyards since 2010 have been barges or tugboats. Among oceangoing ships of at least 1,000 gross tons that transport cargo and meet Jones Act requirements, their numbers have declined from 193 to 99 since 2000, and only 78 of those 99 can be deemed militarily useful. Even in their expressions of support for the Jones Act, government officials concede that the U.S. shipping industry and its associated ecosystem have been depleted.[82]

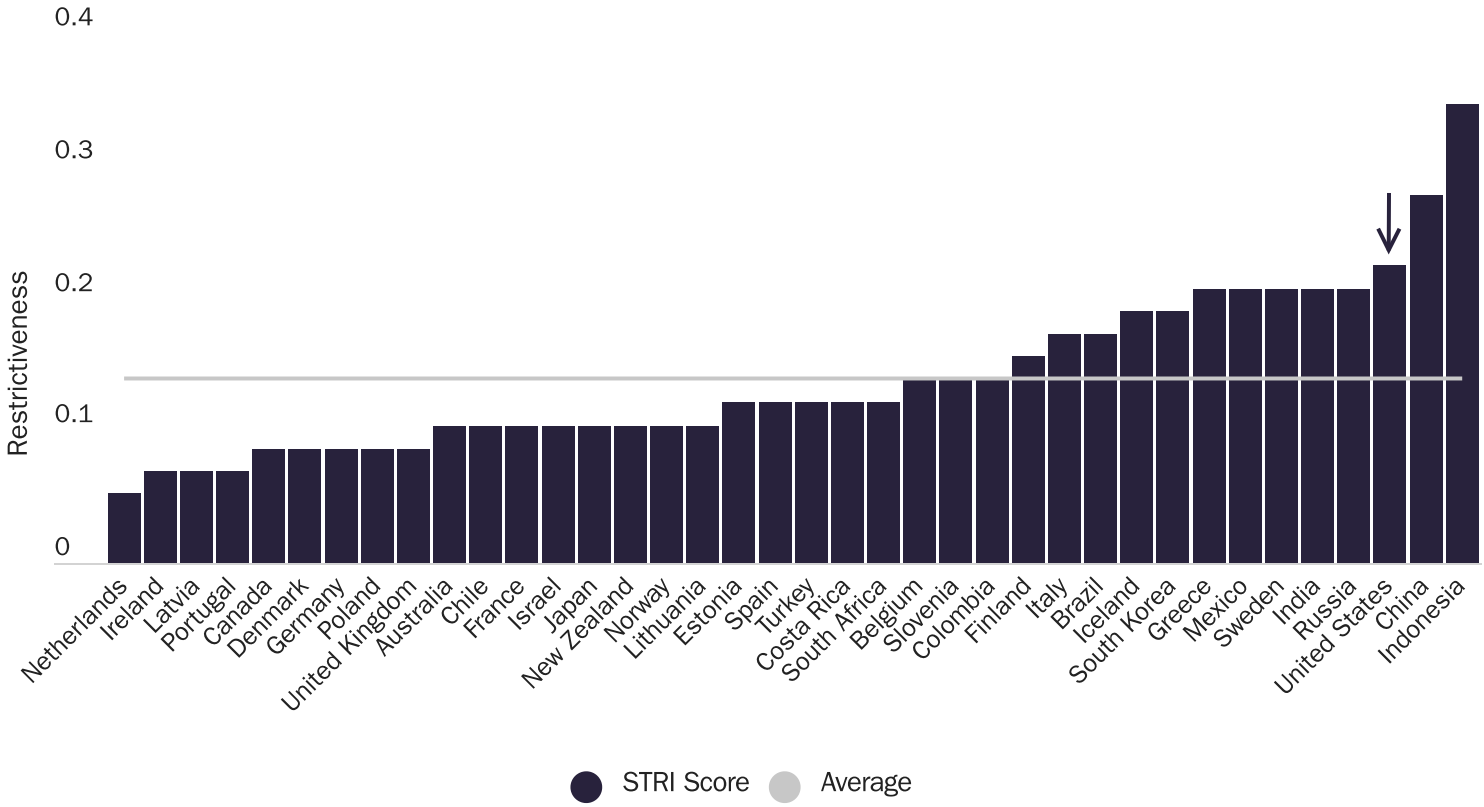
The Jones Act fleet is not only shrinking but also increasingly decrepit because of artificially high replacement costs. Of the mere 98 ships in service, more than a third (34.7 percent) are past the age of 20, and a quarter of them (24.5 percent) are past 30. Studies also show that these old vessels are not only inefficient but dangerous.

With fewer (and older) ships, fewer shipyards, and fewer workers in the industry, the Jones Act has undoubtedly failed to achieve its national security objectives—a conclusion evident by the fact that the U.S. military during the Gulf War and thereafter rarely turned to the Jones Act fleet (and overwhelmingly relied on foreign-built ships) to meet its sealift needs.[83]

Second, higher shipping costs caused by the Jones Act increase demand for alternative forms of transportation, including trucking, rail, and pipeline services, raising those modes' rates and inflating business costs throughout the supply chain—thus affecting the operations and finances of nearly every business in nearly every U.S. industry, especially manufacturing. The Jones Act therefore disadvantages U.S. companies relative to their foreign competitors and consumes funds that U.S. households could spend or invest elsewhere

Figure 13

Restrictiveness on foreign entry for maritime transport services (2017)

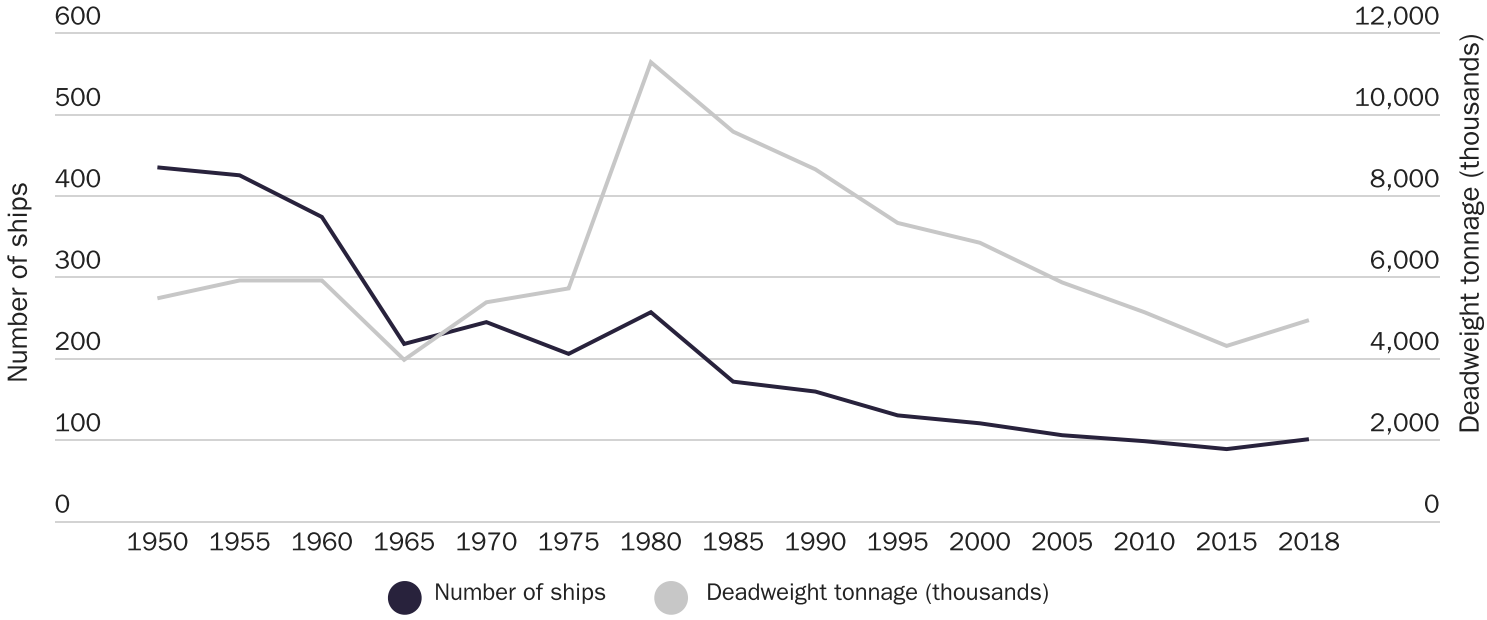


Source: "Services Trade Restrictiveness Index Regulatory Database," Organisation for Economic Co-operation and Development, https://qdd.oecd.org/subject.aspx?Subject=063bee63-475f-427c-8b50-c19bffa7392d.

Notes: The restrictiveness index assigns values between 0 (least restrictive) and 1 (most restrictive). STRI = Services Trade Restrictiveness Index.

Figure 14

Jones Act oceangoing ships



Source: Congressional Research Service, "Shipping Under the Jones Act: Legislative and Regulatory Background," updated November 21, 2019, p. 14, fig. 1.

Note: Deadweight tonnage is a measure of ship cargo capacity.

> "After years of subsidies and trade protection, the U.S. machine tools industry was in worse shape than when the policies began and today remains a Defense Department concern."

in the economy (on more productive ventures). Indeed, some of those competitors, such as Russian gas producers that service Northeastern U.S. communities due to the artificially high cost of shipping liquified natural gas from Texas and Louisiana, are in hostile territories—another unintended consequence that undermines national security.

At the same time, heightened use of trucks and freight trains increases infrastructure and maintenance costs, as well as environmental costs (surface transportation emits more carbon than ships). It also raises safety issues (e.g., transporting toxic materials on U.S. highways) and increases traffic congestion—especially on highways running parallel to U.S. sea lanes—thereby generating opportunity costs from lost wages and lost output for American commuters. Finally, the Jones Act has been a persistent irritant to important U.S. trade partners, thus discouraging U.S. exports in those markets. These economic harms further undermine, rather than support, U.S. national security.

MACHINE TOOL "VOLUNTARY" RESTRAINT AGREEMENTS, SUBSIDIES, AND BUY AMERICAN RESTRICTIONS. Following a 1983 petition from the domestic machine tool industry under Section 232 and an affirmative "national security" determination by the Commerce Department in 1984, the Reagan administration concluded in 1986 five-year "voluntary restraint agreements" (VRAs) with Japan and Taiwan to limit their exports of certain machine tools and requested that nine other countries limit their U.S. machine tool market shares to certain levels. The federal government—led by the Commerce Department and the DOD—simultaneously implemented a "Domestic Action Plan" to "assist, encourage, and fund a variety of research and development activities to help modernize machine tool and manufacturing technology."[84] This included the creation of the National Center for Manufacturing Sciences (NCMS), a public-private consortium intended to "revitalize" the machine tool industry. Finally, Congress in 1986 and 1988 imposed Buy American restrictions on the DOD's procurement of foreign-made machine tools.[85] The VRAs were modified in 1991 and extended through December 1993, when they expired. The NCMS still exists, though it has been expanded to cover all manufacturing operations in North America (as opposed to just U.S. machine tools producers).

These trade restrictions and subsidies proved unsuccessful. First, the VRAs cost U.S. machine tool consumers (i.e., other U.S. manufacturers) hundreds of millions of dollars per year but provided much smaller benefits to U.S. producers, resulting in an estimated annual net loss of $647,892 (in 2017 dollars) per job protected.[86] Among the measures' victims was one of the United States' largest machine tool producers, Hurco, which sourced certain hardware from Taiwan and survived because it won an exemption from the government through 1990.[87] The trade measures also failed to reverse import growth (which expanded by 2.51 percent per year between 1986 and 1990) or domestic job losses (which declined by 2.09 percent per year), while delivering substantial "quota rents" to foreign producers.[88] Import growth was attributable to the exemptions, lax government enforcement, and the growth of unconstrained foreign suppliers—most notably Austria and China.[89]

Second, neither the trade restrictions nor the subsidies revitalized the domestic industry. A 1990 Government Accountability Office report found, for example, that American companies had thus far failed to meet the Reagan administration's domestic market share targets in four of the six machine tool categories at issue.[90] The ITC in 1993 found that domestic machine tools shipments actually declined by 11.7 percent between 1989 and 1991, while employment dropped by 9.8 percent.[91] According to a 1995 article for the *Philadelphia Inquirer*, after years of subsidies and import protection, the U.S. machine tool industry still remained a "distant third" in global production—essentially tied with Italy but well behind both Germany and Japan; had only half the volume of sales (measured in constant dollars) in 1995 that

it had 30 years earlier; and saw its workforce shrink from 108,000 in 1980 to 58,300 in 1995 (as well as experience stagnant wages).[92]

Finally, the programs were plagued with dysfunction. The Government Accountability Office report found that the Commerce Department's methods for monitoring quota compliance and related import volumes suffered from a lack of documented procedures and data, inaccurate calculation methodologies, and reporting delays of five months or more. It also found problems with compliance and enforcement. Moreover, U.S. restrictions on supplies from major foreign producers likely fueled the growth of new market entrants, including China, which has since become a global leader.

In 1993, the George H. W. Bush administration quietly allowed the machine tools VRAs to fade away.[93] Furthermore, neither the Buy American restrictions nor the NCMS's continued operation ever revitalized the domestic machine tools industry, which remains a DOD concern.

SEMICONDUCTOR TARIFFS AND SUBSIDIES. National security also undergirded U.S. support for the semiconductor industry in the 1980s and '90s, but it also proved costly and unsuccessful.[94] Government support was primarily implemented through two measures: the 1986 Semiconductor Trade Agreement (STA) between the United States and Japan and contemporaneous subsidies to support domestic semiconductor research and production. Each measure, however, generated meager benefits for specific U.S. firms while imposing substantial and unforeseen economic costs, leaving long-term national security objectives unmet or even undermined.

THE STA. Under the STA, the Japanese government agreed to stop its producers from "dumping" dynamic random-access memory (DRAM) and erasable programmable read-only memory chips—enforced through production limits and export restraints that kept prices above U.S.-determined levels—and to guarantee foreign producers 20 percent of the Japanese market. In exchange, the United States suspended ongoing antidumping and Section 301 (a U.S. law intended to police foreign trading practices that allegedly harm U.S. commerce) investigations of Japanese memory chips.[95]

The STA's economic harms were significant. A 1994 Peterson Institute analysis found that in 1989, the STA generated a net national welfare loss of $974 million ($2.04 billion in 2020 dollars) and cost U.S. consumers over $525,000 ($1.10 million in 2020 dollars) per manufacturing job potentially saved. After the STA took effect, domestic semiconductor prices "skyrocketed," and a "full-fledged shortage of DRAMs was widely felt in the United States and Europe by early 1998."[96] As a result, U.S. semiconductor users, particularly up-and-coming computer manufacturers such as Apple that were dependent on DRAMs, were hobbled and less able to compete with Asian and European producers that could obtain cheaper DRAMs.[97] As a result, the computer manufacturing industry shed one job for every U.S. semiconductor job supposedly gained from the STA.[98] Increased DRAM prices also added almost $100 to the price of a personal computer selling for $600 or $700 in 1988.[99]

The STA also ended up helping *Japanese semiconductor producers* more than their U.S. competitors because the STA allowed the Japanese to charge higher prices in the United States and elsewhere. According to one Brookings Institution study, Japan's manufacturers earned $1.2 billion in extra DRAM profits in 1988 alone and another $3–4 billion on all products in 1989—most of which was paid by U.S. consumers and computer manufacturers.[100] Other studies found similar gains for Japanese producers, in part due to collusive behavior.[101]

U.S. producers, on the other hand, did not increase production capacity, despite artificially high domestic prices and U.S. government subsidies.[102] All but one U.S. chip maker left the DRAM market within a decade, and the STA prevented neither industry recessions nor declining U.S. market share (which shrunk from 83 percent to 70 percent between 1986 and 1992).[103] One reason is that U.S. firms found ways to circumvent the STA

"Government support for the semiconductor industry generated meager benefits for U.S. firms while imposing substantial costs, leaving national security objectives unmet or even undermined."

> "The U.S.–Japan Semiconductor Trade Agreement hurt American computer companies, targeted the wrong products, and helped turn fledgling Korean competitors into market leaders."

by importing not individual chips but rather assembled circuit boards that weren't subject to the agreement.[104] The benefits of the Japanese market share targets also proved illusory: although foreign semiconductor exports to Japan in 1992 hit the STA's 20 percent market share targets, economist Craig Parsons found that this "achievement" was caused by broader macroeconomic trends, not the agreement itself.[105] Other reports at the time noted that Japanese firms dumped the semiconductors that they were forced to buy into Tokyo Bay.[106] Overall, "there is little consensus on whether the STA was effective in increasing the foreign market share."[107]

As a result, "for most U.S. chip makers, the main impact of the price hikes was vastly greater profits strengthening their Japanese competitors."[108] Longer term, the STA actually helped "accelerate the entrance of Korean companies onto the world DRAM scene—as with Japanese companies, the supernormal profits that were obtainable in the years immediately after the [STA] allowed Korean firms such as Hyundai, Samsung, and LG to reap unexpected returns and gain a foothold at the lower end of the semiconductor technology ladder."[109] They are now market leaders.

Finally, the STA had significant political ramifications in the United States and abroad. It encouraged collusion among Japanese producers and restored the Japanese government's control over the sector, with U.S. help. It led to the creation of a new and powerful lobbying group in the United States—composed of injured downstream user industries—that would go on to mold U.S. trade policy for decades.[110] And it demonstrated the folly of U.S. security nationalism: just as the DOD was recommending action, American companies were *exiting* the DRAM market, having already discerned that their future was not in the "high-volume, low-profit commodity" but in advanced microprocessors, specialty chips, and design.[111] As a result, U.S. Memories, a private consortium to expand domestic DRAM production, was "stillborn and collapsed in January 1990 owing to insufficient financial support and an unwillingness of other major buyers . . . to commit to future purchases."[112] Government planners foresaw none of this.

SEMATECH. Sematech (short for "semiconductor manufacturing technology") was not a DRAMs project but instead a semiconductor R&D consortium funded jointly by private industry and the federal government—very similar to the consortium now proposed in the NDAA. As chronicled by Brink Lindsey in a 1992 piece for *Reason*, the primary impetus for Sematech was national security: only a month before the entity's formation, a Pentagon-sponsored study on "defense semiconductor dependency"—prepared by the Defense Science Board, whose advisory panel conveniently included Sematech member companies—concluded that "it is simply no longer possible for individual U.S. semiconductor firms to compete independently against world-class combinations of foreign industrial, governmental and academic institutions." The DOD therefore recommended $1 billion in government funding for a "Semiconductor Manufacturing Technology Institute." Congress authorized $100 million a year for five years via the Defense Advanced Research Projects Agency.[113]

Lindsey showed how Sematech "confirm[ed] all the darkest suspicions of industrial-policy critics." In its first phase, "Sematech was able to borrow technology from private companies and reproduce manufacturing results that other private companies had achieved years before—and do it with taxpayers' money"; and in its second phase, Sematech did some "useful work, both in evaluating new equipment and improving working relations between chipmakers and suppliers"—but it was work that, while it may have helped a few favored U.S. equipment suppliers, added "very little to what private industry is already capable of doing for itself."[114]

Meanwhile, U.S. semiconductor firms were staging a major turnaround but did so by "ignor[ing] just about everything Sematech's supporters have ever said about

semiconductor competitiveness." Instead, "American companies have been thriving in those supposedly marginal 'specialty' markets derided by the Defense Science Board." Even worse, Lindsey explained how Sematech actually *hindered* the industry's revitalization by "favoring older, more-established companies [i.e., Sematech's member companies] over innovative newcomers." He finally debunked Sematech's national security basis, noting that the U.S. military had ample domestic and foreign supplies of both commodity DRAMs and the chips most essential to U.S. weapons systems.[115]

Subsequent studies have confirmed Lindsey's contemporaneous reporting. In a 1996 paper, for example, Douglas A. Irwin and Peter J. Klenow concluded that the "U.S. government's contributions to Sematech do not induce more semiconductor research than would otherwise occur."[116] Even Sematech proponents Kenneth Flamm and Qifei Wang concluded that the consortium's impact on member companies' R&D expenditures was inconclusive and could in fact have been negative on net.[117] That is hardly a ringing endorsement, given Lindsey's account of other, noneconomic harms. In 2020, the Carnegie Endowment's James L. Schoff included Sematech among the cautionary tales of American "technonationalism" in the 1980s:

> The U.S. and Japanese bureaucrats promoting industrial policy and technonationalism at that time could not foresee the growth of the internet and how it would evolve in tandem with the smartphone and other new digital technologies. They could not conceive of AI-enabled cyber hacks of cloud-based data centers or stimulate the rise of internet titans like Google, Amazon, or the modern version of Apple. These companies flourished in the techno-globalist era and avoided single-firm product models by incorporating the best components of various leading technologies into their own product lines. Now these firms possess some of the world's most coveted technology, investing more than most governments do to push new boundaries and accelerate change through design and systems integration.
>
> Another lesson is that governments generally overreact to perceived technonationalist threats. Many U.S. policymakers and scholars during the 1980s viewed competition with Japan over technology as a form of economic warfare and regularly assumed the worst about the Japanese government's intentions. American fears that Japan would come to dominate technological fields like semiconductors, supercomputers, satellites, and aerospace in the same way they pushed U.S. manufacturers out of the production of radios and televisions simply never happened, and U.S. initiatives such as SEMATECH or Super 301 trade dispute cases had only a marginal effect. After all, Japanese firms became members of SEMATECH within ten years, and many market-opening Super 301 cases against Japan involved products (like dynamic random access memory chips) that were soon overtaken by new technology or—in the case of satellites—were eventually subject to U.S. export controls. U.S. firms prospered because of their ability to innovate and compete effectively, not because of such technonationalist or protectionist measures.[118]

Given the NDAA's plans to subsidize the U.S. semiconductor industry and to establish another R&D consortium, it appears that U.S. policymakers have not learned these lessons.

Other "Security Nationalist" Failures

These four case studies are a representative sample of the U.S. government's long-standing inability to achieve national security objectives through protectionism and industrial policy, as

"Sematech did not induce more R&D than would have otherwise occurred and is today a cautionary tale of American 'technonationalism.'"

> "Freer markets—including openness to international trade and investment—can bolster national security and enhance the country's resilience to economic 'shocks.'"

well as the frequent abuse of "national security" for political purposes. Other examples of security nationalist failures include: Trump administration Section 232 tariffs on aluminum and Section 301 tariffs on Chinese imports;[119] previous episodes of steel protectionism, including President Bush's broad "safeguard" measures in 2001;[120] the Sugar Program;[121] crude oil import quotas from the 1950s to early 1970s;[122] textiles and apparel protection;[123] wool/mohair subsidies;[124] Japanese automobile quotas; and antidumping duties on supercomputers and flat panel displays (which also received generous U.S. government R&D subsidies).[125] In each case, along with many others, the outcome was essentially the same: high economic costs, the continued demise of the favored industry, political dysfunction, and U.S. government advocates who, as the American Enterprise Institute's Claude Barfield explained in his book *High Tech Protectionism*, "either never understood or willfully ignored the structure of the industry and the nature of worldwide competition in the sector."[126]

In short, any past successes of U.S. security nationalism are the exception, not the rule.

FREE MARKETS ENHANCE U.S. NATIONAL SECURITY AND "RESILIENCE"

Freer markets—including openness to international trade and investment—can bolster national security and enhance the country's resilience to economic "shocks," such as a pandemic. The relationship between trade and national security has played a central role in U.S. economic and foreign policy since Secretary of State Cordell Hull helped create the World Trade Organization's predecessor, the General Agreement on Tariffs and Trade, in the late 1940s and usher in the modern era of globalization.[127] Since that time, numerous academic studies have supported Hull's instincts, in terms of both geopolitics and economics, that trade and economic interdependence can prevent armed conflict and make countries more resilient to shocks.

Open Markets Help Achieve Geopolitical Objectives

A wide body of research across a range of countries and time periods reveals a strong, positive relationship between trade and national security.[128]

- One of the most influential analyses of trade and peace is that of John R. Oneal, Bruce Russett, and Michael L. Berbaum, who examined almost 10,000 country pairs between 1885 and 1992 and found that increasing two nations' economic interdependence (as measured by bilateral trade-to-GDP ratio) from the 10th to the 90th percentile lowers the probability of a fatal dispute between them by 32 percent. They estimated that the growth in U.S.-China trade between the 1960s and 2002 reduced the probability of a fatal militarized dispute between the two nations by 27 percent, as compared with what it would have been without the increase in commercial relations (and assuming China's authoritarianism remained unchanged). They further found that militarized disputes between nations significantly decreased their bilateral trade in the following year, thus indicating that "the relationship between trade and conflict is reciprocal. . . . Peace and commerce promote each other."[129]
- Solomon W. Polachek and Carlos Seiglie similarly found in a 2006 study that as two countries' gains from trade increase, their level of armed conflict decreases and their level of cooperation increases. In particular, a doubling of bilateral trade volumes leads to a 20 percent decrease in conflict.[130]
- In a 2016 *Review of Development Economics* paper, Jong-Wha Lee and Ju Hyun Pyun examined 243,225 country pairs from 1950 to 2000 and found that "an increase in bilateral trade interdependence significantly promotes peace," with this effect strongest for contiguous

countries (e.g., the United States and Canada). They also showed that peace is separately promoted by a nation's openness to global trade and that "an increase in global trade openness reduces the probability of interstate conflict more for countries far apart from each other than it does for countries sharing borders." Finally, they found that "states more dependent on the world economy tend to have fewer conflicts than those less dependent," thus providing a strong "security motive" for nations' efforts to increase *other countries*' global economic integration.[131]

- Patrick J. McDonald in a 2004 article for the *Journal of Conflict Resolution* found that "free trade, and not just trade, promotes peace by removing an important foundation of domestic privilege—protective barriers to international commerce—that enhances the domestic power of societal groups likely to support war, reduces the capacity of free-trading interests to limit aggression in foreign policy, and simultaneously generates political support for the state often used to build its war machine." Testing the link between individual countries' trade barriers (measured in terms of both tariff levels and deviation from an ideal "free trade" state) and their propensity to engage in military conflicts, McDonald found that "the tendency of protective trade policies to increase military conflict is both statistically and substantively significant" and that "the level of free trade exerts a larger effect than aggregate trade flows on the outbreak of peace" between countries. He concluded that "these results strongly support the claim that free trade enhances the prospects for peace."[132]
- Matthew O. Jackson and Stephen Nei in a 2015 paper examining alliances and interstate wars found that international trade induces peaceful and stable alliances: "Trade increases the density of alliances so that countries are less vulnerable to attack and also reduces countries' incentives to attack an ally." Examining detailed historical data on wars and trade, they showed that "the dramatic drop in interstate wars since 1950 is paralleled by a densification and stabilization of trading relationships and alliances"; that "countries with high levels of trade with their allies are less likely to be involved in wars with any other countries (including allies and nonallies)"; and that "an increase in trade between two countries correlates with a lower chance that they will go to war with each other." They found that a country having more allies and more trade with those allies leads the country to be less prone to attack and less prone to *being attacked*. Importantly, they also noted that "in the absence of international trade, no network of alliances is peaceful and stable"—thus indicating the centrality of trade to peace, especially after 1950.[133]
- A 2020 analysis of 140 countries from 1970–2012, by Benny Kleinman, Ernest Liu, and Stephen J. Redding, found that as countries become greater economic "friends" (as measured by welfare exposure/gains due to the other countries' productivity growth), they become greater political "friends" in terms of having more similar United Nations voting records, being less likely to be strategic rivals (i.e., "whether two countries regard each other as competitors, a source of actual or latent threats that pose some possibility of becoming militarized, or enemies") and being closer to the "U.S.-led liberal order." They concluded that these results, taken together, "are consistent with the view that increased conflict of economic interests between countries leads to heightened political tension between them."[134]

"A wide body of research across a range of countries and time periods reveals a strong, positive relationship between trade and national security."

"Economic openness can *decrease* a country's vulnerability to demand or supply shocks, or it can help the economy recover thereafter."

- Finally, in a 2012 issue of the *British Journal of Political Science*, Timothy Peterson and Cameron Thies found that the post-World War II decline in armed conflict is driven by an "unprecedented" increase in intra-industry trade (i.e., trade in similar—in many cases, branded—commodities, caused by economies of scale and consumer demands for variety) during this period.[135]

In sum, armed conflicts decrease as nations' economic interdependence and trade openness increase, and a country should seek to encourage other countries' global economic integration to discourage future attacks on that country. These national security benefits are driven by several factors: First, by making countries more commercially interdependent, trade encourages these nations to avoid war or other large-scale armed conflicts (which could impose substantial economic losses). Second, trade and commercial bargaining are more cost-effective than war as a means of resolving disputes with, or obtaining resources from, another country. Third, trade increases material prosperity (e.g., goods, services, investment, ideas) and promotes mutual tolerance and understanding.[136] And fourth, free trade can limit the political power of domestic constituencies that may benefit from increased conflict.

Regardless of the reason, the outcome is clear: while global economic integration cannot eliminate armed conflicts, trade liberalizing policies make peace among nations more likely (and thus enhance national security) than the nationalist alternative.

"Open" Nations Can Still Be "Resilient"

Finally, there is little to indicate that trade and investment openness has made the United States less economically resilient and thereby increased national security risk. Indeed, openness in many cases can *decrease* a country's vulnerability to demand or supply shocks, or it can help the economy recover thereafter.

JUST HOW "OPEN" ARE WE? That being said, the United States is not nearly as open or "dependent" on imports and global supply chains as claimed. Regarding openness, the United States has low "most favored nation" tariffs on goods generally, for example, but maintains high tariffs on dozens of politically sensitive goods and is one of the world's most frequent users of nontariff barriers (e.g., trade remedies) on goods, services, and investment.[137]

Nor is the U.S. economy especially reliant on imported goods: according to a 2019 analysis from the Federal Reserve Bank of San Francisco, imports account for only about 11 percent of U.S. consumer spending—a share that has remained "nearly unchanged" in the past 15 years. Thus, "despite how individual shopping experiences may appear, the majority of U.S. personal consumption expenditures are on domestically produced goods and services."[138]

In fact, the United States is one of the least trade-dependent countries in the world. According to the World Bank, for example, the United States in 2019 ranked second-to-last among surveyed countries in terms of trade (imports and exports of goods and services) as a share of national GDP—26 percent, right below Cuba (27 percent) and also well below major manufacturers such as China (36 percent), Japan (37 percent), South Korea (77 percent), and Germany (88 percent), as well as the world average (60 percent).[139] The United States also ranked near the bottom of a similar ranking of only import shares: fifth lowest at 14.6 percent and again below China (17.3 percent), Japan (18.3 percent), South Korea (37 percent), Germany (41.1 percent), and the world average (29.8 percent).[140] More complex analyses of trade dependency reveal similar results.[141] In terms of manufacturing supply chains, for example, Richard Baldwin and Rebecca Freeman found that imported inputs from only five countries—Canada, China, Mexico, Germany, and South Korea—make up more than 0.5 percent of U.S. manufacturing output, tied for the lowest number among the 21 Organisation for Economic Co-operation and Development nations.[142]

This is not to say, of course, that the United States' relative lack of global integration

is a "good" thing or that further closing the U.S. economy would be relatively costless—in fact, the preceding sections reveal much the opposite. Nevertheless, the nation's alleged import "dependency" and lack of protective measures are a common justification for new security nationalism—one that the data reveal to be generally groundless.

OPENNESS AND RESILIENCY ARE NOT MUTUALLY EXCLUSIVE. More importantly, there is little to suggest that a country's openness to foreign trade and investment undermines its economic resiliency or response to national emergencies. This conclusion makes intuitive sense—greater trade and investment openness might make an economy more vulnerable to *external* supply or demand shocks, but it also helps reduce a nation's vulnerability to (and improve its recovery from) *domestic* shocks—and is borne out in academic research. For example, economists Francesco Caselli and others found in 2015 that, when a countrywide shock occurs, "openness to international trade can lower GDP volatility by reducing exposure to domestic shocks and allowing countries to diversify the sources of demand and supply across countries."[143] Similarly, a 2016 examination of openness and economic fragility from Aida Caldera-Sánchez and colleagues found a positive relationship between trade openness and economic vulnerability.[144] Examining how certain policies (i.e., financial market liberalization, capital account openness, trade openness, exchange rate policies, and product market regulation) affect a country's economic growth and risk of financial crisis, the authors found that "lower import tariffs . . . lowers crisis risk while having a favourable impact on average growth."[145]

Similar conclusions apply to the COVID-19 crisis. For example, a 2020 assessment from Barthélémy Bonadio and others of the pandemic's impact on global supply chains and national economic performance found that "renationalization" of supply chains would generally not improve a country's economic performance after a global pandemic:

> We show that the average real GDP downturn due to the Covid-19 shock is expected to be ~29.6%, with one quarter of the total due to transmission through global supply chains. However, "renationalization" of global supply chains does not in general make countries more resilient to pandemic-induced contractions in labor supply. The average GDP drop would have been ~30.2% in a world without trade in inputs and final goods. This is because eliminating reliance on foreign inputs increases reliance on the domestic inputs, which are also disrupted due to nationwide lockdowns. In fact, trade can insulate a country imposing a stringent lockdown from the pandemic-shock, as its foreign inputs are less disrupted than its domestic ones.[146]

The authors also examined the effect of pandemic lockdowns on individual sectors (including manufacturing industries such as textiles, chemicals and pharmaceuticals, and electrical equipment) and concluded that "there is no sector in which supply chain renationalization notably improves resilience, measured either by GDP, or by value added of the sector itself." These results are preliminary but consistent with the research on openness and resiliency more generally. Combined, the analyses should foment caution among American policymakers seeking to improve U.S. economic resiliency and performance by renationalizing supply chains.

The research is also backed by anecdotal evidence: in his book on the economics of COVID-19, for example, Cato's Ryan Bourne documents several instances of foreign suppliers and trade openness (e.g., East Asian clothing producers and foreign carmakers) helping the U.S. economy recover and of closed sectors (e.g., domestic meatpacking facilities or tariff-protected light truck production) doing the opposite.[147]

Indeed, domestic policy likely outweighs trade openness in terms of mitigating the risk of economic shocks. For example, two

"An early assessment of the pandemic's impact on global supply chains and national economic performance found that 'renationalization' of supply chains would generally not improve a country's economic performance."

> "Domestic policy likely outweighs trade openness in terms of mitigating the risk of economic shocks, including pandemics."

of the most "trade-dependent" countries noted in the previous section (Germany and South Korea) experienced COVID-19-induced quarterly GDP contractions in the first half of 2020 that were similar to or better than the relatively "closed" Japan or United States, while other "open" economies performed less favorably over the same period.[148] Germany's initial "V-shaped" recovery is particularly noteworthy in this regard, given the country's level of economic development and high dependence on trade.[149] Sweden, meanwhile, also has "high exposure to international value chains" but "face[d] a milder recession this year than many economies in the euro area."[150] Bourne further notes that certain foreign suppliers rebounded quickly from COVID-19, but "it was the lack of demand from importing countries that took longer to contain the virus, such as the United States and the UK, which prolonged a depression of activity in those industries."[151] These situations indicate that domestic policies, in particular countries' ability to control the virus or keep their economies open, drove their economic performance more than trade or investment liberalization. Subsequent research supports these conclusions.[152]

Research also supports the general primacy of domestic policy and domestic demand over trade openness in terms of mitigating economic shocks. For example, the study from Caldera and others found that the policies with the greatest benefit in terms of both economic growth and crisis risk were those that improve the quality of domestic institutions (e.g., more effective government, greater voice and accountability, and better control of corruption). A 2016 examination from Lino Briguglio and Melchior Vella of 172 countries found that trade openness can lead to economic growth volatility but that this risk can be mitigated entirely by good governance (as measured in this case by the Rule of Law portion of the Worldwide Governance Indicators).[153] A World Bank analysis of how various policies affect the ability of European economies to absorb an external shock and recover thereafter found the most significant and negative effects for both shock absorption and recovery to come from domestic policies, namely state control of production and prices; regulatory barriers to entrepreneurship; and an uncompetitive banking sector. (Trade openness effects, meanwhile, were mixed or ambiguous.)[154]

MARKET-ORIENTED POLICIES CAN SUPPORT MANUFACTURING AND NATIONAL SECURITY

Although the data belie the supposed "death" of the U.S. manufacturing sector and the defense industrial base, several market-oriented policy reforms would support national security by strengthening the U.S. economy in general and boosting the manufacturing sector's performance in particular. Where possible, the reforms discussed in this section incorporate current U.S. laws and policies related to national security (see the Appendix) and reflect the preceding sections' conclusions that using only domestic output to satisfy U.S. demand in times of emergency would be impractical (as even many industrial policy advocates recognize[155]) and counterproductive; that U.S. industrial policies targeting specific companies or industries have a woeful track record; that simply removing government restrictions on trade, investment, and consumption would better achieve core national security objectives; and that domestic policies are a critical contributor to a nation's economic strength and resiliency.

Trade and Investment Reforms to Bolster National Security

Six policies liberalizing trade and investment would support U.S. national security by improving access to and production of essential goods:

- **Unilateral liberalization of tariffs on industrial inputs.** President Trump's tariffs on global steel and aluminum imports, as well as on Chinese capital goods, have been repeatedly found to harm the U.S. manufacturing sector

and antagonize allies (e.g., the EU and Canada) while providing little long-term benefit to the protected domestic industries at issue. Eliminating these measures—whether through unilateral executive action or legislation—would thus provide an immediate boost to the U.S. manufacturing sector. Longer term, Congress should reform or eliminate the U.S. laws, such as Section 232, that provide the president with vast discretion to impose tariffs on "national security" or other grounds without any congressional input or oversight—thus generating tariffs and injecting uncertainty into manufacturing supply chains. Should full repeal or line-by-line amendment of these laws prove politically untenable, Congress should consider legislation that would subject presidential trade restrictions to congressional approval, such as the Global Trade Accountability Act, which Sen. Mike Lee (R-UT) introduced.[156]

U.S. "trade remedy" duties on industrial inputs impose similar economic harms.[157] Congress should follow other jurisdictions by requiring the executive branch to consider the costs that these duties inflict on other U.S. manufacturers and to refrain from implementing them where doing so would be inconsistent with the "public interest," including U.S. national security. Other methodological improvements might also be in order.[158] Finally, Congress should expand the current provision of U.S. law prohibiting the president from restricting "the importation into the United States of any material determined to be strategic and critical" under the Stock Piling Act (with limited exceptions) to apply to any other goods that the U.S. government deems so "essential" as to be stockpiled in case of national emergency.[159]

- **New trade and investment agreements with U.S. allies.** The U.S. government should liberalize trade and investment with allies through existing legal mechanisms, including expanding the National Technology and Industrial Base (NTIB) to include allies (and innovative manufacturing nations) such as Finland, Germany, Japan, the Netherlands, South Korea, Singapore, Switzerland, and Sweden; fully implementing the NTIB and further liberalizing trade, investment, and R&D collaboration among all NTIB members, for example by eliminating U.S. procurement restrictions (e.g., Buy American; the Berry Amendment; and the Byrnes-Tollefson Amendment), exempting NTIB members from U.S. investment screening, and eliminating U.S. controls on high-technology and defense-related exports to these trusted nations; and entering into new reciprocal defense procurement agreements or security of supply arrangements, or expanding the coverage of the current agreements (e.g., to medical goods), to ensure that the United States and partner countries have access to essential items in times of emergency or abnormally high demand. Over the longer term, the United States should consider new comprehensive free trade agreements with these and other countries, including by reentering the Trans-Pacific Partnership (now the Comprehensive and Progressive Trans-Pacific Partnership).

  There already appears to be support in Congress for several of these recommendations. For example, the 2021 NDAA instructs the DOD to improve NTIB implementation and consider expanding the list of NTIB member countries.[160] This process has only just begun, and further NTIB reforms—for example with respect to procurement, investment, and export controls—remain necessary. The legislation also imposes new printed circuit board acquisition requirements on the DOD *but* permits the DOD to acquire these items from "covered nations," which includes the

"Eliminate restrictions on imports of manufacturing inputs and liberalize trade and investment with allies through mechanisms such as the National Technology and Industrial Base."

> "Eliminate the Jones Act and 'Buy American' restrictions, and reform U.S. export controls and trade agreement exceptions for 'national security.'"

United States, NTIB members, NATO members with reciprocal procurement agreements, and any other country (excluding Russia, China, Iran, and North Korea) that meets specified national security conditions.[161]

- **Repealing the Jones Act.** As the 2018 Cato Institute paper concluded, the evidence against the Jones Act is compelling:

  Under its watch the U.S. shipbuilding industry has atrophied, its shipping fleet has withered, and any contribution to the military's sealift capability has been trivial at best. The failure of the Jones Act to meet its intended objectives, meanwhile, has inflicted considerable economic harm through a variety of direct and indirect channels. Rather than serving to bolster national security, the Jones Act has stultified domestic shipbuilding, diminished the size of America's merchant marine reserve, and hamstrung our ability to respond expeditiously and effectively to natural and manmade disasters.[162]

  Nothing less than immediate repeal is warranted. In the meantime, the president should grant any waiver requests submitted by American companies now suffering under the law.
- **Reforming U.S. export controls.** As documented by numerous experts, U.S. "national security" restrictions on certain exports, especially technology products such as satellites and semiconductors, can harm the U.S. defense industrial base.[163] For example, export controls can reduce the incentive for investment by reducing the market size for a company's goods.[164] Beyond the aforementioned NTIB-related reform, U.S. policymakers should reform the U.S. export controls regime more broadly by limiting controls to only essential national security objectives; omitting items that are available in other countries; streamlining the export licensing process to minimize exporter (and taxpayer) burdens; or ensuring system flexibility through automatic sunset provisions or mandatory annual reviews of controlled products.
- **Reforming existing trade agreement rules on national security and short supply.** The terms under which U.S. trade agreement parties can restrict trade in the name of "national security" or "short supply" should be revised to establish objective definitions of both terms and ensure that participants' invocation of these exceptions is subject to binding dispute settlement.[165] These reforms would maintain national sovereignty while increasing predictability for U.S. companies and disciplining abuse by governments. The national security exception changes would also be consistent with the United States' historical view of the General Agreement on Tariffs and Trade.[166]
- **Eliminating Buy American restrictions.** As Cato scholars have argued for decades, Buy American procurement requirements are bad law, bad economics, bad trade policy, and bad politics—and can especially harm U.S. manufacturers.[167] The U.S. government should eliminate these restrictions, particularly for the procurement of essential goods and services. For example, the government should terminate the Stock Piling Act's Buy American rules for "strategic and critical materials" and should block attempts to implement similar rules for the Strategic National Stockpile (which covers medical goods). As President Truman warned when signing the Stock Piling Act into law:

  > [Buy American] provisions will not only materially increase the cost of the proposed stockpiles but will tend to defeat the conservation and strategic objectives of the bill by further depleting our already inadequate underground reserves of strategic materials.

> Furthermore, there can be a serious conflict between those provisions and the foreign economic policy which this Government is actively pursuing. It also seems to me that the application of the Buy American Act may frequently hamper the effective achievement of the essential purpose of the legislation which is to enlarge the stock of vital raw materials available within our borders in time of possible emergency.[168]

These principles apply equally today.

Other Market-Oriented Reforms to Enhance U.S. National Security

Beyond trade policy, the United States should implement "horizontal" economic reforms that would boost U.S. manufacturers and national security:

- **Human capital.** To address the DOD's immediate concerns regarding the dearth of qualified U.S. manufacturing workers in science, technology, engineering, and mathematics fields, the federal government should significantly expand high-skilled immigration. Research shows that U.S. restrictions on high-skilled immigration have undermined national security objectives by encouraging multinational corporations to offshore jobs and R&D activities to their affiliates in more welcoming countries and by benefiting potential U.S. adversaries, especially China, in terms of new jobs, new businesses, and new innovations, thus causing a relative decline in the United States' own innovative capacity.[169] In fact, restrictive U.S. immigration policies have likely boosted China's semiconductor industry, which the ITC in 2019 found had been hamstrung by a lack of skilled human capital.[170]

  Over the longer term, private-sector training and apprenticeship programs can equip native workers for the future needs of advanced manufacturing industries. For example, the employer-funded Federation for Advanced Manufacturing Education program has helped hundreds of new high-school graduates and older factory workers gain modern ("grey collar") manufacturing skills and find high-paying work in U.S. factories that now utilize computers and robotics.[171] These efforts can be assisted by reforms to federal, state, and local government educational policies that eliminate biases against vocational schools that can provide skills at lower cost and allow older workers, whether currently employed or recently jobless, to train for new careers.[172]
- **Tax policy.** Governments should further reform corporate tax policy to encourage American companies—manufacturers or otherwise—to locate and invest in the United States and to ensure that current businesses are globally competitive. In particular, the federal government and the states should further reduce corporate tax rates, which combined remain above the Organisation for Economic Co-operation and Development average and are shouldered in large part by workers and consumers.[173] The government should also expand and make permanent the 2017 Tax Cuts and Jobs Act's temporary "full expensing" provision ("100 percent bonus depreciation"), which allows U.S. businesses to write off certain business investments immediately and fully. Localities might also consider lowering property taxes, which are borne by owners of industrial (and other) real estate and are high by global standards.[174] These reforms would benefit all companies and should be pursued regardless of any national security concerns. Nevertheless, they *would* benefit the U.S. manufacturing sector: substantial research shows, for example, that full expensing increases investment, jobs,

> **"'Horizontal' reforms of U.S. immigration, education, tax, and regulatory policies would boost U.S. manufacturers and national security."**

> "The case of machine tools—highlighted as 'at risk' by the Department of Defense—shows the potential benefits of the free market reforms proposed herein."

and economic growth and that a permanent and expanded version (covering structures such as factories) would especially benefit U.S. manufacturers.[175]

- **Eliminate "never needed" regulations.** During the COVID-19 pandemic, state and federal governments temporarily suspended hundreds of regulations to boost domestic production, investment, and adjustment during the national emergency, revealing in the process that these "never needed" regulations discouraged economic growth and dynamism while providing little, if any, public benefit.[176] Although many of these regulations affect nonmanufacturing issues and industries (e.g., physician licensing), many others—such as FDA testing and approval of medical goods—directly inhibit the domestic production of certain essential goods. Others, such as biofuels mandates, increase production costs for U.S. manufacturers. Repeal of these regulations would therefore boost not only economic growth generally but also American manufacturers directly—all to the benefit of national security.

Additional government action should not be considered unless and until these and other market-oriented policies prove insufficient to satisfy legitimate U.S. national security concerns. New and expansive industrial policy programs, however, would be unnecessary. U.S. law already provides the federal government with several tools (e.g., Title III of the Defense Production Act of 1950 or U.S. government stockpiles) to fill discrete gaps in the defense industrial base. (See the Appendix.) And experience with these laws, the current state of the U.S. manufacturing sector, and the failures of past "security nationalism" policies argue for both skepticism and caution when pursuing protectionism, subsidies, or other government interventions intended to boost specific parts of the U.S. defense industrial base.[177]

Case Study: Machine Tools

The case of machine tools—an industry highlighted as "at risk" by the DOD in its *Fiscal Year 2019 Industrial Capabilities Report to Congress* (and often by advocates of U.S. industrial policy)—shows the potential benefits of several of the reforms in the previous section. The DOD's report made the following findings:

- The United States in 2017 was the second largest consumer and fifth largest producer of machine tools (behind China, Japan, Germany, and Italy, and just in front of South Korea, Taiwan, and Switzerland).
- "Major risks" to the industry include U.S. universities' lack of "large-scale industrial machine tool research programs" and of cooperative efforts with industry; a lack of skilled labor to meet current and projected needs (likely the largest problem); "economic tradecraft" and intellectual property theft by China and unnamed other countries; other nations' "coherent investment plans and tax policies to support their own industrial sectors"; and U.S. export controls. The DOD subsequently lamented the fact that foreign machine tool producers, notably in Japan and Taiwan, were increasing exports to China while decreasing exports to the United States.
- To address the "major risks" identified, the DOD has begun working on plans to improve the U.S. machine tools workforce and establish a national network of "machine tool hubs" focused on both skills development and "increasing the prestige of manufacturing as a profession in order to inspire more prospective workers to choose it as a career."[178]

Despite these risks, the DOD did not view it necessary to directly subsidize the U.S. machine tool industry or specific domestic goods using one of the numerous legal authorities permitting it to do so (see Appendix).

Many of the problems that the DOD identified (to the extent that they are valid

at all[179]) would be improved by implementing the reforms discussed in the preceding subsections. Although the United States remained a top-five global producer of machine tools, the government could solidify access to these goods through new arrangements that liberalize trade (tariff and nontariff barriers[180]) in machine tools with allies and major producing nations such as Japan, Germany, Italy, South Korea, and Taiwan. (In a good first step, the Trump administration reduced tariffs on certain Japanese machine tools as part of the 2019 U.S.-Japan "Phase One" Deal.[181]) U.S. machine tools producers and their customers, moreover, would benefit from the elimination of tariffs on industrial inputs (especially steel and aluminum) and current restrictions on high-skill foreign workers as well as from corporate tax and regulatory reforms. And U.S. workers would benefit from private-sector workforce development programs such as the Federation for Advanced Manufacturing Education program.

Given the failures of U.S. machine tools protectionism and planning in the 1980s and 1990s, as well as the documented economic and political problems with American protectionism and industrial policy more broadly, these market-oriented policies should be prioritized.

CONCLUSION

Although theory might support using protectionism and other market interventions to boost national security, current "security nationalism" proposals ignore several facts. First, reports of the demise of U.S. industrial base are exaggerated—overall, the U.S. manufacturing sector is productive on both global and historical terms, as are the industries that are most relevant to national security. Second, history and academic research show that freer markets can bolster national security and economic resilience and that U.S. "security nationalism," by contrast, has been not only unsuccessful but often based on an expansive and political definition of "national security." Third, U.S. law already permits the federal government, primarily through the DOD, to address discrete weaknesses in the defense industrial base.

For these reasons, expansive new security nationalism proposals warrant extreme skepticism, and market-oriented policies should be prioritized. As President Truman stated decades ago:

> The United States is opposed to governmental policies fostering autarchy, for itself as well as for others. Encouragement of uneconomic domestic production and unjustified preferential treatment of domestic producers destroys trade and so undermines our national economic strength. A large volume of soundly based international trade is essential if we are to achieve prosperity in the United States, build a durable structure of world economy and attain our goal of world peace and security.[182]

American policymakers would be wise to remember—and heed—Truman's advice.

"Given the health of U.S. manufacturing, the checkered history of government intervention, and the availability and efficacy of market-oriented alternatives, security nationalism proposals warrant extreme skepticism."

APPENDIX: SUMMARY OF U.S. LAWS INTENDED TO SUPPORT THE DEFENSE INDUSTRIAL BASE

U.S. Policies Expanding International Cooperation to Bolster National Security

THE NATIONAL TECHNOLOGY AND INDUSTRIAL BASE. The United States has established a four-country National Technology and Industrial Base (NTIB) specifically designed to bolster U.S. national security by expanding the country's industrial capacity beyond U.S. borders. A 2020 Congressional Research Service (CRS) report describes the NTIB as follows:

> The [NTIB] consists of the people and organizations engaged in national security and dual-use research and development (R&D), production, maintenance, and related activities within the United States, Canada, the United Kingdom, and Australia. The NTIB, as established by 10 U.S.C. §2500, is intended to support national security objectives of the United States, including supplying military operations; conducting advanced R&D and systems development to ensure technological superiority of the U.S. Armed Forces; securing reliable sources of critical materials; and developing industrial preparedness to support operations in wartime or during a national emergency.[183]

The CRS report adds that the NTIB was part of an effort by Congress in the mid-1990s to support production and R&D of critical defense materials and products. It originally included Canada—a long-standing U.S. defense industrial partner[184]—but was expanded in 2016 (as part of the National Defense Authorization Act for Fiscal Year 2017) to include the United Kingdom and Australia to leverage those countries' defense R&D efforts and to avoid U.S. restrictions on exports of technology to these allies. According to the report, "Congress also directed [the Department of Defense] to create a plan that would promote closer integration of the technology and industrial bases of all NTIB member countries."[185] Such integration was, in Congress' view, an important way to boost U.S. national security.

Participation in the NTIB allows member countries and their manufacturers several benefits: procurement preferences for conventional ammunition, uniforms, and other items; exemptions from some domestic sourcing (Buy American) restrictions on the U.S. government's acquisition of buses, chemical weapons antidotes, valves and machine tools, ball bearings and roller bearings, and certain components for naval ships (including diesel engines);[186] exemptions from foreign ownership requirements of the National Industrial Security Program; and preferences for contracts awarded under a national security program. U.S. law also directs the secretary of defense to develop a "national security strategy for the NTIB based on a prioritized assessment of risks and challenges to the defense supply chain" and to submit both an annual report to Congress on "NTIB capabilities, performance, and vulnerabilities" and a report on "unfunded priorities to address gaps or vulnerabilities in the NTIB."[187]

Although the NTIB was established years ago and reflects Congress's priority to bolster national security through international cooperation, little work has been undertaken to achieve congressional objectives. For example, the *Fiscal Year 2019 Industrial Capabilities Report to Congress* issued in 2020 contains limited references to the NTIB and describes no major U.S. government efforts thereunder (even though it notes a 2018 Department of Defense [DOD] recommendation to address industrial base risks by "working with allies and partners on joint industrial base challenges through the NTIB and similar structures").[188]

The CRS also noted other limitations on the NTIB's use and thus the effective integration of the NTIB countries' defense industrial bases, including domestic sourcing requirements, such as the Buy American Act (41 U.S.C. §§ 8301–8303) and the Byrnes-Tollefson Amendment (10 U.S.C. § 8679); small business set-asides that apply only to American small businesses as defined under U.S. law; U.S. export controls on certain categories of defense articles and services, especially the International Traffic in Arms Regulations, administered by the State Department, that restrict the export of defense-related goods and services;[189] and the NTIB's omission of Finland, Germany, the Netherlands, South Korea, Singapore, Switzerland, Sweden, or other U.S. allies that are innovative and productive.[190]

INTERNATIONAL DEFENSE PROCUREMENT AGREEMENTS. The United States also has several agreements with allies to ensure sufficient supplies of defense-related materials:

- Pursuant to reciprocal defense procurement agreements between the DOD and its counterparts in 27 foreign governments, each country agrees to remove barriers to national security–related purchases of supplies and services of the other country.[191] The countries with which the DOD has these agreements

also are considered "qualifying countries" under the United States' Defense Federal Acquisition Regulation Supplement 225.872, meaning that the DOD has determined it "inconsistent with the public interest" to apply restrictions on the federal government's acquisition of qualifying products from these countries.[192]

- Second, the DOD also has security of supply arrangements with several countries (see Table 8) that "allow the DOD to request priority delivery for DOD contracts, subcontracts, or orders from companies in these countries." These arrangements implement the "Meeting National Defense Requirements" section of the "Declarations of Principles for Enhanced Cooperation in Matters of Defense Equipment and Industry" that the United States has signed with certain nations that "recognizes the potential for a certain degree of mutual interdependence of supplies needed for national security, and calls for the parties to explore solutions for achieving assurance of supply."[193]

Table 8

U.S. defense procurement agreements

Country	Security of supply arrangement	Reciprocal defense procurement and acquisition
Australia	✔	✔
Austria		✔
Belgium		✔
Canada	✔	✔
Czech Republic		✔
Denmark		✔
Egypt		✔
Estonia		✔
Finland	✔	✔
Germany		✔
Greece		✔
Israel		✔
Italy	✔	✔
Japan		✔
Latvia		✔
Luxembourg		✔
Netherlands	✔	✔
Norway	✔	✔
Poland		✔
Portugal		✔
Slovenia		✔
Spain	✔	✔
Sweden	✔	✔
Switzerland		✔
Turkey		✔
United Kingdom	✔	✔

Sources: "Security of Supply," Industrial Policy, Department of Defense, http://www.businessdefense.gov/security-of-supply/; and "Reciprocal Defense Procurement and Acquisition Policy Memoranda of Understanding," International Contracting, Contract Policy, Defense Pricing and Contracting, https://www.acq.osd.mil/dpap/cpic/ic/reciprocal_procurement_memoranda_of_understanding.html.

Domestic Laws Aimed at Supporting the "Defense Industrial Base"

U.S. law also provides the DOD with authority to identify and mitigate defense-related industrial procurement and capacity issues.

First, U.S. law requires the DOD to assess annually the defense industrial base and work to mitigate any potential concerns. In particular, the DOD is required to "develop a national security strategy" for the NTIB that "shall be based on a prioritized assessment of risks and challenges to the defense supply chain and shall ensure that the national technology and industrial base is capable of achieving" multiple enumerated objectives, including the president's *National Security Strategy* and "sustaining production, maintenance, repair, logistics, and other activities in support of military operations of various durations and intensity." The law further requires the DOD, in consultation with secretary of commerce and the secretary of energy to "prepare selected assessments of the capability of the national technology and industrial base to attain the national security objectives set forth" in the statute. This includes the submission of an annual *Industrial Capabilities Report* to Congress that reviews the U.S. defense industrial base and describes "any mitigation strategies necessary to address any gaps or vulnerabilities in the national technology and industrial base" and "any other steps necessary to foster and safeguard the national technology and industrial base."[194]

Second, U.S. law provides the DOD with several tools to implement the "mitigation strategies," including those listed and described in Table 9. For example, the Defense Production Act of 1950 (DPA) allows the DOD to identify priority sectors for government contracting and enter into those contracts (Title I) and to support, through purchases or loans/loan guarantees, "essential" domestic industrial base capabilities that are found to be nonexistent, at risk of loss, or insufficient to meet government needs (Title III). Several other programs provide the DOD with the authority and funding to support the industrial base. The DOD also can use the National Defense Stockpile Transaction Fund and Strategic and Critical Materials Stock Piling Act (50 U.S.C. § 98 *et seq.*), which authorizes the National Defense Stockpile Manager to fund material R&D projects to develop new materials for the stockpile and requires the president to encourage the development and conservation of domestic sources of "strategic and critical materials" through procurement.[195] The Stock Piling Act is also subject to the Buy American Act of 1933, despite President Truman's opposition at the time the policy was enacted.[196]

Past DOD recommendations and actions have used these laws to support the U.S. defense industrial base. For example, in a September 2018 DOD report issued pursuant to President Trump's July 21, 2017, Executive Order 13806 on "Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States," the DOD expressly noted that it can address industrial base risks by, among other things: expanding direct investment in the lower tier of the industrial base through DPA Title III, ManTech, and Industrial Base Analysis and Sustainment programs; diversifying sources of domestic and international supply of critical materials and technologies, including through expanded use of the National Defense Stockpile program; and working with allies and partners on joint industrial base challenges through the NTIB and similar structures.[197]

The fiscal years 2018 and 2019 industrial capabilities reports submitted to Congress also use the legal authorities from Table 9. The reports, however, do not show a broad-based decline in the U.S. manufacturing sector as a whole and instead conclude that the U.S. defense industrial base is, in general, "profitable and expanding."[198] The fiscal year 2019 report, in particular, summarizes the strong and improving state of the defense industry and then provides sector-specific risk assessments for aircraft; chemical, biological, radiological, nuclear; ground systems; missiles and munitions; nuclear matter warheads; radar and electronic warfare; shipbuilding; soldier systems; space; materials; cybersecurity for manufacturing; electronics; machine tools; organic defense industrial base; software engineering; and workforce. These analyses reveal very few sector-wide concerns, instead focusing on narrow product/process risks (e.g., ammonium perchlorate supply or gallium nitride technologies[199]) that may require DOD support. As a result, the fiscal year 2019 report lists relatively few actions by the DOD to mitigate—for example through direct funding under DPA Title III—risks to the domestic industrial base. Indeed, the most common risks found in the DOD industrial bases analyses are lack of a skilled and "clearable" workforce and insufficient demand from the U.S. government. Neither can be blamed on "deindustrialization."

The primary exceptions to DOD's conclusions are in the soldier systems (textiles; batteries; night vision), electronics (in particular, printed circuit boards), and machine tools sectors, where the DOD voiced broader concerns about the health of the domestic industry. However, despite these complaints, the DOD did *not* intervene (e.g., through subsidies or contracts) to support the sector's industrial capabilities or specific products. Among the DOD's reasons for not doing so was a lack of "unacceptable levels of industrial base risks."[200] Instead, the DOD's efforts were again focused on improving workforce-related impediments, such as science,

Table 9

U.S. domestic laws intended to support defense industrial base

Program	Legal authority	Objective	Actions
Defense Priorities and Allocations System (DPAS)	Title I of the Defense Production Act of 1950 (DPA)	The purpose of the DPA is to assure the timely availability of industrial resources to meet current national defense and emergency preparedness program requirements and to provide an operating system to support rapid industrial response in day-to-day operations and national emergencies. The DPA authorized the president to require preferential treatment of national defense programs. DPAS establishes procedures for placement of priority ratings on contracts, defines the industry's responsibilities under rated orders, and sets forth compliance procedures.	As of fiscal year (FY) 2019, there were 13 "DX" programs, which have the "highest national defense urgency."
DPA Title III	Title III of the DPA	The DPA Title III program provides the president, through the Department of Defense (DOD), broad authority to ensure timely availability of domestic industrial resources essential for the execution of the National Security Strategy of the United States through the use of tailored economic incentives.	At end of FY 19, the DPA Title III portfolio consisted of 37 projects totaling more than $1 billion in government and industry funding to strengthen the domestic industrial base.
The Committee on Foreign Investment in the United States (CFIUS)	Section 721 of the DPA	CFIUS is an interagency committee that reviews certain foreign acquisitions, mergers, or takeovers of U.S. businesses to determine the effect of a transaction on the national security of the United States. The committee is chaired by the secretary of the Treasury Department and includes nine voting members, including the DOD (through its Office of Industrial Policy).	CFIUS reviewed 231 "covered transactions" in 2019.
Office of Small Business Programs (OSBP)	Section 831 of the National Defense Authorization Act of FY 91	The OSBP maximizes prime and subcontracting opportunities for small businesses to respond to DOD "warfighter requirements." The program's goal is to contribute to an "innovative, cost effective, and agile industrial base, to directly support the National Defense Strategy and a robust economy."	In FY 19, the OSBP conducted numerous training sessions for small businesses across the country.
Industrial Base Fund	10 U.S.C. § 2508	The Industrial Base Analysis and Sustainment (IBAS) program seeks to "create a modern Industrial Base that fortifies traditional and forges emerging sectors to respond at will to National Security Requirements." Under the IBAS, DOD makes direct investments "to improve industrial base resilience to improve force readiness." The IBAS office directs investment by identifying strategy/focus areas, obtaining resources, and overseeing the execution of projects, "aiming to ameliorate industrial base and manufacturing issues and strengthen the defense industrial base." This includes efforts through Cornerstone Other Transaction Authority, which is a government-run, integrated contract vehicle that carries out prototype projects, capabilities, and capacities in support of defense industrial base requirements across 18 sectors.	In FY 19, IBAS made investments in the following areas: human capital (solid rocket motor initiative and workforce skills); infrastructure (naval propulsion foundry, aluminum foundry, tungsten, and electronic beam welding); source mitigation (microelectronics and materials including boron carbide, explosive initiators, carbon fiber, and critical energetics [butanetriol]); and constrained, fragile, and emerging markets (directed energy supply chain assurance initiative, radar affordability and resiliency initiative, small unmanned aircraft system, optical ceramics, and carbon nanotube).
Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs	15 U.S.C. § 638	The SBIR program is intended to strengthen the role of innovative small business concerns in federally funded research or research and development (R/R&D). Any federal agency with an extramural budget for R/R&D in excess of $100 million must participate in the SBIR program and reserve a minimum percentage of its R/R&D budgets for small business R/R&D contracts. The STTR program expands public- and private-sector partnerships to include joint venture opportunities for small businesses and nonprofit research institutions. In particular, the STTR program provides financing to bridge the gap between basic R&D and commercialization of resulting innovations.	According to a 2019 DOD-funded report, the SBIR/STTR contracts initiated between 1995 and 2015 generated: $121 billion in total sales of new products and services; $28 billion in sales of new products to the U.S. military; $347 billion in total economic impact nationwide; and 1,508,295 U.S. jobs with an average compensation of $73,461.

Table 9 (continued)

Program	Legal authority	Objective	Actions
Rapid Innovation Fund (RIF)	Pub. L. No. 116-92 § 878	The RIF program was established by the National Defense Authorization Act of FY 11 as a competitive, merit-based program designed to accelerate the fielding of innovative technologies from SBIR/STTR, defense laboratories, and other sources into military systems.	Congress appropriated $250 million to RIF in FY 19 funding. FY 19 program highlights include: $120 million projects selected by modernization assistant directors; $120 million mission priority projects selected by military services and DOD agencies; and a total of 94 anticipated awards worth $2.5 million each.
ManTech	10 U.S.C. § 2521	The DOD Manufacturing Technology (ManTech) program is designed to anticipate and close gaps in domestic manufacturing capabilities through the "development and application of advanced manufacturing technologies and processes that will reduce the acquisition and supportability costs of defense weapon systems and reduce manufacturing and repair cycle times across the life cycles of such systems."	In FY 19, ManTech projects covered infrared sensors, hypersonic aeroshell coatings, high-yield focal plane arrays, OLED microdisplays, microcircuit emulation, and long-range discrimination radar.
National Defense Stockpile Transaction Fund	Strategic and Critical Materials Stock Piling Act	The Strategic and Critical Materials Stock Piling Act of 1939 provides for the procurement, recycling, and upgrade of strategic and critical materials by the National Defense Stockpile (NDS) program. The DOD administers this program via a revolving fund called the NDS Transaction Fund, which is projected to be exhausted by FY 25.	Between FY 03 and FY 18, the NDS Transaction Fund made the following distributions: NDS acquisitions, source qualifications, R&D ($471.3 million); nondefense accounts ($998.6 million); other defense accounts ($2.702 billion); and net cash flow ($3.283 billion).

Source: Office of Industrial Policy, *Industrial Capabilities: Annual Report to Congress, Fiscal Year 2018* (Washington: Department of Defense, May 13, 2019).

technology, engineering, and mathematics training and "increasing the prestige of manufacturing as a profession in order to inspire more prospective workers to choose it as a career."[201]

U.S. Trade Laws Aimed at Protecting the Defense Industrial Base

U.S. law also authorizes the imposition of restrictions on imports to protect certain U.S. industries. The following laws are the most common:

- Section 232 of the Trade Expansion Act of 1962 authorizes the executive branch to initiate an investigation to determine the effects on the national security of imports of a certain product or group of products; prepare a report on the findings of such an investigation and recommend action (e.g., tariffs or quotas) against the subject imports where the report finds that "such article is being imported into the United States in such quantities or under such circumstances as to threaten to impair the national security"; and based on the report and recommendations, adjust the imports of the article and its derivatives so that such imports will not threaten to impair the national security.[202] The Commerce Department (or the Department of the Treasury before it) initiated a total of 31 Section 232 investigations between 1962 and 2019 and initiated three more cases in the first half of 2020.[203]
- U.S. "trade remedy" laws allow for the imposition of duties on imports from specific countries that are found to have injured or threatened to injure the U.S. industry making the same (or directly competitive) product. Antidumping duties guard against imports that are alleged to be priced below "fair market value" (typically determined via a Commerce Department examination of home market prices or production costs); countervailing duties apply to allegedly subsidized imports; and safeguards apply to imports that have experienced recent and unexpected surges. As of August 2020, there were 539 antidumping or countervailing duty orders and two safeguard actions.[204]
- Buy American laws restrict government procurement to domestically produced goods. The Buy American Act of 1933 requires federal agencies, including the DOD, to buy U.S. "unmanufactured articles, materials, and supplies" and "manufactured articles, materials, and supplies" (produced in the United States domestic inputs) when they are acquired for public use, unless a specific exception applies.[205] Other major domestic procurement restrictions include the Buy America provision of the Surface Transportation Assistance Act of 1982; the American Iron and Steel

Requirements of the Consolidated Appropriations Act, 2014, and the Water Resources Reform and Development Act of 2014; and the American Recovery and Reinvestment Act of 2009. These laws restrict specific types of federal government procurement, especially for the construction of public buildings, aviation projects, highways, railroads and rail cars, and buses;[206] specific sectors, including supplies, construction materials, information technology, and defense;[207] and the procurement of specific materials, especially iron and steel.[208] Finally, defense procurement is further restricted by the Berry Amendment (10 U.S.C. § 2533a), which applies to food, clothing, fabrics, fibers, yarns, other made-up textiles, and hand or measuring tools; and the Byrnes-Tollefson Amendment (10 U.S.C. § 8679), which restricts U.S. government contracting for vessel construction or repair at foreign shipyards.[209]

Other U.S. laws intended to protect American manufacturers from allegedly unfair or injurious competition include Section 337 (19 U.S.C. § 1337), which addresses antitrust and intellectual property rights claims, including allegations of patent infringement and trademark infringement by imported goods; Section 301 of the Trade Act of 1974, which permits the Office of the U.S. Trade Representative to respond to unfair trade practices and in certain cases impose unilateral remedies (e.g., tariffs) against imports from the offending country; and both the Trading with the Enemy Act of 1917 and International Emergency Economic Powers Act of 1977, which allow the president to regulate all forms of international commerce and to freeze assets in times of war or national emergency.

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18. Lawrence and Edwards, "US Employment Deindustrialization," p. 6.

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177. For example, the Department of Defense's *Fiscal Year 2019 Industrial Capabilities Report* notes that the National Defense Stockpile (NDS) Transaction Fund was projected to run a deficit due in large part to "legislatively directed disbursements" that are not related to the NDS. In particular, from FY 2003 to FY 2018, 89.8 percent of the proceeds from NDS program activities, measured in real dollars, were diverted to other defense and non-defense programs, such as the Defense Health Program, construction of the World War II Memorial, and the Federal Supplementary Medical Trust Fund. Such actions undermine the NDS's important national security objectives. Office of Industrial Policy, *Fiscal Year 2019 Industrial Capabilities Report*, p. 97.

178. Office of Industrial Policy, Fiscal Year 2019 Industrial Capabilities Report.

179. Certain aspects of the Department of Defense report do raise concerns about its economic rigor and bias: "Machine tool production also correlates with trade deficits." Office of Industrial Policy, *Fiscal Year 2019 Industrial Capabilities Report*, p. 112.

180. "SNS 2.0: The Next Generation: Building a More Resilient Strategic National Stockpile," Public Health Emergency, Office of the Assistant Secretary for Preparedness and Response, Department of Health and Human Services, https://www.phe.gov/about/sns/Pages/sns-next-generation.aspx.

181. "Fact Sheet on U.S.-Japan Trade Agreement," Office of the United States Trade Representative, September 2019, https://ustr.gov/about-us/policy-offices/press-office/fact-sheets/2019/september/fact-sheet-us-japan-trade-agreement; and "Annex II: Tariffs and Tariff-Related Provisions of the United States," Office of the United States Trade Representative, January 1, 2019, https://ustr.gov/sites/default/files/files/agreements/japan/Annex_II_Tariffs_and_Tariff-Related_Provisions_of_the_United_States.pdf.

182. Truman, "Statement by the President upon Signing the Strategic and Critical Materials Stockpiling Act."

183. Congressional Research Service, "Defense Primer: The National Technology and Industrial Base," January 31, 2020.

184. For a detailed look at the history of U.S.-Canadian defense industrial cooperation, see Andrew P. Hunter et al., *U.S.-Canadian Defense Industrial Cooperation* (Washington: Center for Strategic and International Studies, June 2017).

185. Congressional Research Service, "Defense Primer."

186. Section 812 of the Senate's Fiscal Year 2021 National Defense Authorization Act would eliminate these procurement restrictions, leaving only those for naval vessels. National Defense Authorization Act for Fiscal Year 2021, S. 4049, 116th Cong. § 812.

187. Congressional Research Service, "Defense Primer."

188. Office of Industrial Policy, *Fiscal Year 2019 Industrial Capabilities Report*, pp. 16–17.

189. Individuals or business entities must obtain a license from the Department of State to export materials covered by International Traffic in Arms Regulations (ITAR). The regulation provides licensing requirement exemptions for some U.S. exports to Canada and some temporary imports from Canada to the United States, but many ITAR-controlled items do not qualify for the Canadian exemptions and other NTIB members are not eligible for the Canadian exemptions.

190. Congressional Research Service, "Defense Primer"; and William Greenwalt, *Leveraging the National Technology Industrial Base to Address Great-Power Competition: The Imperative to Integrate Industrial Capabilities of Close Allies* (Washington: Atlantic Council, April 2019).

191. Qualifying countries include Australia; Austria; Belgium; Canada; Czech Republic; Denmark; Egypt; Estonia; Finland; France; Germany; Greece; Israel; Italy; Japan; Latvia; Luxembourg; Netherlands; Norway; Poland; Portugal; Slovenia; Spain; Sweden; Switzerland; Turkey; and the United Kingdom. "Reciprocal Defense Procurement and Acquisition Policy Memoranda of Understanding," International Contracting, Contract Policy, Defense Pricing and Contracting, https://www.acq.osd.mil/dpap/cpic/ic/reciprocal_procurement_memoranda_of_understanding.html.

192. DFARS 225.872-1 (a) (June 29, 2018).

193. Partner countries include Australia, Canada, Finland, Italy, The Netherlands, Spain, Sweden, and the United Kingdom. "Security of Supply," Industrial Policy, Department of Defense, http://www.businessdefense.gov/security-of-supply/.

194. 10 U.S.C. §§ 2501, 2504, 2505.

195. 50 U.S.C. § 98h; "Materials of Interest," Strategic Materials, Defense Logistics Agency, https://www.dla.mil/HQ/Acquisition/StrategicMaterials/Materials/; and 50 U.S.C. § 98h-6.

196. Truman, "Statement by the President upon Signing the Strategic and Critical Materials Stockpiling Act."

197. Notably, the Department of Defense's core macro findings on the "Decline of U.S. Manufacturing Capabilities and Capacity" ended in 2010 and are therefore essentially irrelevant given the dramatic rebound in American Manufacturing output and value-added since that time. Interagency Task Force, *Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States* (Washington: Department of Defense, September 2018), p. 25nn26–32, https://www.hsdl.org/?view&did=817145.

198. Office of Industrial Policy, *Industrial Capabilities: Fiscal Year 2018*, p. 17; and Office of Industrial Policy, *Fiscal Year 2019 Industrial Capabilities Report*, pp. 34–35, 37.

199. Office of Industrial Policy, *Fiscal Year 2019 Industrial Capabilities Report*, pp. 68, 75.

200. Office of Industrial Policy, *Fiscal Year 2019 Industrial Capabilities Report*, p. 87.

201. "Of the 202 printed circuit board (PrCB) manufacturing facilities surveyed in the U.S. Bare Printed Circuit Board Industry Assessment 2017, 132 facilities anticipated challenges finding experienced employees. . . . Manufacturing facilities cite that roughly 522,000 jobs remained open in the sector in September 2019. There are also limited formal education opportunities for electronic interconnect manufacturing in the United States." Office of Industrial Policy, *Fiscal Year 2019 Industrial Capabilities Report*, pp. 106, 112.

202. Congressional Research Service, "Section 232 Investigations"; and 19 U.S.C. § 1862.

203. Congressional Research Service, "Section 232 Investigations."

204. "Import Injury Investigations," United States International Trade Commission, https://usitc.gov/investigations/import_injury.

205. 41 U.S.C. §§ 8301–8305.

206. "Buy America Provisions—Side-by-Side Comparison," Department of Transportation, last updated March 13, 2012, https://www.transportation.gov/buy-america-provisions-side-side-comparison.

207. "Buy America(n) Acts: Sector Specific Information," Trade Commissioner Service, Government of Canada, https://www.tradecommissioner.gc.ca/sell2usgov-vendreaugouvusa/procurement-marches/sector_chart-tableau_sectoriels.aspx?lang=eng.

208. For example, the "specialty metals restriction" codified in 10 U.S.C. § 2533b, prohibits the Department of Defense (DOD) from purchasing any "specialty metal" not melted or produced in the United States, except in specified instances. Other U.S. laws prohibit the DOD from: purchasing ball and roller bearings not manufactured in the United States or Canada; purchasing carbon, alloy, or armor steel plate melted and rolled outside the United States or Canada; and acquiring, or allowing a contractor to acquire, steel for any construction project or activity for which U.S. steel companies have been denied the opportunity to compete for the acquisition.

209. "Canadian Access to the United States Defence Market," Canadian Aerospace and Defence Industry, Government of Canada, https://www.ic.gc.ca/eic/site/ad-ad.nsf/eng/ad00271.html.

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The Pandemic Does Not Demand Government Micromanagement of Global Supply Chains

Evidence and analysis refute current arguments that economic nationalism would bolster the U.S. industrial base (and thus national resiliency). Instead, American protectionism has been repeatedly found to weaken the U.S. manufacturing sector and the economy more broadly.

FEBRUARY 24, 2021 • PANDEMICS AND POLICY

By Scott Lincicome

Summary

This essay is a part of the Pandemics and Policy series.

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Policymakers should

- resist using trade restrictions or subsidies to re-shore global supply chains in case of a public health emergency or to reduce American "dependence" on foreign countries for essential medical goods;
- acknowledge that the nation's overall productive capacity and its medical goods industries are generally healthy and that domestic industries and their supply chains have adapted during the pandemic to meet extraordinary demand;
- understand that past government attempts to re-shore "essential" supply chains have proven costly and unsuccessful;
- recognize that global integration and economic openness, by contrast, can bolster U.S. resiliency by increasing economic growth, mitigating the impact of domestic shocks, and maximizing flexibility; and
- adopt market-oriented policies that would generally benefit the U.S. economy while also supporting the industrial base and national resiliency, such as liberalizing unilateral trade and investment; entering new trade and investment agreements with U.S. allies, particularly those that specialize in medical goods; eliminating nationalist restrictions on government stockpiles and opposing any new ones; expanding high-skilled immigration; and eliminating "never needed" regulations that were suspended during the pandemic to boost domestic production, investment, and adjustment.

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President Biden has proposed that the U.S. government "take steps in the aftermath of the [COVID-19] crisis to produce American-sourced and manufactured pharmaceutical and medical supply products in order to reduce our dependence on foreign sources that are unreliable in times of crisis," adding that his "goal is to develop the next generation of biomedical research and manufacturing excellence, bring back U.S. manufacturing of medical products we depend on, and ensure we are not vulnerable to supply chain disruptions, whether from another pandemic, or because of political or trade disputes." This view, according to the Biden administration, undergirded the president's January 25, 2021, "Buy American" executive order further restricting U.S. government purchases to "American-made" goods. It also mirrors the views of the previous administration and others who claim that the pandemic revealed serious weaknesses in essential supply chains that justify protectionism and industrial policy (i.e., targeted and directed government efforts to plan for specific future industrial outputs and outcomes), often on "national security" grounds.

As Daniel Ikenson and Simon Lester acknowledge in a separate Pandemics and Policy piece, "international trade and cross-border investment produce some degree of reliance and risk," including with respect to pandemics and essential goods. However, the current COVID-19-related push to achieve supply chain "resiliency" through economic nationalism suffers from several flaws. In particular, it ignores that the U.S. manufacturing sector—including with respect to most medical goods—was relatively healthy and expanding before COVID-19 and that domestic companies and global supply chains quickly adapted in response to emergency demand; that most federal government attempts to re-shore supply chains on economic security grounds have proven costly and unsuccessful; and that global integration and economic openness can bolster U.S. resiliency by increasing economic growth, mitigating the impact of domestic shocks, and maximizing flexibility in times of severe economic uncertainty. These realities argue for a different approach to achieving *real* resiliency—an approach based on the open and flexible policies that America does best.

The Reality of American Manufacturing and Pandemic Resilience

Contrary to conventional wisdom, there is little evidence of systemic weaknesses in the United States' "industrial capabilities" (i.e., the ability to produce the goods that the country needs in times of war or other national emergency)—the metric that, along with access to similar capabilities abroad, the Department of Defense considers critical for national security.

In fact, the U.S. manufacturing sector remains among the most productive in the world and is a global leader (see Table 1).

Table 1

Top manufacturing countries, 2018 (millions of dollars, unless otherwise noted)

Country	Manufacturing value-added	Merchandise exports	Manufactures exports	FDI inflows (total)	FDI inflows (manufacturing)	Manufacturing value-added per worker (dollars)
China	$3,884,451	$2,486,695	$2,318,153	$138,305	n/a	$29,188
United States	$2,300,398	$1,663,982	$1,176,498	$253,561	$166,889	$177,127
Japan	$959,243	$738,143	$641,106	$9,858	$13,242	$92,448
Germany	$746,485	$1,560,539	$1,364,575	$73,570	$12,826*	$96,632
South Korea	$427,724	$604,860	$528,991	$12,183	$5,245	$94,841
India	$409,087	$324,778	$223,265	$42,156	n/a	$7,169
Italy	$289,160	$549,527	$452,134	$32,886	$8,481	$73,292
United Kingdom	$279,298	$486,439	$468,817	$65,299	$4,058*	$108,223
France	$260,321	$581,774	$462,086	$38,185	$20,128	$100,938
Mexico	$214,789	$450,685	$362,608	$34,745	$16,318	$29,931

Sources: United Nations Conference on Trade and Development; World Trade Organization; Conference Board; Organisation for Economic Co-operation and Development; and author's calculations.
Notes: FDI = foreign direct investment. Gross domestic product value-added figures were provided in 2015 dollars and have not been adjusted. All other figures are in 2018 dollars. Organisation for Economic Co-operation and Development data were not provided for "n/a" countries. Germany FDI inflows (manufacturing) are for 2017, and UK FDI (manufacturing) are for 2015 (the latest data available).

The sector's health is perhaps most evident in its relative ability to attract investment. In 2018, for example, foreign direct investment (FDI) inflows into the U.S. manufacturing sector alone (almost $167 billion) were larger than *total* FDI inflows into China for the same year ($138 billion). The total value of foreign investor equity (FDI stocks) in the U.S. manufacturing sector reached $1.77 *trillion* that same year.

Manufacturing also performs well on a historical basis, continuing earlier trends of expansion. As I explained in a paper on the U.S. manufacturing sector overall, real (inflation-adjusted) value-added and gross output were up significantly between 1997 and 2018, while investment—capital expenditures, research and development (R&D), and FDI—also has been consistent and historically strong. Finally, the sector has experienced improved financial performance since 2001 (the first year of data available), with real gains in revenues, post-tax income, and assets.

These topline data also mask that U.S. *durable goods* production (real gross output and real value-added) has increased even more significantly—by 35.9 percent and 109 percent, respectively—since 1997. (Contrary to some popular claims, moreover, these gains are not solely attributable to changes in computing power; they are substantial even when removing the entire computers and electronics industry.) By contrast, small declines in nondurable goods production have been driven by basic, low-margin consumables such as textiles and apparel, tobacco, or "dematerialized" goods like paper—*not* other nondurables like chemicals (including pharmaceuticals) and energy that might have a legitimate national security nexus. Remove the decliners, and nondurable goods' real value-added and gross output increased by 22.9 percent and 10.3 percent, respectively, between 1997 and 2018.

Second, the manufacturing industries most closely associated with pandemic resiliency have generally prospered in recent years. For example, a 2020 St. Louis Federal Reserve study of "essential medical equipment" (hand sanitizer, masks, personal protective equipment, ventilators, etc.) found that *American* producers supplied the vast majority (more than 70 percent)

of these products in 2018. The World Trade Organization (WTO) further notes that the United States is not just a top global producer and importer of medical goods but also a top exporter (second overall, right behind Germany).

Government data on domestic production of medical equipment and supplies also show a healthy industry with expanding real output and value-added between 1997 and 2018. This includes the broader "medical equipment and supplies manufacturing" industry, which had $102 billion in gross output and $62 billion in value-added in 2018, and the two most important sub-categories, "surgical and medical instrument manufacturing" ($45.9 billion) and "surgical appliance and supplies manufacturing" ($37.4 billion). Indeed, real output in the latter category—which contains ventilators, masks, and many other medical goods—increased by almost 90 percent over the period examined. Other categories, such as "analytical laboratory instrument manufacturing" (121.8 percent), "irradiation apparatus manufacturing" (468 percent), and "electromedical and electrotherapeutic apparatus manufacturing" (418.1 percent) also experienced substantial gains in real output.

The only domestic medical goods industry that has contracted in recent years is basic personal protective equipment, or PPE (i.e., textiles, apparel, paper products, and rubber gloves), but even there, the concern is overblown. For example, the domestic textile industry in 2018 generated approximately $54 billion and $17.6 billion in real gross output and value-added, respectively, and has seen significant increases (4.7 percent and 5.4 percent) since the end of the Great Recession. Also, the apparel industry produced $9.6 billion in output in 2018.

With respect to pharmaceuticals, government data on output, R&D, and capital expenditures show that American manufacturers have performed well in recent years (see Table 2).

Table 2

Real gross output (billions of U.S. dollars)

Industry	2018 Output	Change 1997–2018	Percentage change 1997–2018	Change 2000–2018	Percentage change 2000–2018	Change 2009–2018	Percentage change 2009–2018
Pharmaceutical and medicine manufacturing (total)	$242.8	$58.7	31.9%	$39.1	16.1%	$12.6	5.5%
Medicinal and botanical manufacturing	$16.5	$(0.6)	-3.5%	$(0.5)	-2.9%	$2.8	20.4%
Pharmaceutical preparation manufacturing	$178.5	$34.2	23.7%	$17.7	11.0%	$2.7	1.5%
In-vitro diagnostic substance manufacturing	$16.7	$4.1	32.5%	$2.1	14.4%	$4.5	36.9%
Biological product (except diagnostic) manufacturing	$32.0	$22.1	223.2%	$20.7	183.2%	$3.2	11.1%

Source: Bureau of Economic Analysis.

Domestic research and development (millions of current U.S. dollars)

Industry	2001	2017	Percentage change
Pharmaceuticals and medicines	$10,137	$66,202	553.1%

Source: National Science Board.

Capital expenditures (millions of current U.S. dollars)

Year	Industry	Total expenditures	Total new expenditures	Expenditures for structures	Expenditures for equipment
2017	Pharmaceutical and medicine manufacturing	$16,196	$15,917	$5,846	$10,350
2018	Pharmaceutical and medicine manufacturing	$15,096	$14,450	$6,099	$8,998

Source: "Annual Capital Expenditures: 2018," U.S. Census Bureau, https://www.census.gov/library/publications/2019/econ/2018-aces-summary.html.

A 2020 McKinsey report notes that the United States is home to more than 500 pharmaceutical manufacturing facilities—among the highest concentrations in the world. The WTO adds that the United States is both a major importer *and* exporter of pharmaceutical products, having shipped almost $41 billion in medicines (35 percent of total U.S. medical goods exports) in 2019.

Available public data on domestic and global production of pharmaceutical inputs (i.e., active pharmaceutical ingredients, or API) do not indicate a need for urgent government funding, such as that offered to Eastman Kodak Company. According to the Food and Drug Administration (FDA), of the roughly 2,000 global API manufacturing facilities, 13 percent are in China; 28 percent are in the United States; 26 percent are in the European Union; and 18 percent are in India. For the APIs on the World Health Organization's "essential medicines" list for the U.S. market, 21 percent of manufacturing facilities are in the United States; 15 percent are in China; and the rest are in the EU, India, and Canada. The FDA further notes that the United States was home to 510 API facilities in 2019, 221 of which supply the aforementioned "essential medicines." The development and production of the BioNTech/Pfizer and Moderna COVID-19 vaccines underscore the United States' pharmaceutical capacity (and the need for international cooperation).

Third, there is substantial evidence that domestic producers and supply chains have thus far weathered the pandemic as well as could be expected, given 2020's massive and unforeseen shocks to global medical goods supply and demand. In particular, an extensive December 2020 analysis of "U.S. industries producing COVID-19 related goods and the supply chain challenges and constraints that impacted the availability of such goods" from the nonpartisan U.S. International Trade Commission (USITC) drew the following conclusions:

- The United States is a large global producer of pharmaceuticals, medical devices, soap and cleaning products, and N95 masks. Prior to the pandemic, the U.S. market for these goods was primarily satisfied by domestic manufacturers, with imports supplementing that production.
- The United States was a smaller producer of low-value PPE products—surgical masks, medical gowns, and rubber gloves—that are primarily produced in developing countries with low labor costs or abundant supply of raw materials (especially in the case of rubber gloves).
- Pharmaceutical and medical device production and supply chains proved resilient during the pandemic, and supply concerns remained limited throughout 2020. With respect to pharmaceuticals in particular, the USITC's conclusions echoed a previous analysis showing China and India to be major suppliers of certain drug products but little evidence of U.S. "dependency."
- The most significant factor affecting the availability of other COVID-19-related goods was the unprecedented demand for such items in the United States and abroad. In response, U.S. producers significantly increased production but in most cases could still not keep up with demand. For example, U.S. N95 mask producers supplied 80 percent of the domestic market in 2019 (30 million units per month, with medical professionals needing only about 10 percent—or 3 million—of those) and increased production six-fold by the end of 2020 in response to the pandemic. However, domestic demand for N95 masks increased by as much as *ten-fold* during the summer of 2020, easily outpacing the U.S. expansions.
- Imports of medical goods, especially PPE, helped fill the gap between domestic supply and demand, which in many cases exceeded historical volumes by several orders of magnitude. Import sources were widely varied overall, with China the dominant import source for only surgical masks and medical gowns. Although some shortages did exist in the first half of 2020, they were mostly alleviated in subsequent months (though PPE supply remains tight). Only rubber gloves continued to be a concern going into 2021, mainly due to the limited availability of natural rubber (sourced primarily from Malaysia) and artificial alternatives.

- Beyond demand, the most common concerns raised by U.S. producers and importers were regulatory barriers (especially for surgical masks, medical gowns, and hand sanitizer), tariffs on finished goods and manufacturing inputs, and uncertainty regarding future demand once the pandemic ends.

Overall, the report shows a large and diverse U.S. medical goods market in which both domestic production and imports vary according to comparative advantages and work in tandem to satisfy consumer demand—demand that skyrocketed in response to a once-in-a-generation pandemic and was met (albeit imperfectly) by both imports and increased domestic production, most of which came without government support. In short, the system was stressed but ended up working pretty well.

Anecdotal evidence supports the USITC's findings. Many U.S. companies shifted operations to produce high-demand PPE during the pandemic—an example of the U.S. manufacturing sector's pre-existing industrial capacity and flexibility. Others were drawn into the market by sky-high

demand: online crafts retailer Etsy, for example, sold more than $600 million in facemasks during the second and third quarters of 2020 (12 million units in April alone), and "more than 110,000 sellers sold at least one mask between April and June." Although short-term gaps in U.S. PPE supply inevitably emerged during the pandemic (due to astronomical demand, pre-pandemic stockpiling mistakes, or other issues), they were filled in by foreign producers and the stockpiles. As of late summer 2020, for example, National Institute for Occupational Safety and Health–approved N95 masks were readily available (for individual or bulk purchase) on websites like Amazon. Several members of Congress even went so far as to write to President Biden complaining about a potential *glut* of U.S.-made PPE, because the "industry retooled production chains in the spring to respond to the crisis," and as a result, "domestic production capabilities for essential products like isolation gowns, N95 masks, testing swabs and other critical products have grown exponentially."

Widescale repatriation and "self-sufficiency" policies, by contrast, defy basic economic sense and would produce significant distortions. Most notably, there is the problem of maintaining pandemic-level capacity in non-pandemic times. The USITC calculated that in 2020, the United States used many times the number of N95 masks, medical gowns, surgical masks, and other essential goods that were used in 2019. Maintaining that much excess capacity in times of normal demand is extremely costly (for many industries, profitability kicks in at around 80 percent capacity utilization), and running at that level in non-pandemic times would produce a global glut—ironically, similar to the ones the U.S. government complains about when China subsidizes "global excess capacity" and certain to cause new trade tensions. Indeed, we could already have a glut of American-made PPE, and foreign governments are already speaking out about other nations' pandemic-era subsidies.

Compounding this issue is policymakers' inability to know which products to target both during and after the pandemic. Ventilators, for example, were on no one's radar before COVID-19 hit. In March 2020, when they were suddenly considered essential for fighting the coronavirus, the U.S. government invoked the Defense Production Act (DPA) to force domestic manufacturers to make them. By the summer, however, medical professionals determined that ventilators were not as critical as once thought, but producers continued to churn them out under government orders, leading to reports of the goods "piling up" in a strategic reserve or being donated to "countries that don't need or can't use them." According to the USITC's December 2020 report, other DPA-funded medical goods production will only come online after mid-2021, when the pandemic may have subsided.

Given these interventions, as well as the numerous U.S. companies that independently expanded operations or entered the medical goods market in response to the pandemic, it is an open question as to whether additional government action is needed to boost domestic production of essential medical goods. Indeed, companies such as Mark Cuban's new generic drug company, are in the process of adding domestic capacity without government subsidies. By the time U.S. policymakers decide to intervene in the U.S. market, it will look much different than the one on which they based their decision and will likely change again by the time any government-supported production comes online.

Finally, there is a serious risk that future government interventions will have political, rather than economic, motivations—similar to the ones that reportedly drove the Trump administration's doomed subsidies to Eastman Kodak. According to a July 2020 Congressional Research Service report, for example, the Department of Defense invoked the DPA to give hundreds of millions of dollars, appropriated under the Coronavirus Aid, Relief, and Economic Security Act to fight COVID-19, to politically connected industries (shipbuilding, semiconductors, space-based defense, aviation, microelectronics, rare earth mining, etc.) that are at best

tangentially related to the pandemic. The report adds that these and other COVID-19 actions lacked transparency and accountability, led to the reassignment of one official, and were opposed by several House committees because they were not, as Congress intended, "reserved for health and medical countermeasures."

Supply Chain Nationalism Makes the United States Less Resilient

Protectionism often undermines resiliency by weakening a country's economy and manufacturing sector—a conclusion supported by decades of research. For example, International Monetary Fund economists in 2018 examined data for 151 countries over 51 years (1963–2014) and found that "tariff increases lead, in the medium term, to economically and statistically significant declines in domestic output and productivity" as well as more unemployment and higher inequality. These harms were amplified for the U.S. manufacturing sector: increased tariffs on manufacturing inputs (e.g., steel) resulted in a statistically significant decline in manufacturing sector-wide output (6.4 percent) and productivity (3.9 percent) five years after the tariff hikes in question. Economists have come to similar conclusions in the context of COVID-19: a November 2020 analysis, for example, found that the economic costs of "localizing" global supply chains for medical goods would lower economic activity and incomes yet also prove unable to insulate countries from a pandemic-induced economic shock.

The United States' implementation of nationalist policies on security grounds—for steel, ships, machine tools, semiconductors, and other "essential" goods—also reveals a long track record of high costs, high risks, failed objectives, and unintended consequences. In case after case, the protected industries did not emerge stronger or more resilient—in fact, just the opposite. This checkered history must be considered when evaluating new proposals to support certain industries on national security grounds.

By contrast, extensive literature ties trade openness to improved economic performance more broadly. A 2018 paper from Robert Feenstra summarized the studies on the long-run, overall gains from trade for the United States, calculating total average gross domestic product (GDP) gains of 1.1 percent per year due to increased product variety arising from imports, the productivity-enhancing effects of trade-induced creative destruction, and pro-competitive effects on domestic prices. Other studies have shown similar benefits for the U.S. economy.

Overall, the evidence and analysis refute current arguments that economic nationalism would bolster the U.S. industrial base (and thus national resiliency). Instead, American protectionism has been repeatedly found to weaken the U.S. manufacturing sector and the economy more broadly.

Free Markets Enhance U.S. Resilience

There is little to indicate that trade and investment openness has made the United States less economically resilient and thereby increased national security risk. In fact, openness in many cases can *decrease* a country's vulnerability to demand or supply shocks, or it can help the economy recover.

This conclusion makes intuitive sense—greater trade and investment openness might make an economy more vulnerable to *external* supply or demand shocks, but it also helps reduce a nation's vulnerability to (and improve its recovery from) *domestic* shocks—and is borne out in academic research. In fact, an August 2020 assessment of the pandemic's initial impact on supply

chains and national economic performance found that “renationalization” of supply chains would generally not improve a country’s overall economic performance, or the performance of specific sectors (including manufacturing industries such as textiles, chemicals and pharmaceuticals, and electrical equipment), after a global pandemic. A subsequent analysis came to similar conclusions, finding that manufacturers who used imported inputs fared worse when their supplier markets were hit by COVID-19 but fared better when their own home market was hit.

Finally, domestic policy likely outweighs trade openness in terms of mitigating the risk of economic shocks. For example, two of the most “trade-dependent” countries—Germany and South Korea—experienced COVID-19-induced quarterly GDP contractions in the first half of 2020 that were similar to or better than the relatively “closed” Japan or United States, while other “open” economies performed less favorably over the same period. Germany’s initial “V-shaped” recovery is particularly noteworthy, given the country’s level of economic development and high dependence on trade. Cato’s Ryan Bourne adds that certain foreign suppliers rebounded quickly from COVID-19, but “it was the lack of demand from importing countries that took longer to contain the virus, such as the United States and the UK, which prolonged a depression of activity in those industries.” These situations indicate that domestic policies, in particular countries’ ability to control the virus or keep their economies open, drove their economic performance more than trade or investment liberalization. Subsequent research supports these conclusions.

Market-Oriented Reforms Can Further Support Manufacturing and Resiliency

While the “death” of the U.S. manufacturing sector and our economic “vulnerability” and dependency have been greatly exaggerated, several market-oriented policy reforms would support national resiliency by strengthening the U.S. economy generally and boosting the manufacturing sector’s performance in particular:

- **Unilateral liberalization of tariffs on industrial inputs and medical goods.** President Trump’s tariffs have harmed the U.S. manufacturing sector, increased uncertainty, and antagonized allies while providing little long-term benefit to the protected domestic industries at issue. At the same time, imports of PPE and pharmaceuticals have proven vital in fighting COVID-19. Eliminating import restrictions would thus provide an immediate boost to the U.S. manufacturing sector and additional relief during and after the pandemic. Longer term, Congress should reform or eliminate the U.S. laws that provide the president with vast discretion to impose tariffs on “national security” or other grounds without any congressional input or oversight.

- **New trade and investment agreements with U.S. allies.** The U.S. government should liberalize trade and investment with allies by expanding the National Technology and Industrial Base (NTIB) to include allies (and innovative manufacturing nations) such as Finland, Germany, Japan, the Netherlands, South Korea, Singapore, Switzerland, or Sweden. The government also should fully implement the NTIB and further liberalize trade, investment, and R&D collaboration among all NTIB members, for example by eliminating U.S. procurement restrictions (e.g., Buy American; the Berry Amendment; and the Byrnes-Tollefson Amendment). Over the longer term, the United States should consider new comprehensive free trade agreements with these and other countries.

- **Eliminating Buy American restrictions.** As Cato scholars have argued for decades, Buy American procurement requirements are bad law, bad economics, bad trade policy, and bad politics—and can especially harm U.S. manufacturers. The federal government should

eliminate these restrictions, particularly for the procurement of essential goods and services. For example, the government should terminate the Stock Piling Act's "Buy American" rules for "strategic and critical materials" and should block attempts to implement similar rules for the Strategic National Stockpile (which covers medical goods).

- **Improving human capital.** In order to address immediate concerns regarding the dearth of qualified U.S. manufacturing workers in science, technology, engineering, and mathematics fields, the federal government should significantly expand high-skilled immigration—restrictions on which have been shown to encourage multinational corporations to offshore jobs and R&D activities to their affiliates in more welcoming countries and to benefit potential U.S. adversaries, especially China, in terms of new jobs, new businesses, and new innovations. Over the longer term, private-sector training and apprenticeship programs, such as the employer-funded Federation for Advanced Manufacturing Education program, can equip native workers for the future needs of advanced manufacturing industries and supplement federal, state, and local government educational policies.

- **Eliminating "never needed" regulations.** During the COVID-19 pandemic, state and federal governments temporarily suspended hundreds of regulations to boost domestic production, investment, and adjustment during the national emergency, revealing in the process that these "never needed" regulations discouraged economic growth and dynamism while providing little, if any, public benefit. Although many of these regulations affect nonmanufacturing issues and industries (e.g., physician licensing), many others—such as FDA testing and approval of medical goods—directly inhibit the domestic production of certain essential goods. The USITC cited these and other U.S. regulations as a major impediment to boosting domestic medical goods production during the pandemic. Other regulations, such as biofuels mandates, increase production costs for U.S. manufacturers. Repeal of these regulations would therefore boost not only economic growth generally but also American manufacturers directly—all to the benefit of economic resiliency.

Additional government action—for example, government stockpiles or private inventory mandates—need not be considered unless and until these and other market-oriented policies prove insufficient to satisfy legitimate security concerns. It is difficult to conceive, however, of scenarios in which new and expansive industrial policy programs would be warranted.

Conclusion

Economic openness and global interdependence undoubtedly risk the importation of economic shocks—including pandemics—into the United States that roil supply chains for essential goods and cause serious disruptions to our daily lives. However, both theory and practice show that this same openness can promote global stability and improve the nation's resilience in times of national emergency and that nationalist policies present a far *greater* risk to our ability to withstand and respond to economic shocks—even when such policies are implemented on security, rather than purely economic, grounds.

The COVID-19 vaccine produced by Germany's BioNTech and U.S. multinational pharmaceutical giant Pfizer provides a timely lesson in this regard. Immigrants founded and run both companies and are heavily represented on their vaccine research teams in both Germany and the United States. Each company relies on global capital markets to fund most business operations, and Pfizer famously passed on government funding for the coronavirus vaccine R&D, choosing instead to foot the $2 billion bill (and assume related risks) itself. The vaccine's development, meanwhile,

relied on “messenger RNA” technology first developed by Hungarian and American researchers, as well as initial COVID-19 gene mapping by Chinese and Australian scientists.

The German and American drug companies partnered in March 2020 (having previously collaborated on a flu vaccine), and Pfizer assigned production to its existing pharmaceutical manufacturing, supply, and distribution facilities in Belgium and the United States (in Missouri, Massachusetts, and Michigan), using raw materials from, among other places, Canada and a British-owned facility in Alabama. To deliver the vaccine, Pfizer piggybacked off its previous experience and capacity related to global refrigerated distribution, setting up cold storage systems in the United States and Germany. Pfizer also partnered with cargo companies (FedEx, UPS, and DHL) and United Airlines to deliver doses around the world using a global logistics and transportation infrastructure (warehouses, planes, computer systems, workers, etc.) that developed over decades. Some of the first doses injected into American arms were flown from Belgium.

BioNTech and Pfizer were able to go from concept to final delivery of millions of vaccine doses in only a matter of months—just as their management boldly predicted in April, more than a month before Operation Warp Speed was officially announced. This miraculous effort resulted not from the plan of any single person or government but by international teams of companies and individuals, complex global supply chains, and long-standing policies facilitating the organic, cross-border flow of labor, goods, services, and knowledge. Surely, some state funding (e.g., grants for basic research and vaccine purchase commitments) was involved, but attempts to “nationalize” and micromanage the vaccine’s development and delivery would have delayed—if not thwarted—those processes, costing numerous lives along the way.

If the goal is, as President Biden claims, to “develop the next generation of biomedical research and manufacturing excellence,” then we’ve already succeeded.

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Executive Summary

In the wake of the COVID-19 pandemic and rising U.S.-China tensions, American policymakers are again embracing industrial policy. Both President Biden and his predecessor, as well as legislators from both parties, have advocated a range of federal support for American manufacturers to fix perceived weaknesses in the U.S. economy and to counter China's growing economic clout.

These and other industrial policy advocates, however, routinely leave unanswered important questions about U.S. industrial policy's efficacy and necessity. First, what is industrial policy? Advocates of industrial policy often fail to define the term, thus permitting them to ignore past failures and embrace false successes while preventing a legitimate assessment of industrial policies' costs and benefits. Yet U.S. industrial policy's history of debate and implementation establishes several requisite elements—elements that reveal that most industrial policy successes are not industrial policy at all.

Second, what are the common obstacles to effective U.S. industrial policy? Several obstacles prevent U.S. industrial policies from generating better outcomes than the market. This includes legislators' and bureaucrats' inability to pick winners and efficiently allocate public resources (F. A. Hayek's knowledge problem); factors inherent in the U.S. political system (public choice theory); lack of discipline regarding scope, duration, and budgetary costs; interaction with other government policies that distort the market at issue; and substantial unseen costs.

Third, what problems will industrial policy solve? The most common problems purportedly solved by industrial policy proposals are less serious than advocates claim or else are not fixable via industrial policy. This includes allegations of widespread U.S. deindustrialization and a broader decline in American innovation; the disappearance of good jobs; the erosion of middle-class living standards; and the destruction of American communities.

Fourth, do other countries' industrial policies demand a U.S. industrial policy? The experiences of other countries generally cannot justify a U.S. industrial policy because countries have different economic and political systems. Regardless, industrial policy successes abroad—for example, in Japan, South Korea, and Taiwan—are exaggerated. Also, China's economic growth and industrial policies do not justify similar U.S. policies, considering the market-based reasons for China's rise, the Chinese policies' immense costs, and the systemic challenges that could derail China's future growth and geopolitical influence.

These answers to these questions argue strongly against a new embrace of industrial policy. The United States undoubtedly faces economic and geopolitical challenges, including ones related to China, but the solution does not lie in copying China's top-down economic planning. Reality, in fact, argues the opposite.

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Introduction

American policymakers on both the left and right are once again embracing industrial policy to fix alleged U.S. market failures and to counter China's own economic interventions. Congress is currently poised to pass—with vocal White House support—several pieces of legislation that would deliver tens of billions of taxpayer dollars to "critical" domestic industries and technologies. Unfortunately, the public discourse has thus far elided several essential questions about what industrial policy actually is; how past U.S. attempts at industrial policy (properly defined) have fared; whether current proposed industrial policies can fix the economic problems they target; and whether the industrial policies of other countries—particularly China—demand that the U.S. government follow suit.

This paper will systematically answer each of these questions, addressing both economic theory and practice (as demonstrated through numerous historical and current examples of U.S. industrial policy in action). Overall, these answers reveal numerous problems that argue strongly against the adoption of new U.S. industrial policies, and they establish a high bar for future government action.

What Is Industrial Policy?

Assessing the necessity and efficacy of U.S. industrial policy requires first defining the term. Without this definition, industrial policy advocates can claim that past failures are not, in fact, industrial policy, while other policies tangentially related to government action are clear industrial policy successes. There also is the risk, as economist Herbert Stein notes in the 1986 book, *The Politics of Industrial Policy*, of "adopt[ing] so loose and sweeping a definition of industrial policy that it becomes virtually synonymous with overall economic policy," thus precluding a legitimate assessment of industrial policy's costs, benefits, and overall desirability.[1] As fellow economist Mancur Olson writes in the same book, often industrial policy proposals "are so vague that they invite the reaction that industrial policy is neither a good idea nor a bad idea, but no idea at all; that it is the grin without the cat."[2] In short, if everything is industrial policy, then nothing is.

INDUSTRIAL POLICY'S REQUISITE ELEMENTS

Fortunately, industrial policy's long history of academic debate and implementation in the United States establishes several requisite elements that, when combined, can identify whether past or proposed government initiatives are properly considered industrial policy. For example, when examining U.S. industrial policy efforts in the 1920s and 1930s, economic historian Ellis Hawley explained:

> By *industrial policy* I mean a national policy aimed at developing or retrenching selected industries to achieve national economic goals. In this usage, I follow those who distinguish such a policy, both from policies aimed at making the macroeconomic environment more conducive to industrial development in general and from the totality of microeconomic interventions aimed at particular industries. To have an industrial policy, a nation must not only be intervening at the microeconomic level but also have a planning and coordinating mechanism through which the intervention is rationally related to national goals, a general pattern of microeconomic targets is decided upon, and particular industrial programs are worked out and implemented.[3]

As the Mercatus Center's Adam Thierer wrote in a 2020 article, Hawley's definition shows that "targeted and directed efforts to plan for specific future industrial outputs and outcomes is at the heart of a proper understanding of industrial policy."[4] Such outputs and outcomes must also occur within national borders: government procurement of foreign-made semiconductors, for example, cannot be industrial policy. Thus, industrial policy is inherently nationalist, with government support for domestic industry either indirect (e.g., tariffs, quotas, and "Buy American" mandates) or direct (e.g., subsidies for American companies, jobs, or investments).

"Industrial policy's long history of academic debate and implementation in the United States establishes several requisite elements that, when combined, can identify whether past or proposed government initiatives are properly considered industrial policy."

Finally, industrial policy output and outcomes are *commercial* in nature, distinguishing them from both basic scientific research and defense procurement, such as fighter jets. The former has no targeted or strategic commercial application. The latter, as explained by Richard Nelson and Richard Langlois in the 1980s, is categorically different from commercial-oriented industrial policies for three reasons.

First, as the sole consumer of such goods, the federal government has a unique and deep knowledge of the products or technology at issue and its own needs therefor, as well as a strong and direct interest in obtaining high-quality deliverables. Second, the public strongly believes in the legitimacy of the government's primary mission (thus minimizing politicization and short-termism). And third, commercial spillovers are an unintended benefit, as opposed to the main purpose, of government action.[5]

Similar definitions and policies were offered by industrial policy advocates in the 1980s and 1990s, the last heyday of U.S. industrial policy. This includes former Clinton administration official Robert Reich in *The Next American Frontier* (1983); historian Otis L. Graham in *Losing Time: The Industrial Policy Debate* (1992); and former Commerce Department official Erik Pages in *Responding to Defense Dependence* (1996).[6] More recently, the Carnegie Endowment's Uri Dadush and the Hudson Institute's Arthur Herman, citing a 2006 paper by economists Howard Pack and Kamal Saggi, have echoed these historical definitions.[7]

"Industrial policy aims *not* at making the macroeconomic environment more conducive to industrial development in general but at dictating the specific *composition* of commercial industrial activity within the nation to achieve a broader national goal."

Thus, both advocates and critics coalesce around four essential features of industrial policy:

- a focus on manufacturing, to the exclusion of services and agriculture;
- targeted and directed *microeconomic* (firm or industry-specific) support (e.g., tariffs or subsidies), as opposed to horizontal, sector-wide, or economy-wide policies (e.g., corporate tax rate reductions or patents);
- a government plan to fix market failures, including negative externalities, and thereby achieve in targeted industries/companies clear, specific, and measurable commercial outcomes, such as jobs, investments (research and development, capital expenditures, etc.), output, or products that are better than what the market could provide in the absence of industrial policy; and
- a requirement that these market-beating commercial outcomes be generated within national borders.

As Duke University economist Michael Munger explains, industrial policy is *not* aimed at making the macroeconomic environment more conducive to industrial development in general. It does not target the *levels* of research, jobs, or even industrial activity that we generally have in the United States, nor does it even correct perceived or real shortcomings of markets by any means necessary.[8] It aims at dictating the specific *composition* of commercial industrial activity within the nation to achieve a broader national goal.[9] Thus, for example, industrial policy does not say "we need to lower carbon emissions" (via, for example, a carbon tax or a nondiscriminatory consumer subsidy paired with unilateral free trade in environmental goods); it says "we need to lower carbon emissions *by subsidizing or protecting American solar panel companies and workers*."

WHAT INDUSTRIAL POLICY ISN'T

Many of the industrial policies that advocates propose contain the four elements above, but often these same individuals add events or transactions that cannot be considered industrial policy without rendering the term inutile. A pro-industrial policy symposium hosted by the conservative think tank American Compass, for example, contains proposals for reshoring core digital technologies, offering subsidies for biopharmaceutical and semiconductor manufacturing, and putting local-content restrictions on electrical grid equipment and medical goods.[10] All of these proposals seek to encourage domestic production of targeted commercial industries pursuant to a broader national strategy, and they therefore qualify as industrial policy

rightly understood. On the other hand, the symposium adds active labor market policy, environmental regulatory reform, an infrastructure bank, World Trade Organization (WTO) reform, and vigorous antitrust action by a new Department of Economic Resilience. Yet while each might tangentially benefit domestic manufacturing, none directly supports a specific industry or targets specific market-beating commercial outputs.

This confusion permeates the current debate over industrial policy both here and abroad. In fact, many (if not most) of the industrial policy successes that proponents praise are not industrial policy at all, and they often border on the absurd. Examples include Apple and the smartphone (and almost every piece of essential hardware that it contains); Microsoft Windows; Google, Google Maps, and the entire internet; supercomputers; semiconductors and semiconductor lasers; digital optical networks; the graphical user interface; global positioning system (GPS); LED screens; plasma displays; artificial intelligence and speech recognition; videoconferencing; closed captioning; Linux and cloud computing; nanotechnology; renewable energy (lithium batteries, wind power, solar panels); nuclear energy; fracking; seismic imaging; LED lighting; airbags; the civilian aviation industry (and jet engines in particular); the pharmaceutical and biotech industries, as well as most innovative drugs, including HIV/AIDS treatments and mRNA technology; magnetic resonance imaging; advanced prosthetics; the human genome project; hybrid corn; and even lactose-free milk![11]

Yet few of these modern marvels are the direct result of industrial policy in any legitimate sense. For example, industrial policy proponents routinely cite the Defense Advanced Research Projects Agency (DARPA) for its support for (or even invention of) the commercial internet as a poster child of industrial policy success. However, leaving aside the missing manufacturing nexus, DARPA did not have a plan for, or even anticipate, the internet—there was no "mission-oriented directionality" to the government support provided, nor was there any effort to make the Advanced Research Projects Agency Network (ARPANET) or early email a broader commercial success instead of simply "data links to connect computer facilities doing defense-related work." Indeed, a decade earlier the Department of Defense had terminated research done by the Air Force into "a decentralized communications grid distinct from the traditional telephone," and those people involved in ARPANET explained that DARPA "would never have funded a computer network in order to facilitate email."[12]

"Many (if not most) of the industrial policy successes that proponents praise are not industrial policy at all, and they often border on the absurd."

Overall, ARPANET's contributions to the commercial internet (packet switching and early email) were just that—contributions, as were private-sector efforts such as the early 20th century radio and television technologies, and during the 1970s, Xerox's Ethernet and Randy Seuss's Computerized Bulletin Board System.[13] Just as surely, government funding has supported research that was later used by private companies to produce commercial information technology successes. But none of these scattershot government contributions to one part of an eventual commercial success can properly be considered a coherent, strategic industrial policy.

This conclusion may sound obvious, but the argument is common, especially in the tech sector.[14] As noted, for example, it is routinely asserted that the federal government—via industrial policies that developed core components and financial support for Apple—invented the iPhone![15] However, as documented by researcher José Luis Ricón, such assertions equate as industrial policy any government support given at any point in the history of a product's or company's creation, and assign all credit for the innovation to the state.[16] In particular, the industrial policy that led to the multi-touch screen was actually National Science Foundation and Central Intelligence Agency funding for basic research at the University of Delaware into an entirely different field (neuromorphic systems), and the researchers independently developed the multi-touch system to aid their state-funded research.

Meanwhile, another private company, Bell Labs, was developing a similar technology without state support. The connection between the state and several other core smartphone technologies was similarly attenuated and unplanned, with foreign or private alternatives emerging in parallel. Furthermore, state funding for Apple was just a small government-secured loan issued by a private bank that supplemented substantial private startup capital that the company already had. In other words, "Apple was steaming ahead before the involvement of the [state-backed loan] and given what we know, it is most reasonable to assume that it would have continued to do so hadn't there been government involvement."[17]

"The COVID-19 vaccines developed under Operation Warp Speed have been heralded as a triumph of American industrial policy, but the first vaccine to reach the market, the Pfizer/BioNTech vaccine, disproves this assertion."

Leaving aside even the wholly private innovation of packaging all of these technologies into the iPhone, crediting these technologies to industrial policy renders the term meaningless. Political scientist Alberto Mingardi finds that these sorts of misattributions routinely plague the much-heralded examples of American industrial policy success.[18]

The space program is also often cited as an industrial policy model, but, as economist John Kay explains, its lessons are limited at best:

> Apollo was a success because the objective was specific and limited; the basic science was well understood, even if many subsidiary technological developments were needed to make the mission feasible; and the political commitment to the project was sufficiently strong to make budget overruns almost irrelevant. Centrally directed missions have sometimes succeeded when these conditions are in place; Apollo was a response to the Soviet Union's pioneering launch of a human into space, and the greatest achievement of the USSR was the mobilisation of resources to defeat Nazi Germany.[19]

It's unfathomable to think that the U.S. government—and American voters—will have the political will for another project such as the moonshot, especially for commercial objectives that, unlike space exploration, lack a traditional government nexus. Furthermore, products developed from space technologies arose not from a central industrial plan, but were instead the result of decentralized private actions utilizing directionless, government-funded research.

Finally, the COVID-19 vaccines developed under Operation Warp Speed have been heralded as a triumph of American industrial policy, but the first vaccine to reach the market, the Pfizer/BioNTech vaccine, disproves this assertion. BioNTech is a German company that had been working on mRNA vaccines for years and began its collaboration with Pfizer (based on an earlier working relationship) months before the U.S. government began Operation Warp Speed in May 2020 or contracted with the companies for a vaccine in July of that same year.[20] (BioNTech management actually predicted in April 2020 that distribution of finished doses would occur in late 2020.) The companies famously refused government funds for research and development or for testing and production—efforts that instead leveraged Pfizer's substantial *preexisting* U.S. manufacturing capacity, as well as multinational research teams, global capital markets and supply chains, and a logistics and transportation infrastructure that had been developed over decades. In fact, the Trump administration's contract with Pfizer was for finished, FDA-approved vaccine doses only, and it expressly excluded from government reach essentially all stages of vaccine development (i.e., "activities that Pfizer and BioNTech have been performing and will continue to perform without use of Government funding").[21] There is even some evidence that Operation Warp Speeds' allocation of vaccine materials to participating companies (some of which still have not produced an approved vaccine) may have impeded non-participant Pfizer's ability to meet its

initial production targets and expand production after the vaccine was approved.[22]

Surely, some state support, such as funding for mRNA research and a large vaccine purchase commitment, was involved both before and during the pandemic, but it lacked the necessary commercial, strategic, or nationalist elements of industrial policy. In fact, Hungarian biochemist and mRNA visionary Katalin Karikó left her government-supported position at the University of Pennsylvania "because she was failing in the competition to win research grants" and thus "moved to the BioNTech company, where she not only created the Pfizer vaccine but also spurred Moderna to competitive imitation."[23] The National Institutes of Health grant supporting her early work actually came through her colleague, Drew Weissman, and was not directly connected to mRNA research.[24] Other efforts, such as Moderna's mRNA vaccine, had more state support, but the BioNTech/Pfizer vaccine shows that it was not a necessary condition for producing a wildly successful COVID-19 vaccine.

What Obstacles Must Industrial Policy Overcome in the United States?

American industrial policies face several obstacles that prevent their effective implementation. This section provides the most common of those obstacles, as well as real-world examples of how they have plagued past U.S. industrial policy efforts—and thus why new industrial policy proposals should, in general, be opposed.

THE KNOWLEDGE PROBLEM

Perhaps the most widespread industrial policy obstacle is the knowledge problem. In "The Use of Knowledge in Society," Nobel laureate F. A. Hayek explained that the information needed to secure the best use of scarce national resources "never exists in concentrated or integrated form but solely as the dispersed bits of incomplete and frequently contradictory knowledge which all the separate individuals possess." Because this information is unique and ever-changing, central planners cannot discern it via aggregate, retrospective statistics: "The continuous flow of goods and services is maintained by constant deliberate adjustments, by new dispositions made every day in the light of circumstances not known the day before, by B stepping in at once when A fails to deliver."[25]

Thus, decentralized, market-based economic activity in general produces better outcomes than centrally planned activity (one authority for the whole economic system) because the former better mobilizes the diffuse knowledge—via price signals and millions of individual, real-time, dynamic transactions—that are needed for economic actors to make relevant decisions. Because no single person possesses all such knowledge in real time, economic planners must show how their "solution is produced by the interactions of people each of whom possesses only partial knowledge" and fixes "the unavoidable imperfection of man's knowledge and the consequent need for a process by which knowledge is constantly communicated and acquired."[26] They rarely do.

A core part of industrial policy's knowledge problem is timing: because markets and personal preferences are constantly evolving, the facts (products, investments, supply and demand, etc.) on which an industrial policy is designed will inevitably be different than the facts that exist at the time it is approved, and they will likely change again (and again) upon implementation. Discovery is endless. Thus, history repeatedly has shown that the "critical technologies" (and suppliers) of today are often not so critical tomorrow, and only markets are flexible and nimble enough to reveal the difference. Planners don't stand a chance.

"History repeatedly has shown that the 'critical technologies' (and suppliers) of today are often not so critical tomorrow, and only markets are flexible and nimble enough to reveal the difference. Planners don't stand a chance."

Past U.S. industrial policy efforts have often struggled to surmount the knowledge problem, particularly in high technology goods. As technology experts Patrick Windham, Christopher T. Hill, and David Cheney noted in 2020, for example, "US efforts in the 1990s to identify 'critical technologies' did not succeed, partly because it is hard to predict which technologies will be most valuable in the future."[27] James L. Schoff of the Carnegie Endowment for International Peace cites these efforts among the U.S. "technonationalism" failures in the 1980s and 1990s. He documents how past efforts to support critical technologies, (as defined by a National Critical Technologies Panel) through trade and investment restrictions, subsidies, and public-private

consortia failed because the government—which was worried about Japan at the time—could not foresee how the marketplace would develop. The U.S. government therefore focused on current national champions such as Motorola and Toshiba, and missed how the internet would transform mobile and digital technologies and "stimulate the rise of internet titans" that today "possess some of the world's most coveted technology, investing more than most governments do to push new boundaries and accelerate change through design and systems integration."[28] After noting another U.S. government miscue—seeing Japan as an unstoppable technological powerhouse—Schoff explains that American firms "prospered because of their ability to innovate and compete effectively, not because of such technonationalist or protectionist measures."[29]

Even if policymakers pick the right industry to promote, moreover, they can struggle to identify and support the right product in that industry. For example, U.S. semiconductor policy in the 1980s saw dynamic random access memory (DRAM) chips as being central to national security and the future of U.S. global technology leadership and believed that trade restrictions would encourage new American entrants in the DRAM market. Yet no such investments occurred because U.S. firms were exiting the DRAM market after rightly determining that future success would be in advanced microprocessors, specialty chips, and design, rather than "high-volume, low-profit commodity" memory chips.[30]

"Past U.S. industrial policy efforts have often struggled to surmount the knowledge problem, particularly in high technology goods."

Similar problems plagued contemporaneous U.S. supercomputer policy, which targeted older technology and vector supercomputers produced by the American firm Cray and Japan's NEC, just as those products were losing out to non-vector supercomputers, and as the supercomputer industry was undergoing major structural changes that rendered trade protection obsolete.[31] As the American Enterprise Institute's Claude Barfield explains in his book *High Tech Protectionism*, "With supercomputers, as with semiconductors and flat panels, government officials either never understood or willfully ignored the structure of the industry and the nature of worldwide competition in the sector [and] seemed blissfully unaware of the technological trajectories of the industry."[32]

Examples of knowledge problem failures are not limited to history books. For example, in March 2020 the Trump administration invoked the Defense Production Act to push domestic manufacturers to make more ventilators, which were deemed essential to fighting the novel coronavirus at that time. By the summer, however, medical professionals determined that ventilators were not as critical as they had once thought, but producers continued to churn them out under government orders, leading to reports of the goods piling up in a strategic reserve or being donated to "countries that don't need or can't use them."[33] According to a December 2020 report from the U.S. International Trade Commission, production for other medical goods funded by the Defense Production Act will only come online after mid-2021 (with the virus more contained), even though there was evidence of a domestic medical goods glut in late January.[34]

PUBLIC CHOICE—ESPECIALLY IN THE AMERICAN SYSTEM

Government industrial policy plans also face obstacles inherent in the political system that produces and implements those policies. As detailed in the work of public choice theory, political actors act not in the public interest, but in their own rational self-interest, and thus they use the political systems in which they operate to make themselves, not the general public, better off. Elected officials' primary goal is therefore reelection, whereas bureaucrats strive to advance or protect their own careers.

Public choice distorts both the design and implementation of industrial policies. On the former, elected officials frequently advance legislative policies that confer concentrated benefits upon small, homogenous, often local interest groups and impose diffuse (but larger) costs upon the public, because only the former groups have sufficient motivation to

follow the issues closely and apply political pressure through lobbying, campaign contributions, and votes. Because members of the general public are rationally ignorant about these policies (and thus do not tie their votes or contributions to them), elected officials act rationally in supporting the policies, even when they are known to produce net losses for the country. This collective action problem not only generates pork-barrel projects (often through "logrolling" bargains, in which legislators trade votes on each other's pet projects), but it also makes reform or elimination of these programs exceedingly difficult, regardless of their efficacy.[35]

"The same political pressures that distort elected officials' support for an industrial policy can similarly distort the federal bureaucracy's work to effectuate it."

The same political pressures that distort elected officials' support for an industrial policy can similarly distort the federal bureaucracy's work to effectuate it. Research shows, for example, that government agencies' agendas often mirror those of the members of the congressional committees that primarily oversee them—members that often actively seek out these committee assignments in order to affect the regulatory agencies beneath them. Similarly, studies show that agencies can become "captured" by motivated special interest groups or their elected benefactors, who use the agency to further their own narrow interests at the broader public's expense.[36] Even where political pressure is limited (often by design), capture can occur where bureaucrats lack the same level of specialized knowledge as the entities they regulate, and thus they grow to rely on those entities for both information and manpower.

All industrial policies face these political impediments, but two aspects of the American system amplify them. First, large segments of Congress may be replaced every two years and the president every four. This dynamic not only injects short-term thinking and uncertainty into the decisionmaking process, but also makes elected officials more risk-averse and focused on reelection instead of the long-term national interest. Thus, as Mancur Olson explained in 1986, "It is precisely in the areas of uncertainty like high technology and new industries that private venture capital has the greatest advantage" over government.[37] This dynamic has likely worsened since the 1980s, owing partly to longer presidential campaigns that far exceed those in other countries.[38] Representatives today essentially start campaigning for the next election shortly after winning the last one.

Second, the United States has a well-developed lobbying and interest group system, which would inevitably affect, and likely deteriorate, the design and implementation of any significant industrial policy. As Olson explained, because existing organized interests would greatly influence any industrial policy, advocates must explain how proposals to allocate capital on preferential terms to promising new firms in emerging technologies (who usually lack lobbying power) will be insulated from powerful, often declining, firms with a strong lobbying presence.[39] The effect of interest group pressure on federal industrial policy formation and implementation has doubtless increased since Olson first opined on the issue 35 years ago.

Past U.S. industrial policy efforts show how public choice issues can thwart planners' intentions. For example, Windham, Hill, and Cheney note that, along with knowledge problem issues, U.S. critical technologies efforts in the 1990s failed "because decisions about R&D funding priorities inevitably become political, as groups and leaders vie to have their favorites supported"—a process that "results in a broad list that pleases everyone but is largely useless as a guide to policy."[40]

When policies are implemented, moreover, politics often intervenes—even in systems that are designed to be insulated from the political process. The supercomputer policy in the 1990s was essentially client-service for one American company, Cray, and its computer model, while ignoring other American market entrants, such as Hewlett-Packard, IBM, Intel, and Sun Microsystems, which offered different, and arguably better, products.[41] To block a potential National Science Foundation purchase of a supercomputer made by Cray's Japanese rival NEC, the House of Representatives passed legislation sponsored by Rep. David R. Obey (D-WI),

whose district included a Cray facility, that all but guaranteed that Cray would win the contract, and the Commerce Department imposed record-setting antidumping duties of 454 percent on Japanese supercomputer imports in 1997.[42] The duties pressured NEC to agree to invest $25 million in Cray, in exchange for Cray dropping the case, and give Cray exclusive rights to sell NEC's vector supercomputers in the United States.[43] This legal extortion scheme was all the more brazen given that Cray did not even make a vector supercomputer at the time its case blocking NEC's model was settled.

Today, the supposedly impartial Department of Commerce's abuse of the U.S. antidumping law, which permits remedial duties on dumped imports found to injure U.S. manufacturers and workers, is common practice. The agency's actions result in duties that go far beyond the levels needed to remedy injurious dumping, while also revealing that it is an agency captured by domestic interest groups (especially the steel industry); that it is unconcerned with the views of diffuse consumers (including other manufacturers); and that it is unburdened by congressional or judicial checks on its authority.[44]

"These examples not only show how public choice can undermine industrial policy objectives, but also that systems designed to be insulated from political pressures have nevertheless become distorted by them—just as public choice theory predicts."

More recent government efforts to support clean coal and carbon capture technology (CCT) have also fallen victim to politics. A 2018 review by George Mason University's David Hart of 53 energy technology demonstration projects that were funded by the 2009 American Recovery and Reinvestment Act (ARRA) and administered by the Department of Energy (DOE) reveals that coal-related CCT projects "dominate[d] the portfolio from a fiscal perspective . . . accounting for about five out of every six dollars allocated to energy-demonstration projects during the Obama era." They also were subject to more lenient private cost-sharing requirements and over-optimistic government expectations as to whether they would attract follow-on private investment, and were disconnected from "the benefits that each sector might reasonably expect to receive from a project."[45] Meanwhile, technologies with more potential, such as nuclear power, renewables, and gas-fired electricity plants, were ignored.

The government's special treatment of CCT projects, Hart notes, was due at least in part to politics—especially when it came to the largest project in DOE's portfolio (which received almost one-quarter of all government funding), FutureGen:

> This megaproject, which dates back to 2003 and was terminated for the first time in 2008, was revived through ARRA funding earmarked for its Illinois site. President Obama, then a senator from Illinois, had vowed during his 2008 campaign to support clean coal technologies, and the state of Illinois (which had invested its own funds in the project) and its representatives in Congress (and those of surrounding states) pushed to include it among the "shovel-ready" projects eligible for the stimulus. Much like the Clinch River breeder reactor demonstration project . . . the local fiscal benefits of FutureGen apparently weighed heavily in its vampire-like rise from the dead.[46]

Another federally funded clean coal project—the demonstration plant in Kemper, Mississippi—was excluded from Hart's analysis because it had a different funding source, the 2006 Clean Coal Power Initiative, but this "model of President Obama's climate plan" also suffered public choice problems.[47]

Then, of course, there is the case of Solyndra and the Obama administration's "Section 1705" loan program funded by the ARRA. As the Mercatus Center's Veronique de Rugy explains, Solyndra spent almost $1.8 million on lobbyists, employing six firms with ties to Congress and the White House, while DOE reviewed its loan application. Overall, almost $4 billion in DOE grants and financing went to companies with connections to officials in the Obama

administration. De Rugy adds that "nearly 90 percent of the 1705 loan guarantees went to subsidize projects backed by large, politically connected companies including NRG Energy Inc. and Goldman Sachs."[48]

Two separate analyses, one from the Reason Foundation and one from Georgetown University, found a significant connection between Section 1705 loan sizes and their recipients' lobbying efforts.[49] These results are consistent with recent research finding that politically connected firms (as measured by contributions to home state elections) are "64 percent more likely to secure an ARRA grant and receive 10 percent larger grants" than other, less-connected companies, yet "state-level employment creation associated with grants channeled through politically connected firms is nil."[50] Analyses have also found that the Section 1705 and other ARRA-funded loan guarantee programs administered by DOE suffered from other political problems, such as conflicting statutory mandates, time constraints, or uneconomic objectives such as job protection and Buy American rules.[51]

"Unlike private actions, the successes or failures of which are usually adjudicated (often ruthlessly) by the market, government policies often live or die based on political considerations rather than their actual efficacy."

Most recently, a *New York Times* investigation into Maryland vaccine manufacturer and longtime government contractor Emergent BioSolutions found that the company invested heavily in lobbying while ignoring various safety and manufacturing best practices. It had effectively "captured" the Biomedical Advanced Research and Development Authority, which was authorized to disburse and monitor pandemic-related contracts, and yet, despite repeated contracting failures, Emergent was rewarded with a $628 million contract to manufacture COVID-19 vaccines. The company's actions ultimately imperiled millions of doses of Johnson & Johnson vaccines and weakened the Strategic National Stockpile by monopolizing its $500 million annual budget and thus reducing the taxpayer dollars available for pandemic-related supplies.[52]

These examples not only show how public choice can undermine, if not actively work against, industrial policy objectives, but they also show that systems designed to be governed by neutral arbiters and to be insulated from political pressures have nevertheless become distorted by politics—just as public choice theory predicts.

LACK OF DISCIPLINE

American industrial policies can also suffer from a lack of discipline regarding scope, duration, and budgetary costs—often due to public choice issues. Unlike private actions, the successes or failures of which are usually adjudicated (often ruthlessly) by the market, government policies often live or die based on political considerations rather than their actual efficacy. As the Brookings Institution's Linda Cohen and colleagues explain in their 1991 book, *The Technology Pork Barrel*:

> The second difference between public and private decisionmaking is the institutional structure in which decisionmakers are evaluated. Although retrospective evaluation of R&D is difficult and imperfect in the private sector, it is facilitated by the shared recognition that R&D is intended to provide financial returns to the company and by the presence of quantitative, quite easily observed, indexes of success, such as sales, unit costs, accounting profits, and evaluation of the firm in capital markets. In the public sector, the ultimate external test of an R&D program is its ability to generate more political support than opposition.[53]

The authors, who are sympathetic to U.S. industrial policy, examine six federal industrial policy programs that originated in the 1960s and 1970s and were intended to develop commercial technologies for the private sector: the supersonic transport, the Applications Technology Satellites Program, the Space Shuttle, the Clinch River Breeder Reactor

Project, synthetic fuels from coal, and the Photovoltaics Commercialization Program. (They omit basic research and defense projects from their retrospective cost-benefit analysis.) They deem only one program—NASA's satellite activities—as having been worthwhile, but it was killed before being completed. Four others were failures that cost billions of dollars, crowding out more meritorious R&D projects, yet these endured long after fiscal, technological, and commercial failure was established—a survival owed to political pressure (especially financial benefits accruing to numerous congressional districts) and captured regulators. The authors conclude that "the history of the federal R&D commercialization programs . . . is hardly a success story," and that case studies overall "justify skepticism" about such programs. This is because "American political institutions introduce predictable, systematic biases into R&D programs so that, on balance, government projects will be susceptible to performance underruns and cost overruns."[54]

David Hart summarizes the general problem identified by the *Technology Pork Barrel* examples in his 2018 paper:

> Once a project's spending spigot is turned on, its geographically concentrated fiscal benefits attract political support without regard to technological payoffs or commercial viability. Large projects are particularly attractive to legislators whether or not the technologies being demonstrated are ready to be scaled up, and even if cost, schedule, and performance targets are consistently missed. According to this view, white elephants are a virtually inevitable outcome of the U.S. political system.[55]

Numerous other industrial policy projects justify this conclusion, despite Hart's personal optimism that these forces might be controlled. The Jones Act (Section 27 of the Merchant Marine Act of 1920), for example, restricts domestic shipping services to U.S.-built, -owned, -flagged, and -staffed vessels, in order to foment a strong domestic shipbuilding industry and a ready supply of merchant mariners during wartime, yet the act has presided over the long-term degradation of both the industry and the oceangoing merchant marine fleet.[56] Despite these failures, the law has not only persisted for a century, but has actually been made *more restrictive* in recent decades—in large part due to the well-developed lobbying machine comprised of the U.S. shipbuilding industry, maritime unions, the Jones Act fleet, and other groups (including at least one foreign government) that benefit from the policy's continued existence.[57]

"Numerous U.S. industrial policies have endured long after fiscal, technological, and commercial failure was established—a survival often owed to political pressure."

The U.S. ethanol program has also lasted for decades despite numerous studies showing that corn-based ethanol imposes substantial economic and environmental damage, while raising food prices and *undermining* U.S. climate goals. Yet these mandates are championed by almost every presidential candidate visiting Iowa; even the pro-deregulation Trump White House expanded them in 2018, and both Republicans and Democrats—fully aware of the program's flaws—work tirelessly to maintain it.[58]

The U.S. antidumping law has been subject to widespread and decades-long criticism from economists, legal scholars, and trading partners, and various aspects of its administration have been repeatedly ruled illegal by federal courts and adjudicatory panels under U.S. trade agreements (e.g., the World Trade Organization and the North American Free Trade Agreement).[59] Yet the law not only remains in force—accounting for hundreds of special duties today—but has been repeatedly *expanded* by Congress to achieve desired protectionist results and to permit even greater abuse in the future.[60] The government also routinely ignores WTO rulings against the Department of Commerce antidumping abuses—practices that are becoming increasingly common.[61]

The clean-coal megaprojects FutureGen and Kemper persisted in the face of repeated failures and numerous cost overruns because of their political value (and political problems in case of failure). As the *New York Times* wrote of Kemper, "The system of checks and balances that are supposed to keep such

projects on track was outweighed by a shared and powerful incentive: The company and regulators were eager to qualify for hundreds of millions of dollars in federal subsidies for the plant, which was also aggressively promoted by Haley Barbour, who was Southern's chief lobbyist before becoming the governor of Mississippi."[62] As noted above, FutureGen was actually revived because of its importance for former president Barack Obama and his home state of Illinois. That it and other DOE projects were ultimately canceled, Hart notes, likely resulted from a unique confluence of "temporary" events: the ARRA's 2015 expiration date for fund disbursement, a bipartisan push for fiscal austerity, and partisan Republican opposition to Obama-era industrial policy projects.[63] Only the first item might be replicable today. Even the success of the Petra Nova project "suffered chronic mechanical problems and routinely missed its targets before it was shut down" in 2020.[64] According to energy experts, the project reveals the operational and financial impediments to carbon capture more broadly, yet DOE remains committed to funding it.[65]

Surely, not every U.S. industrial policy boondoggle lasts as long as the Jones Act, but the examples above—and many others—reveal that the risk is significant and the problems pervasive.

INTERACTION WITH OTHER POLICIES/DISTORTIONS

Industrial policy implementation is also often undermined by government policies that may have distorted the market at issue. As the Brookings Institution's Shanta Devarajan explains:

> The analytical case for industrial policies is based on the idea that there is a market failure that is preventing industrialization and so some form of government intervention, such as a subsidy, is necessary to correct that failure. The case is usually made in the form of elegant economic models that portray the market failure and show how intervention can lead the economy to higher growth. Most of these models assume that the relevant market failure is the only distortion in the economy. In the real world, however, these economies are full of distortions, such as labor market regulations, energy subsidies, and the like. In this setting, correcting the market failure associated with industrial policy may not promote industrialization; in fact, it may make matters worse. . . . Instead of relying on simple models that assume away all other distortions, governments would do better to identify the biggest distortions in the economy (such as energy subsidies) and work on correcting them. And if the biggest distortion cannot be moved, then governments need to take that into account in identifying the next biggest distortion to be addressed.[66]

Conflicting subsidies are a common problem in the United States. As discussed in the following section on industrial policies' costs, for example, some DOE funding for CCT was allocated to subsidized, politically powerful ethanol producers, despite the product's increasingly obvious shortcomings. Without government support for ethanol, other energy-demonstration projects might have been funded instead, perhaps with better results.

"Conflicting subsidies are a common problem in the United States, as are preexisting laws and regulations that make industrial policy projects slower and more costly."

Then there are the laws and regulations that make industrial policy projects slower and more costly. DOE loan guarantee applicants, for example, must comply with the Davis-Bacon Act (mandating high wages and favoring labor unions) and Buy American laws (mandating domestic content and favoring U.S. manufacturers), both of which increase project costs and paperwork.[67] Buy American restrictions also can limit companies' access to needed materials or lead to project delays, and they confounded ARRA-funded infrastructure projects that were intended to boost the U.S. manufacturing sector.[68] These same projects also had to comply with the National Environmental Policy Act (NEPA),

as well as similar laws at the state level, which require government review and approval of federal actions that significantly affect the environment. A recent assessment of NEPA by Eli Dourado of the Center for Growth and Opportunity finds that publication of NEPA-required environmental impact statements takes an average of 4.5 years, and that ARRA projects have entailed approximately 193,000 NEPA reviews, 7,200 environmental assessments, and 850 impact statements. While these reviews are ongoing, no project funds may be disbursed or actual work begun.[69]

"Entrenched, policy-driven distortions can turn projected industrial policy successes into costly failures—exacerbating market failures rather than fixing them."

Bipartisan efforts to overhaul NEPA have thus far proven unsuccessful, and Democrats—who currently control the federal government—have expressed a desire to apply both Buy American and Davis-Bacon to future industrial policy initiatives.[70] In fact, both are included in the bipartisan U.S. Innovation and Competition Act and Infrastructure Investment and Jobs Act, each of which passed the Senate in the summer of 2021 and seek to subsidize the domestic production of certain goods and technologies.[71]

These entrenched, policy-driven distortions, and others, can turn projected industrial policy successes into costly failures—exacerbating market failures rather than fixing them. Policymakers should therefore focus on correcting distortions caused by current policies before adding another layer of distortion via new industrial policy.

HIGH COSTS—SEEN AND UNSEEN

Finally, industrial policies impose substantial costs beyond the budgetary line item assigned to a specific project. This includes not only substantial cost overruns, but also numerous unseen costs imposed on other parts of the U.S. economy—costs that often undermine an industrial policy's own objectives.

Seen Costs

Projects frequently fall victim to cost overruns well beyond initial budget projections. Borrowing costs, given the perpetual U.S. budget deficit, also magnify this expense. For example, in 2014 DOE claimed that its green energy lending programs were making money because the agency's assessment ignored the interest costs that taxpayers paid to finance the loans at issue. As the Urban Institute's Donald Marron explained at the time, DOE's alleged $810 million profit became a $780 million *loss* when Treasury's borrowing costs were included.[72]

Furthermore, it often takes years to determine whether a project merits its cost. For example, in 2014 DOE congratulated itself at the opening of the subsidized Abengoa cellulosic biorefinery in Hugoton, Kansas, but that plant was shut down in 2015 and sold off at a severely discounted price as part of a 2016 bankruptcy proceeding.[73] By 2018, the entire U.S. cellulosic biofuel industry was on the ropes, and the Hugoton facility still sits idle today.[74]

Finally, cherry-picked industrial policy successes often obscure a wider portfolio of failures and thus, higher costs per success. For example, Hart's review of DOE energy-demonstration projects found that 10 CCT projects accounted for 82 percent of all DOE funding ($3.49 billion of $4.24 billion) in 2009, but only three were still active in 2018, with the huge FutureGen project among the failures.[75] Since Hart's study, one of these three, the Petra Nova power project, was mothballed after suffering frequent outages and missing its carbon sequestration goals.[76] Another, Archer Daniels Midland's Illinois Industrial Carbon Capture and Storage Project (which captures carbon dioxide as a byproduct of ethanol production), is still operating, but it has reached only half of its annual emissions storage target.[77] Only Air Products and Chemicals' carbon capture facility in Texas (which received $284 million from DOE) can be considered successful.[78] Was this one success worth the total CCT portfolio cost of $3.5 billion?

Other industrial policy portfolios raise similar issues. While Tesla famously paid back its $485 million loan under the Advanced Technology Vehicle Manufacturing program, Fisker Automotive went bankrupt without paying off its $529 million loan; Ford's $5.937 billion loan and Nissan's $1.448 billion loan also remain outstanding.[79] Presumably, they will be paid back, but this story remains unwritten.

Unseen Costs

Beyond these seen costs are the many hidden ones that even government industrial policy successes impose on the economy, including indirect costs paid by private parties, deadweight costs to the economy, opportunity costs, misallocation of resources, unintended consequences, moral hazard and adverse selection, and uncertainty.

Indirect costs paid by others

Industrial policies that restrict access to goods and services from disfavored (usually foreign) suppliers raise prices for both the restricted items and their favored competitors, imposing significant costs on consuming companies and individuals. For example, tariffs that former president Donald Trump implemented to boost the U.S. steel and aluminum industries have been repeatedly found to raise foreign and domestic steel prices, thus harming downstream U.S. manufacturers and reducing GDP.[80] Pervasive Buy American rules, which generally restrict government contracts to domestic producers, have similarly been found to act as a barrier to entering the U.S. market and to raise domestic prices in the same way that a tariff does.[81]

Deadweight costs

Trade restrictions or taxation to fund industrial subsidies also impose deadweight costs on the economy. For example, by raising domestic prices a tariff not only redistributes to producers money that consumers used to save when buying cheaper, non-tariffed imports, but also reduces domestic consumption overall. This portion of the consumer surplus is simply destroyed—a deadweight loss that makes the United States, as a whole, worse off in the amount of wealth destroyed (money that consumers, pre-tariff, could have saved, invested, or spent on other things). Economists have repeatedly found that import restrictions impose substantial deadweight costs on the economy—a key reason why so few economists support them.[82] High tax rates have been found to impose similar costs.[83]

"Given that both time and federal budgets are finite, government industrial policies replace efforts and money that could have been spent on other priorities, potentially imposing significant opportunity costs in the process."

Opportunity costs

Industrial policy programs that entail government spending also entail opportunity costs, as explained by St. Louis Federal Reserve Economist Michelle Clark Neely:

> Each subsidy given to an industry or firm generates an opportunity cost: the cost of foregone alternatives. In other words, to correctly evaluate a policy, you need to know not only what you're getting, but also what you're giving up. Based on industrial policy experiments in several countries, most economists have little confidence in the government's ability to measure these benefits and costs properly.[84]

Given that both time and federal budgets are finite, government industrial policies replace efforts and money that could have been spent on other priorities, potentially imposing significant opportunity costs in the process. In *The Technology Pork Barrel*, for example, Cohen and Noll explain that the Clinch River breeder reactor "absorbed so much of the R&D budget for nuclear technology that it probably retarded overall technological progress."[85] Other nuclear projects, and the Space Shuttle, likely had similar net negative effects.[86] As

noted above, more recent government overspending on Emergent BioSolutions' pricey anthrax vaccines left less money available to purchase other medical goods, such as N95 masks, for the Strategic National Stockpile, thus contributing to its shortages when COVID-19 arrived in 2020.[87]

These opportunity costs are sometimes mentioned when government industrial policies publicly fail, but they must also be considered when evaluating the alleged successes, too. As Duke professor Daniel Gross explains, for example, we celebrate that World War II shifted the scientific establishment from its previous projects to atomic fission, radar, and other war-related technologies, but we ignore the canceled projects' potential benefits.[88] Once these types of opportunity costs are considered, allegedly successful industrial policies can end up undermining the economy, as well as various strategic national objectives.

Misallocation of resources

Industrial policies also often distort private investment decisions, pushing resources away from productive transactions, businesses, or industries. When the Trump administration pushed automakers to produce ventilators that were never needed, their efforts occupied machinery, labor, and capital that could have been used to make cars that subsequently were in short domestic supply. The canceled $765 million loan to turn Eastman Kodak into a pharmaceutical ingredient company caused the company's shares to surge 1900 percent, and its market capitalization at one point reached $2.2 billion (a twentyfold increase)—private capital that could not be invested elsewhere (for example, in actual U.S. pharmaceutical ingredient producer Fujifilm).[89] Even after the government loan was stymied, and without any new plan for long-term financial viability (along with continued poor financial performance), the company's shares still traded at three to four times their pre-loan announcement price, thus diverting for several months (if not longer) hundreds of millions of private investment dollars away from other companies.[90]

Industrial policies can also discourage private investment in industries that the government is actually trying to promote. As Harvard's Josh Lerner explains, with respect to the Obama-era DOE's green energy subsidies,

> The enormous scale of the public investment appears to have crowded out and replaced most private spending in this area, as [venture capitalists] waited on the sideline to see where the public funds would go. . . . Rather than being stimulated, cleantech has fallen from 14.9 percent of venture investments in 2009 to 1.5 percent of capital deployed in the first nine months of 2019.[91]

With respect to the Advanced Technology Vehicle Manufacturing program in particular, *Wired* magazine found in 2009 that "this massive government intervention in private capital markets may have the unintended consequence of stifling innovation by reducing the flow of private capital into ventures that are not anointed by the DOE," and then provided instances when this very risk had materialized.[92]

"Industrial policies also often distort private investment decisions, pushing resources away from productive transactions, businesses, or industries."

Finally, potential industrial policy beneficiaries can divert resources from their actual business to obtaining federal benefits (lobbying, grant writing, etc.), thus undermining the former. *Wired* notes, for example, that

> Aptera Motors has struggled this year to raise money to fund production of the Aptera 2e, its innovative aerodynamic electric 3-wheeler, recently laying off 25 percent of its staff to focus on pursuing a DOE loan. According to a source close to the company, "all of the engineers are working on documentation for the DOE loan. Not on the vehicle itself."[93]

Kodak spent almost $800,000 on lobbying before it received its Defense Production Act loan, and Emergent BioSolutions has spent millions on lobbying and winning federal contracts. Overall, countless millions of dollars—dollars that

could have been spent on producing better products—have instead been spent on political efforts by companies in the steel, shipbuilding, ethanol, and other industries that are common industrial policy targets.[94]

Unintended consequences

Industrial policies produce consequences that not only are unforeseen by government planners but also undermine the policies' own objectives. As already noted, government subsidies intended to spur various energy innovations repeatedly discourage them. Steel protectionism has boosted less productive and innovative firms' lobbying efforts and financial returns, thus discouraging overall innovation (R&D spending and creative destruction) in the industry.[95]

"Industrial policies also can generate moral hazard (i.e., encouraging actors to engage in overly risky behavior by protecting them from its consequences) and adverse selection (i.e., the tendency to attract the highest-risk or least-responsible actors)."

Numerous other examples abound. Semiconductor policy during the 1980s and 1990s sought to boost domestic producers' global competitiveness (while diminishing their Japanese competitors), but instead it enriched Japanese chipmakers via quota "rents" and government-backed collusion and helped turn South Korean companies into global leaders.[96] Jones Act shipping restrictions, intended to bolster national security, have pushed American energy consumers to buy from Russian producers and American shippers to use Chinese shipyards for repairs. Restrictions on imports of machine tools from major producer countries in the 1980s fueled the growth of China's machine tools industry.[97] Ethanol subsidies and mandates have reduced cropland, increased food prices, and harmed the environment. Buy American restrictions tied to federal transportation subsidies have raised the price of domestically produced transit buses and discouraged the purchase of more-efficient foreign-made buses, thus lowering the quality and use of public transit (fewer stops and less geographic coverage), increasing traffic congestion, and harming the environment.[98] Outside of the United States, European innovation policy has stymied innovation, while Japanese industrial policy has slowed productivity growth.[99] The list of countries and industries more harmed than helped by industrial policy goes on and on.

Moral hazard and adverse selection

Industrial policies also can generate moral hazard (i.e., encouraging actors to engage in overly risky behavior by protecting them from its consequences) and adverse selection (i.e., the tendency to attract the highest-risk or least-responsible actors). Research shows, for example, that government loan guarantees that insure lenders against incurring losses from default can encourage banks to take on risky borrowers, discourage them from undertaking standard due diligence to apply for credit guarantees, and attract a disproportionate share of risky borrowers, thus resulting in inefficient resource allocation overall.[100] In the United States, the poster child for these problems was the Section 1705 loan guarantee program and the $535 million loan to solar panel manufacturer Solyndra that it supported.[101] As explained by economist Ryan Yonk, the scandal with Solyndra was not that the company failed, but that its loan application—which a 2015 Inspector General report found was plagued with deficiencies and misrepresentations about a company with publicly known problems—was ever approved in the first place.[102] In a comprehensive assessment of all DOE loans and loan programs implemented between 2009 and 2016, the Heritage Foundation's Nick Loris found that projects routinely featured failed companies that "could not survive even with the federal government's help," and added that both the Government Accountability Office and DOE Office of Inspector General reports "identify that the loan programs were fraught with inefficiencies, lack of due diligence, and inadequate oversight and management."[103]

Uncertainty

Industrial policies often produce uncertainties due to their inherently political nature (frequent elections, program lapses, etc.) and potential to engender trade disputes or retaliation from foreign trading partners. Numerous studies, for example, show that U.S. tariffs during the Trump administration increased trade policy uncertainty and thereby decreased investment and economic growth.[104] These results are consistent with the general economics literature showing that policy uncertainty undermines investment, employment, and economic growth. As the University of Chicago's Steven J. Davis explains,

> a variety of studies find evidence that high (policy) uncertainty undermines economic performance by leading firms to delay or forego investments and hiring, by slowing productivity-enhancing factor reallocation, and by depressing consumption expenditures. This evidence points to a positive payoff in the form of stronger macroeconomic performance if policymakers can deliver greater predictability in the policy environment.[105]

Both theory and practice show why it is difficult, if not impossible, for industrial policies to achieve such predictability. These outcomes not only undermine the common argument that industrial policies fix market short-termism—they are similarly afflicted (if not more so)—but also show that such policies impose significant economic harms.

"Industrial policies often produce uncertainties due to their inherently political nature (frequent elections, program lapses, etc.) and potential to engender trade disputes or retaliation from foreign trading partners."

Almost all of these seen and unseen costs arose in the 2009 government bailouts of General Motors and Chrysler, which were deemed industrial policy successes by the Obama administration because they only cost taxpayers about $10 billion, which was the difference between the current-dollar value of funds the government invested and recouped.[106] However, this total ignores the true, interest-adjusted cost to taxpayers, which the Congressional Budget Office estimates was 40 percent higher ($14 billion).[107]

Furthermore, as economist Daniel Ikenson has explained, even this larger dollar figure ignores all of the bailout's hidden costs for the economy. For instance, the $61 billion allocated to these corporations could have been spent on more productive initiatives, such as retraining autoworkers. The long-term competitiveness of GM and Chrysler was diminished because they were not reorganized via standard bankruptcy proceedings. Ford and other U.S.-based automakers who did not receive special treatment lost business, thus harming not only their finances but also American consumers and the economy, because these companies' better products and business models were not rewarded. Moral hazards arose from encouraging the continuation of the companies' and the United Auto Workers' irresponsible practices. Bond holders and other investors suffered because they did not receive the fair value of their holdings, potentially short-circuiting U.S. bankruptcy law along the way. Then there are the political costs of protecting well-connected favorites (here, unions), and the cost of uncertainty about whether and when political actors would again decide to intervene in the market and legal system, citing the bailout as precedent.[108]

If It Creates One Tesla?

Some industrial policy advocates argue that these seen and unseen costs are an expected and necessary part of backing ventures considered too risky for private capital and are worth the expense if the project ultimately supports one big winner, such as Tesla Motors. Even assuming that Tesla's story is fully written, or that electric vehicle (EV) proliferation benefits average Americans, however, this argument must have limits: Would government backing of Tesla be worth one trillion dollars' worth of waste, failure, and cronyism? Two trillion? Surely, some number

of losers—individuals and the economy overall—would be too much, even if the government picked one winner in the process. Costly public failures might also undermine public confidence in the government and support for future federal policies, industrial or otherwise—jeopardizing the next Tesla (or more worthwhile targets) rather than nurturing it. Solyndra's failure had this very result.[109]

These arguments, as well as other industrial policy defenses, also require quantifying the benefits that alleged successes confer, not merely upon the recipient companies and their workers, but on the U.S. economy more broadly. Positive externalities, market-beating R&D spillovers, and faster economic growth are often claimed, but these benefits are rarely supported by hard evidence or thorough empirical analysis. Indeed, a core theme of scholars Deirdre Nansen McCloskey and Alberto Mingardi's book, *The Myth of the Entrepreneurial State*, is the lack of rigorous and systematic empirical analyses of the overall efficacy of nations' industrial policies, as opposed to whether specific projects achieved certain deliverables.[110] Pack and Saggi examined the issue in 2006 and explained a key hurdle to such analyses:

> Although there are cases where government intervention coexists with success, there are many instances where industrial policy has failed to yield any gains. The most difficult issue is that relevant counterfactuals are not available. Consider the argument that Japan's industrial policy was crucial for its success. Because we do not know how Japan would have fared under laissez-faire policies, it is difficult to attribute its success to its industrial policy. It might have done still better in the absence of industrial policy—or much worse. Given this basic difficulty, only indirect evidence can be obtained regarding the efficacy of industrial policy. Direct evidence that can "hold constant" all the required variables (as would be done in a well-specified econometric exercise) does not exist and likely never will.[111]

The authors nevertheless concluded that sectoral targeting has not been not effective.[112] Since then, several literature reviews have come to essentially the same conclusion: the few empirical studies of industrial policy tend to focus on specific transactions and issues rather than the aggregate, economy-wide effects of industrial policy; they often suffer from methodological or data limitations; and they have produced mixed, country-specific results.[113] The studies therefore cannot permit strong conclusions about the success or failure of industrial policy writ large.

"Positive externalities, market-beating R&D spillovers, and faster economic growth are often claimed, but these benefits are rarely supported by hard evidence or thorough empirical analysis."

Finally, one must also consider whether an industrial policy success would have occurred in a market without the supporting program. Often, subsidized successes perform no better than their unsubsidized competitors. The most recent example is the BioNTech/Pfizer COVID-19 vaccine achieving the same or better results than vaccines that received far more government support. Yonk's 2020 assessment of DOE loan guarantee programs, for example, finds that few loans were extended that couldn't have been obtained in the market.[114] He adds:

> Most Section 1705 funding has gone to large corporations who already have access to capital for investments in research, development, and deployment. Recipients of LPO [DOE Loan Program Office] guarantees include multiple Fortune 200 companies, utility companies, and multinationals. Many are wholly owned by yet larger companies. The application process itself all but ensures that only large, established companies will be capable of participating in the program. Applicants can expect to pay between $150,000 and $400,000 in fees before even being considered.[115]

As noted above, other analyses of the program have come to the same conclusion. Semiconductor consortium

SEMATECH's work has also been found to have produced deliverables that the market could have provided without government assistance.[116] A 2020 analysis of 25 cleantech startups funded by the Advanced Research Projects Agency-Energy (ARPA-E) in 2010 found "no clear evidence" that subsidy recipients performed better than similar cleantech startups in terms of being acquired, launching an initial public offering, or receiving venture capital funding within 10–15 years of their founding. The authors therefore conclude that the program did not achieve one of its primary goals, which was to generate "an increased likelihood of success (measured in different ways) for ARPA-E startups compared to similar companies."[117] The authors find that awardees did obtain more patents than nonsubsidized competitors, but do not rule out that this success was due to ARPA-E encouraging subsidy recipients to patent or choosing companies with a higher propensity to patent.[118] Finally, the authors found that funding from DOE's Office of Energy Efficiency and Renewable Energy did not affect awardees' patenting or follow-on funding, while DOE's Small Business Innovation Research awardees actually patented less than the average unsubsidized firm.[119]

"One must also consider whether an industrial policy success would have occurred in a market without the supporting program. Often, subsidized successes perform no better than their unsubsidized competitors."

The ARPA-E program was therefore the best of the bunch. However, the bar is low, and success is *still* no better than what the market could produce. As one supporter of ARPA-E put it, "one would hope to see stronger evidence of the impact of ARPA-E support not only on follow-on funding, but also on product introductions, sales and other downstream commercialization variables over a longer time span."[120] Alas, no such evidence exists.

What Problem Will Industrial Policy Solve?

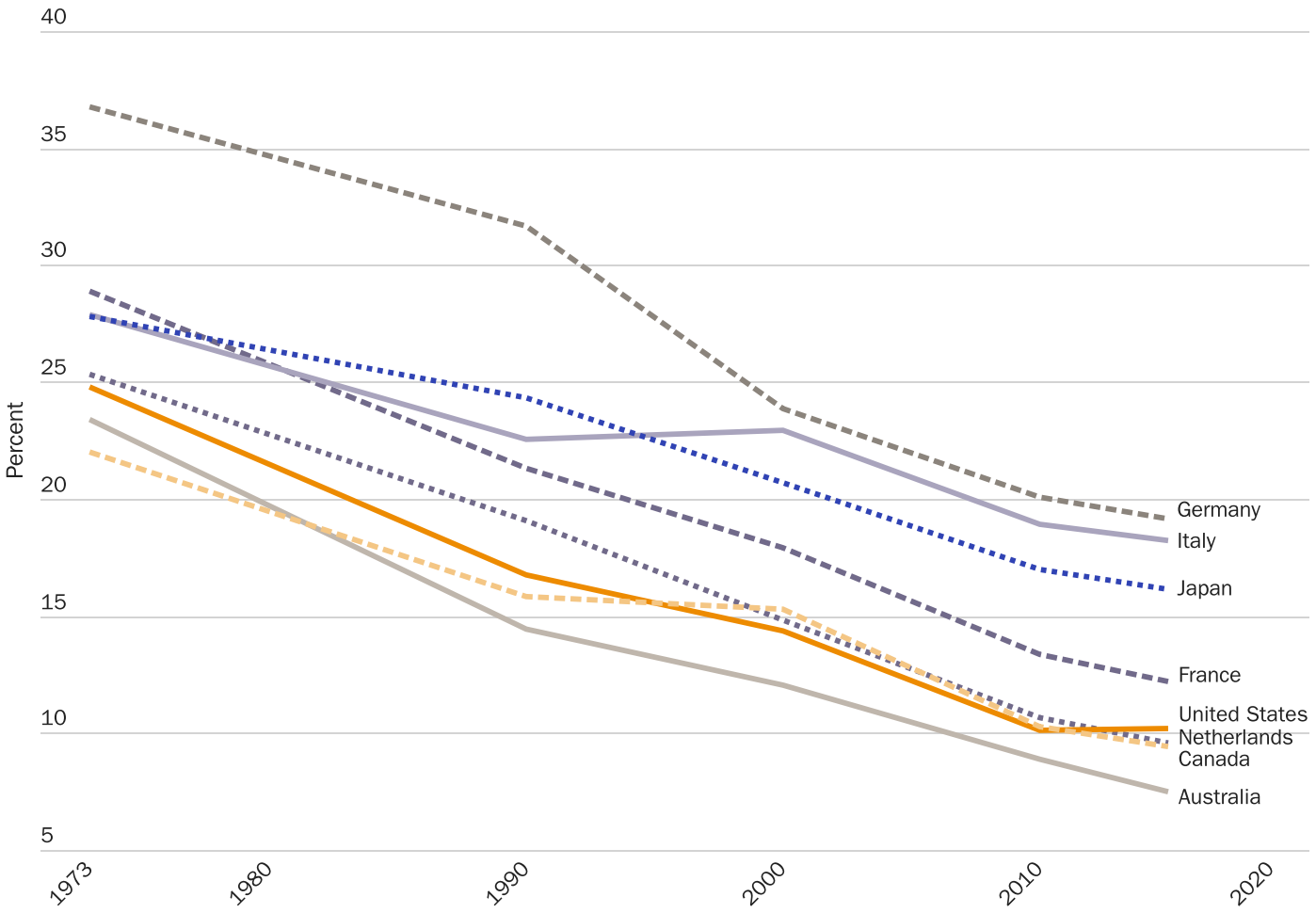
Industrial policy advocates also routinely fail to demonstrate the existence of the specific economic problem that their proposed policies will solve. The most common problems, without which new industrial policy would not be necessary, are either much less serious than advocates claim or else cannot be fixed with industrial policy. This includes allegations of widespread deindustrialization, declining manufacturing jobs and business investment, the erosion of middle-class living standards, and the destruction of American communities.

DEINDUSTRIALIZATION

The supposed deindustrialization of the United States does not justify new industrial policies. There is little merit to the common argument that the U.S. industrial base has been dismantled by decades of free-market fundamentalism and a lack of industrial policy.[121] Both the declining number of manufacturing jobs (Figure 1) and the manufacturing sector's shrinking share of GDP (Figure 2) primarily reflect long-term global trends that are shared by most industrialized nations and that are disconnected from

Figure 1

Share of employment in manufacturing in selected advanced economies, 1973–2016



Source: Robert Z. Lawrence, "Recent US Manufacturing Employment: The Exception That Proves the Rule," Peterson Institute for International Economics Working Paper no. 17-12, November 2017.

specific federal economic policies, whether they are free market or interventionist.

Overall, as Figures 3 and 4 show, the historical trends in U.S. manufacturing jobs and the manufacturing sector's GDP share are a standard story of economic development that all countries eventually experience as they get richer.

Given that these long-term, systemic trends were experienced in other countries, such as Germany and Japan, that had both trade surpluses and active, comprehensive industrial policies, there is little to suggest that new U.S. industrial policies would change the same trends in the United States.

Furthermore, Table 1 and Figures 5 through 7 show that the U.S. manufacturing sector remains among the most productive in the world and has actually expanded since the 1990s—continuing earlier period trends in output, investment (both capital expenditures and R&D), and financial performance.

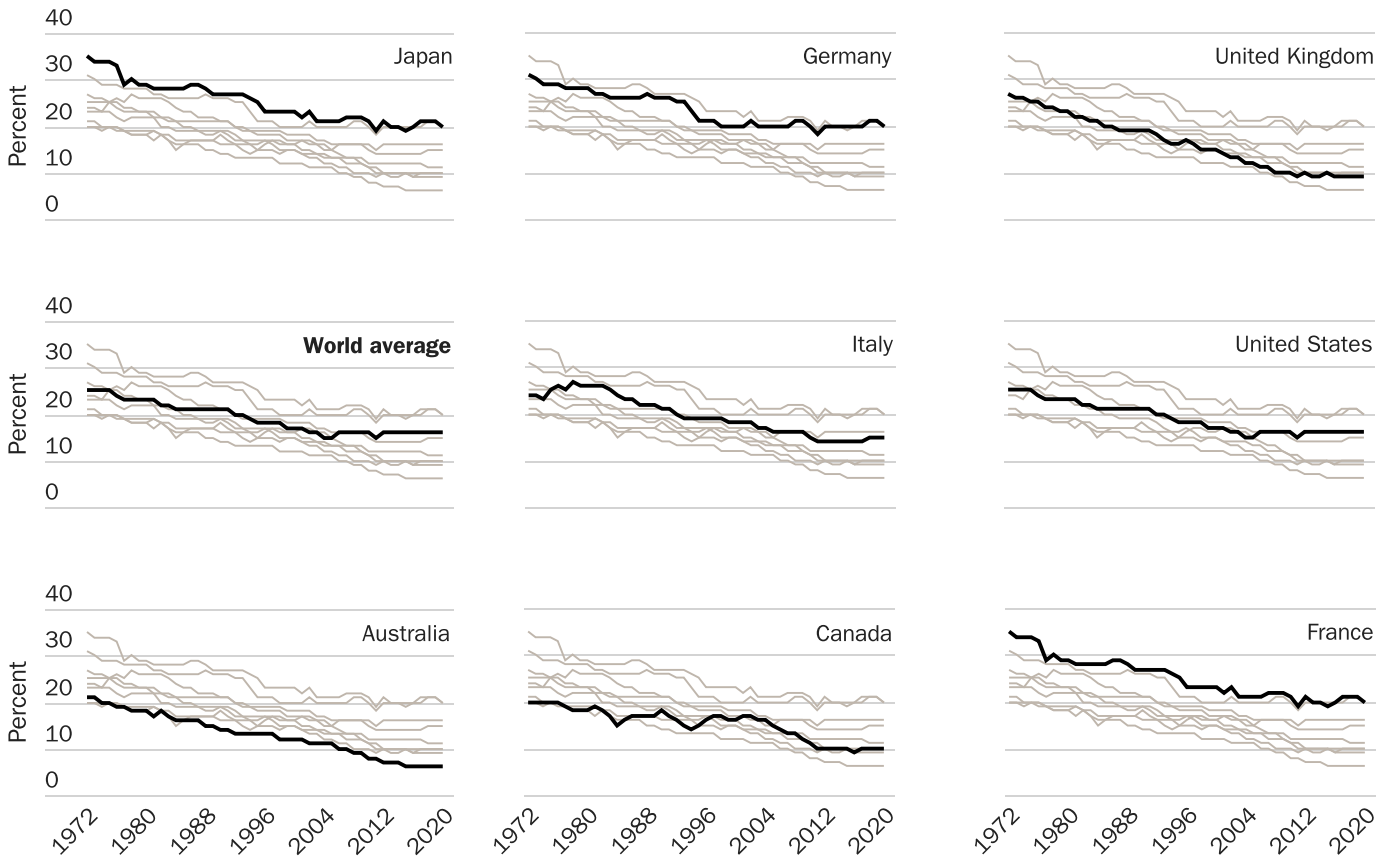
As shown in Table 2 and Figures 8 through 10, moreover, the R&D spending trends for the U.S. manufacturing sector generally track those of the nation overall, which hit all-time highs in R&D spending as a share of GDP and inflation-adjusted dollars spent.

As documented by economist Donald Schneider, numerous experts have concluded that overall *net* investment in the nonfinancial corporate sector (i.e., new investment minus depreciation) has not declined in real terms. As shown in Figure 11, this reached an all-time high on a per worker basis during the mid-2010s and leveled off afterward.

Research from University of Houston economist Dietz Vollrath shows that a causal connection between total U.S. business investment and economic growth disappears after accounting for slowing population growth, which is not something that industrial policy can fix.[122]

Figure 2

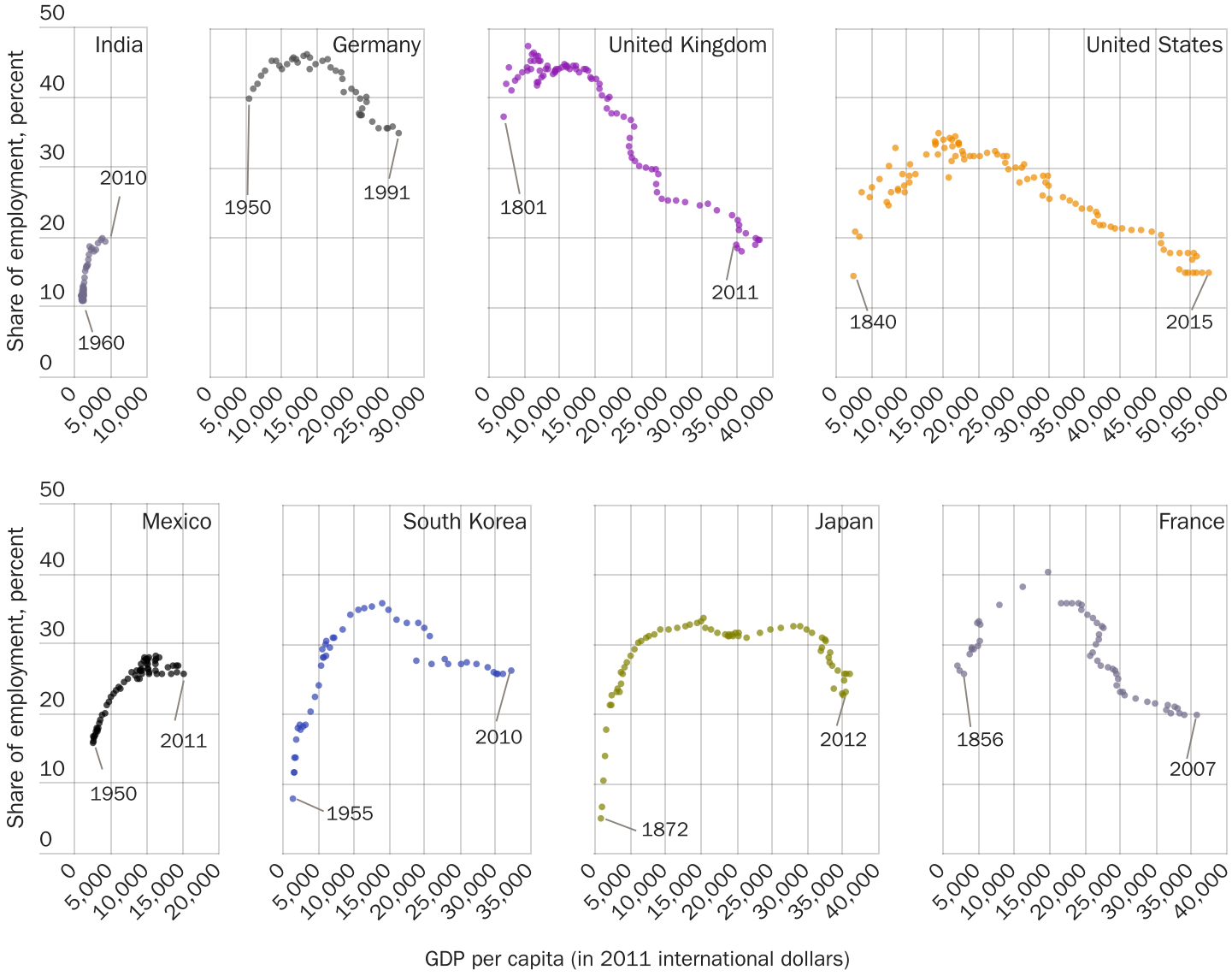
Manufacturing share of gross domestic product in selected advanced economies, 1972–2020



Source: United Nation, National Accounts-Analysis of Main Aggregates, https://unstats.un.org/unsd/snaama/Index.

Figure 3

Manufacturing share of total employment versus gross domestic product (GDP) per capita, selected countries, 1801–2016



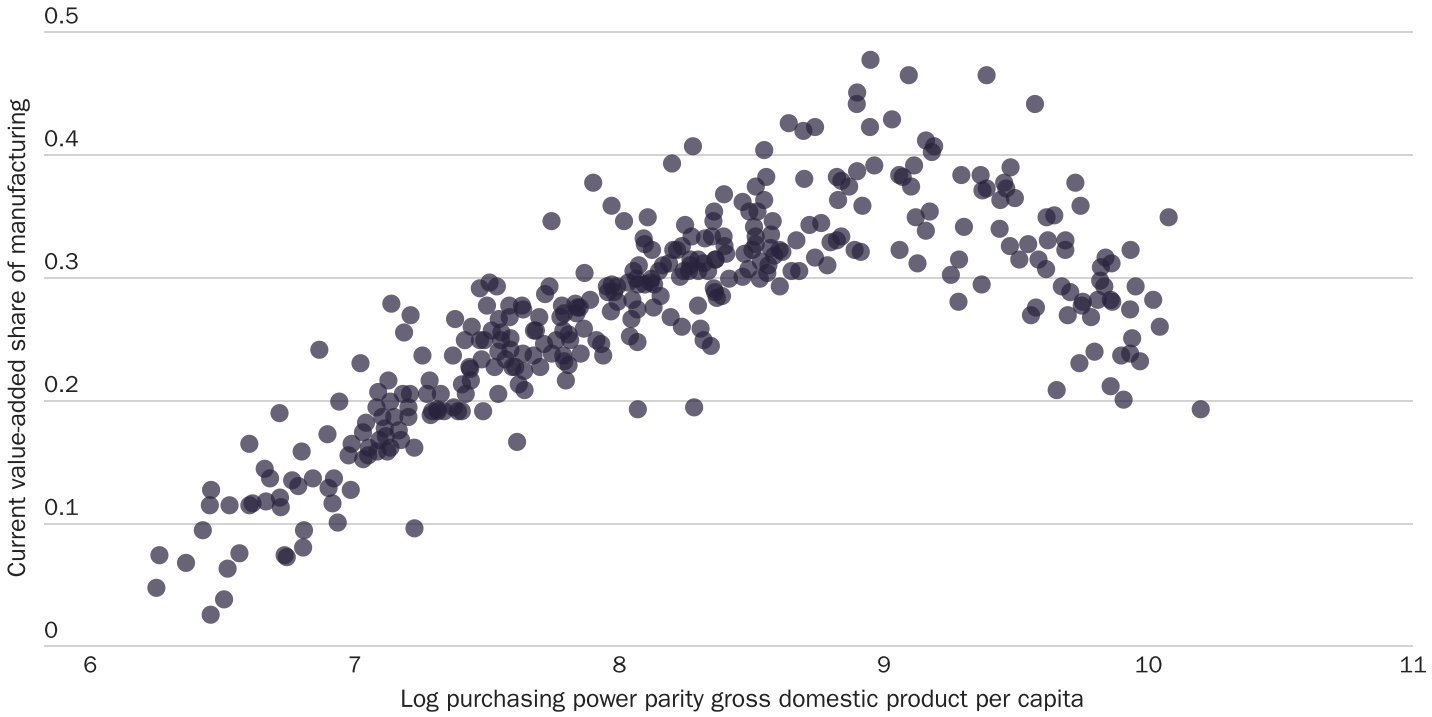
Source: "GDP per Head vs Share of Industry in Employment, 1801 to 2015," Our World in Data, https://ourworldindata.org/grapher/gdp-vs-manufacturing-employment?time=1801..2015.

These topline data underscore that any new American industrial policy would require targeting specific industries to change the sector's composition, *not* the horizontal tax or educational policies that some advocates claim to be industrial policy. And while some manufacturing industries have undoubtedly declined over the last several decades, these changes usually reflect fundamental shifts in U.S. and global markets that are driven by trade, technology, changing consumer habits, and other trends, as opposed to a weak manufacturing sector. The declines also have been offset by gains in other industries, particularly durable goods industries, such as transportation and aerospace, and high-value nondurable goods industries such as chemicals and energy (see Figure 12 and Table 3).

These and other U.S. manufacturing data reveal a flexible and dynamic sector that is generally responsive to free-market forces that are important for the health of the economy overall, not merely for the manufacturing sector. Furthermore, the offshoring or automating of low-wage, low-skill industries in the apparel, furniture, and other manufacturing industries, while undoubtedly difficult for the workers directly affected, is an important part of a healthy,

Figure 4

Manufacturing share versus per capita income (country panels)



Source: Francisco J. Buera and Joseph P. Kaboski, "Scale and the Origins of Structural Change," *Journal of Economic Theory* 147, no. 2 (March 2012): 684–712.

Table 1

Top manufacturing countries, 2018 (millions of dollars, unless otherwise noted)

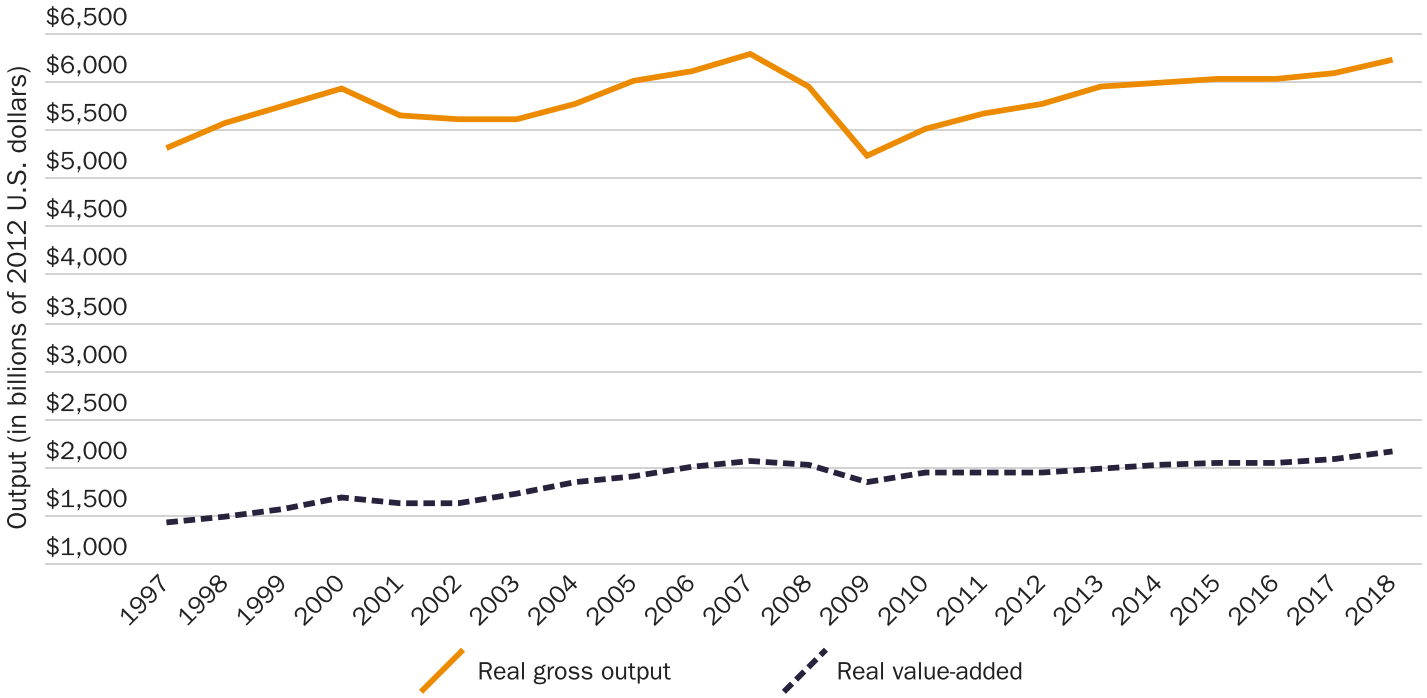
Country	Manufacturing value-added	Merchandise exports	Manufactures exports	FDI inflows (total)	FDI inflows (manufacturing)	Manufacturing value-added per worker (dollars)
China	$3,884,451	$2,486,695	$2,318,153	$138,305	n/a	$29,188
United States	$2,300,398	$1,663,982	$1,176,498	$253,561	$166,889	$177,127
Japan	$959,243	$738,143	$641,106	$9,858	$13,242	$92,448
Germany	$746,485	$1,560,539	$1,364,575	$73,570	$12,826*	$96,632
South Korea	$427,724	$604,860	$528,991	$12,183	$5,245	$94,841
India	$409,087	$324,778	$223,265	$42,156	n/a	$7,169
Italy	$289,160	$549,527	$452,134	$32,886	$8,481	$73,292
United Kingdom	$279,298	$486,439	$468,817	$65,299	$4,058*	$108,223
France	$260,321	$581,774	$462,086	$38,185	$20,128	$100,938
Mexico	$214,789	$450,685	$362,608	$34,745	$16,318	$29,931

Sources: United Nations Conference on Trade and Development; World Trade Organization; Conference Board; Organisation for Economic Co-operation and Development; and author's calculations.

Notes: FDI = foreign direct investment. Gross domestic product value-added figures were provided in 2015 dollars and have not been adjusted. All other figures are in 2018 dollars. Organisation for Economic Co-operation and Development data were not provided for "n/a" countries. Germany FDI inflows (manufacturing) are for 2017, and UK FDI (manufacturing) are for 2015 (the latest data available).

Figure 5

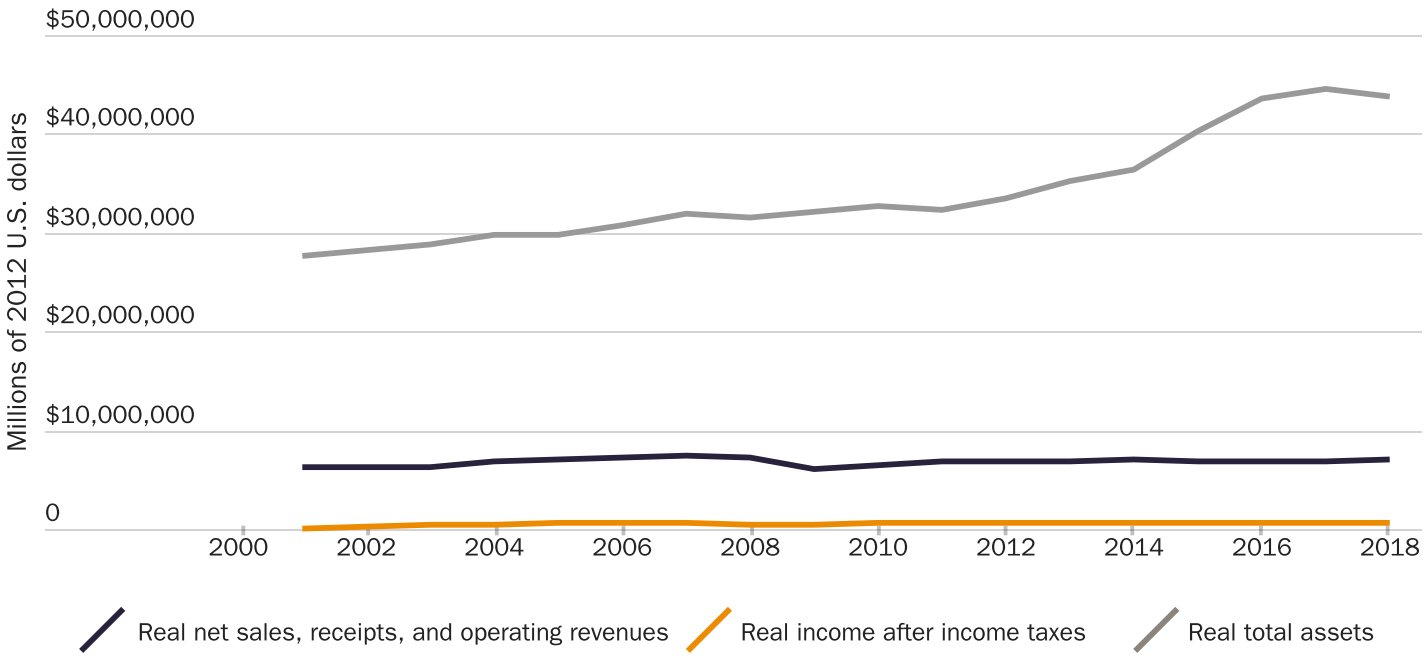
U.S. manufacturing output and value-added, 1997–2018



Source: "GDP-by-Industry," Bureau of Economic Analysis, December 10, 2020, https://apps.bea.gov/iTable/index_industry_gdpIndy.cfm.

Figure 6

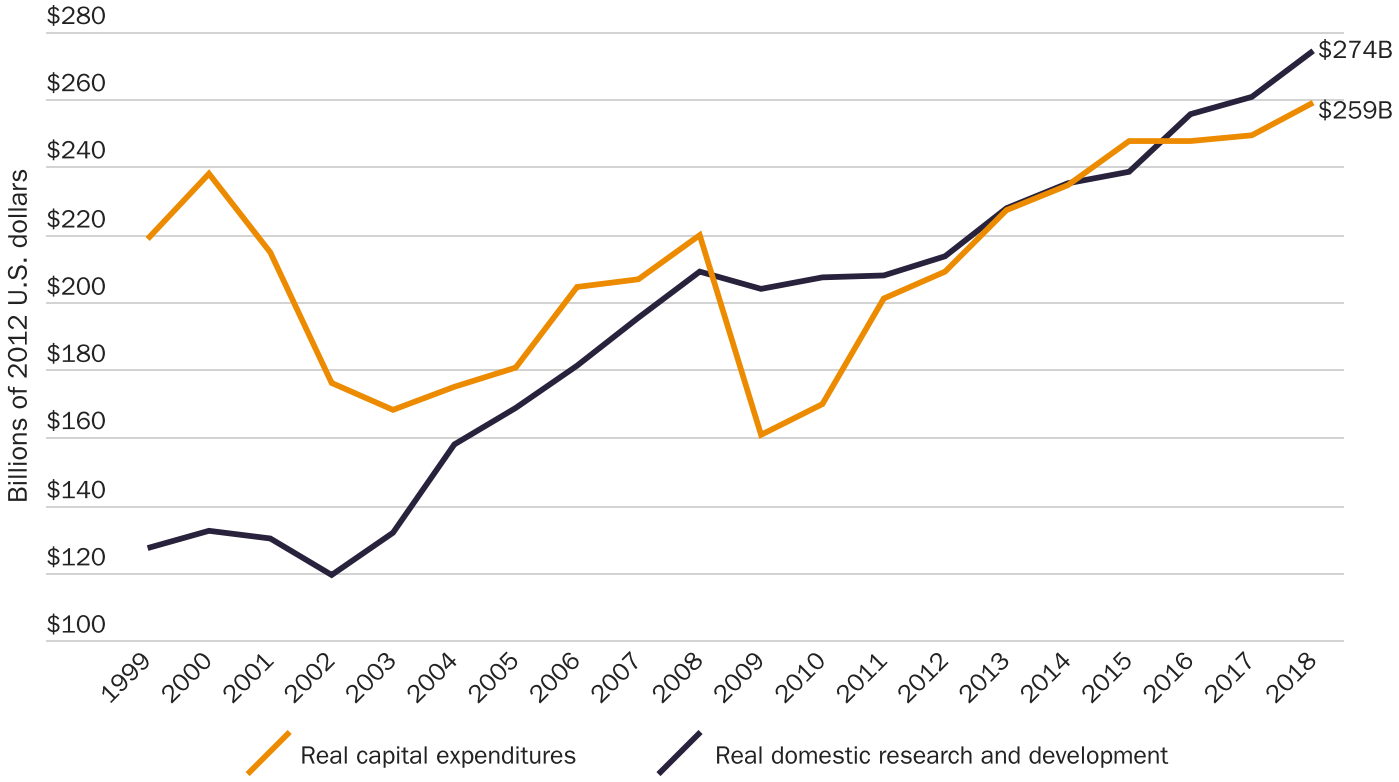
U.S. manufacturing sector financial performance, 2001–2018



Source: "Quarterly Financial Report (QFR): Manufacturing, Mining, Trade, and Selected Service Industries," U.S. Census Bureau, https://www.census.gov/econ/qfr/.
Deflator: "Table 1.1.9. Implicit Price Deflators for Gross Domestic Product," National Income and Products Accounts, National Data, Bureau of Economic Analysis, https://apps.bea.gov/iTable/iTable.cfm?reqid=19&step=3&isuri=1&1921=survey&1903=13#reqid=19&step=3&isuri=1&1921=survey&1903=13.

Figure 7

U.S. manufacturing investment, 1999–2018



Sources: "Research and Development: U.S. Trends and International Comparisons," Science and Engineering Indicators, National Science Board, https://ncses.nsf.gov/pubs/nsb20203/u-s-business-r-d; and "2019 Annual Capital Expenditures Survey Tables," U.S. Census Bureau, December 16, 2020, https://www.census.gov/data/tables/2019/econ/aces/2019-aces-summary.html.
Deflator: "Table 1.1.9. Implicit Price Deflators for Gross Domestic Product," National Income and Product Accounts, National Data, Bureau of Economic Analysis, https://apps.bea.gov/iTable/iTable.cfm?reqid=19&step=3&isuri=1&1921=survey&1903=13#reqid=19&step=3&isuri=1&1921=survey&1903=13.

Table 2

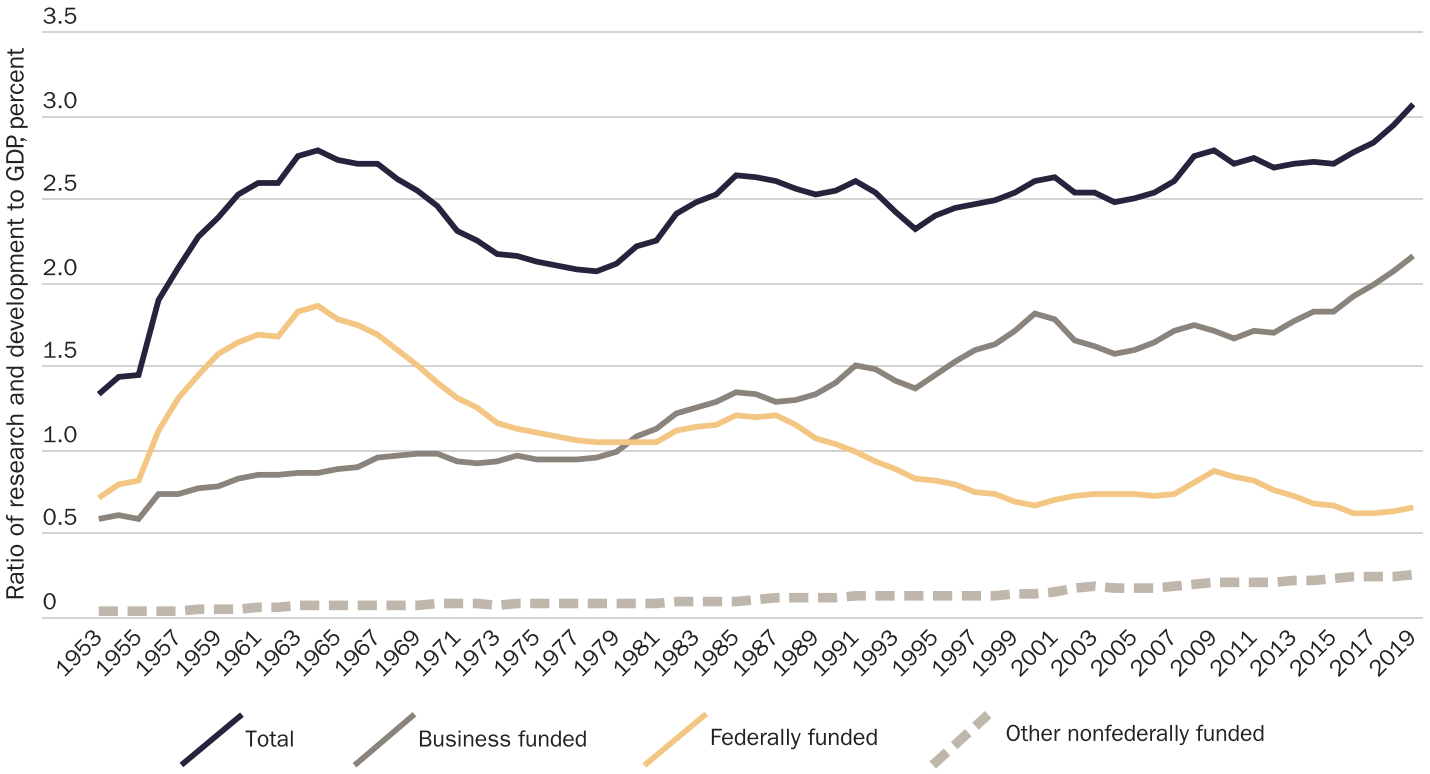
U.S. research and development expenditures by type of work, selected years (2000–2018) (constant 2012 dollar billions)

	All research and development	Basic research	Applied research	Experimental development
2000	343.2	53.8	72.4	217.0
2010	423.1	79.4	82.3	261.4
2011	434.4	74.9	83.5	276.0
2012	433.7	73.8	86.9	273.1
2013	446.4	77.7	86.7	282.0
2014	459.3	79.8	88.6	290.9
2015	472.6	80.5	93.0	299.1
2016	493.5	85.1	101.0	307.3
2017	515.5	86.7	103.0	325.6
2018	549.5	91.7	105.5	352.3
2019	584.4	96.1	111.2	377.1

Source: National Center for Science and Engineering Statistics, *National Patterns of R&D Resources: 2018–19 Data Update* (Alexandria: National Science Foundation, 2021).
Note: Data for 2019 are estimates and will later be revised.

Figure 8

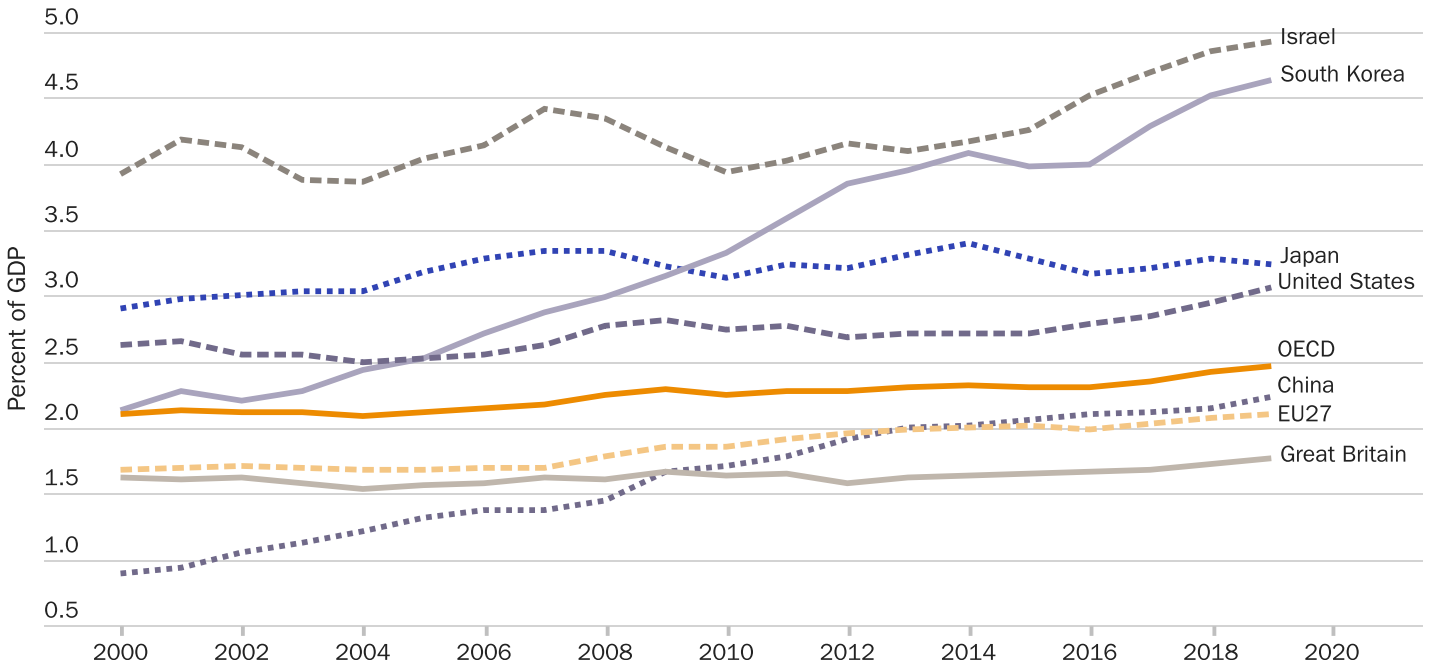
U.S. research and development expenditures as share of GDP, 1954–2018



Source: National Center for Science and Engineering Statistics, National Patterns of R&D Resources, NSF 21-324, https://ncses.nsf.gov/pubs/nsf21324.
Notes: Data for 2019 are estimates; some of these data may later be revised. The GDP data used reflect the Bureau of Economic Analysis's comprehensive revisions of the National Income and Product Accounts of August 2020.

Figure 9

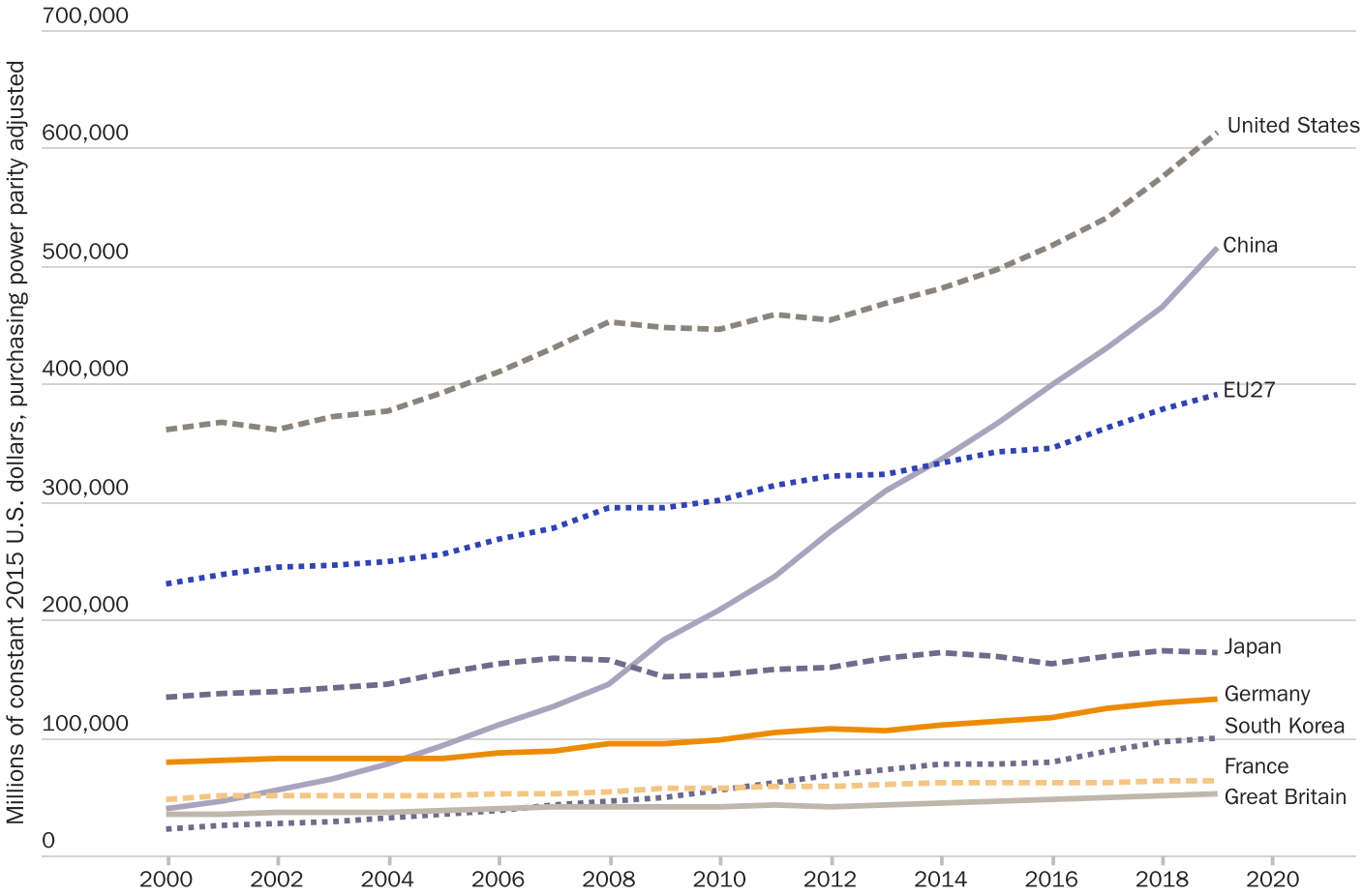
Research and development intensity: gross domestic expenditure on research and development as a percentage of GDP, 2000–2019



Source: "Main Science and Technology Indicators Database," Organisation for Economic Co-operation and Development, https://www.oecd.org/sti/msti.htm.

Figure 10

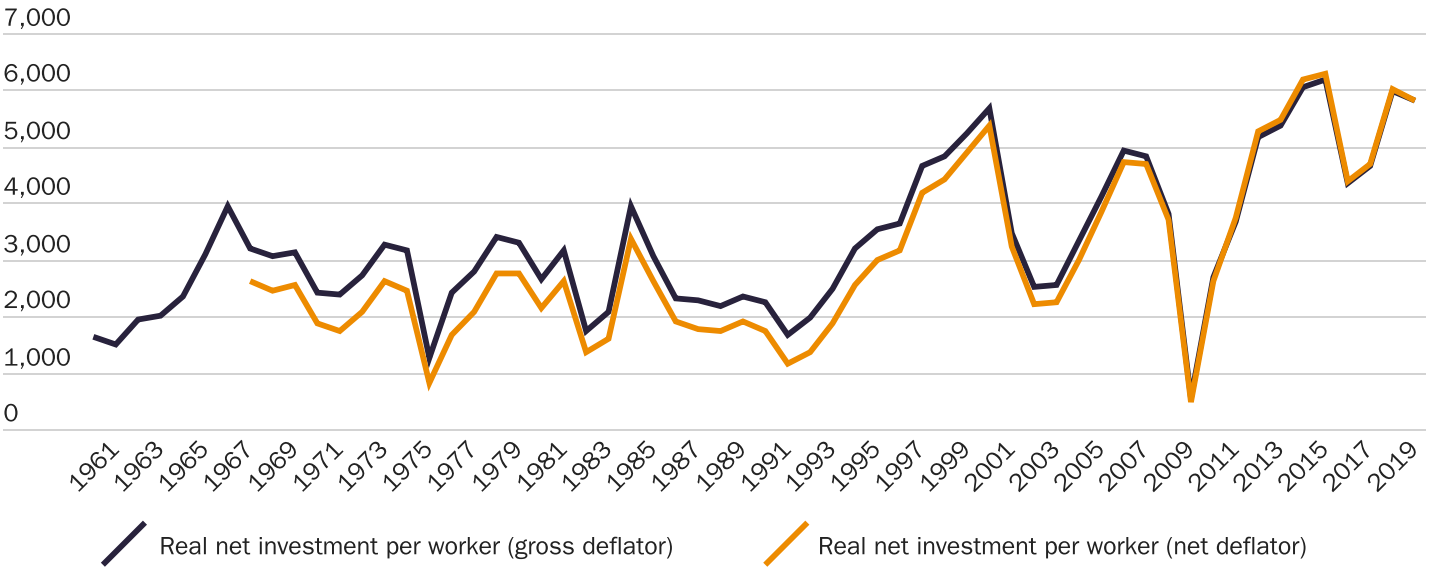
Gross domestic expenditure on research and development, 2000–2019



Source: "Main Science and Technology Indicators Database," Organisation for Economic Co-operation and Development, https://www.oecd.org/sti/msti.htm.

Figure 11

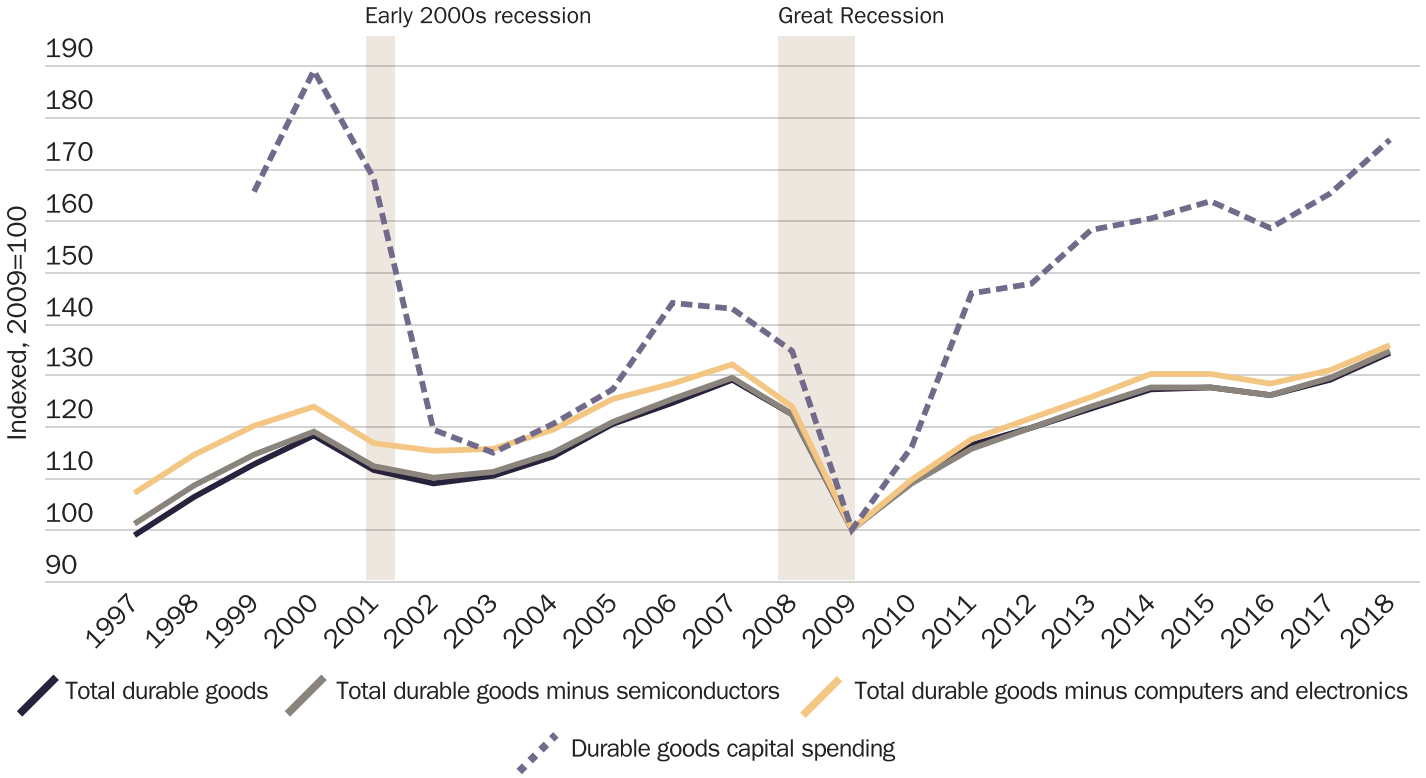
Real net investment in the U.S. nonfinancial corporate sector (2015 dollars), 1961–2019



Source: Donald Schneider, Cornerstone Macro, using Bureau of Economic Analysis data.

Figure 12

Real U.S. durable goods manufacturing output and investment change before and after 2009



Sources: "Gross Output by Industry," Bureau of Economic Analysis, September 30, 2020, https://www.bea.gov/data/industries/gross-output-by-industry#:~:text=What%20is%20Gross%20Output%20by,inputs%20not%20counted%20in%20GDP); and "Annual Capital Expenditures: 2017," U.S. Census Bureau, March 13, 2019, https://www.census.gov/library/publications/2019/econ/2017-aces-summary.html.
Deflator: "Table 1.1.9. Implicit Price Deflators for Gross Domestic Product," National Income and Product Accounts, National Data, Bureau of Economic Analysis, https://apps.bea.gov/iTable/iTable.cfm?reqid=19&step=3&isuri=1&1921=survey&1903=13#reqid=19&step=3&isuri=1&1921=survey&1903=13.

Table 3

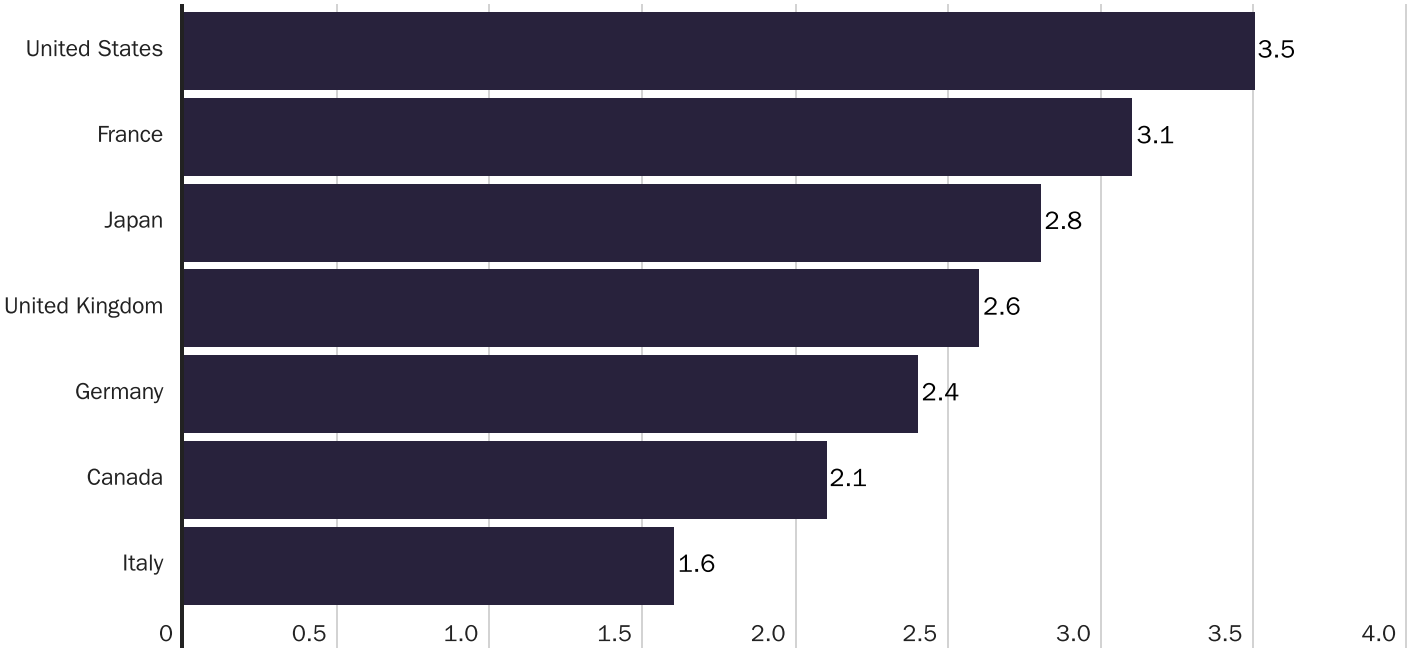
Change in U.S. nondurable goods manufacturing output, total and select industries

Industry	Percentage change in real value-added (1997–2018)	Percentage change in real gross output (1997–2018)
Total nondurable goods	0.2%	3.53%
Food and beverage and tobacco products	8.3%	12.5%
Food manufacturing	45.6%	27.9%
Beverage manufacturing	86.2%	22.2%
Tobacco product manufacturing	–72.7%	–70.1%
Textile mills and textile product mills	–38.9%	–51.5%
Apparel and leather and allied products	–65.4%	–81.6%
Paper products	–36.3%	–22.4%
Printing and related support activities	5.6%	–30.1%
Petroleum and coal products	13.0%	21.5%
Chemical products	14.2%	4.9%
Nondurable goods (excluding textiles, apparel, paper, printing, and tobacco)	22.9%	10.3%

Source: "GDP by Industry," Bureau of Economic Analysis, updated December 10, 2020, https://apps.bea.gov/iTable/index_industry_gdpIndy.cfm.

Figure 13

Real value-added per hour worked in manufacturing, annual percent change, 1990–2018



Source: The Conference Board International Labor Comparison program, January 2020.

dynamic economy and an essential part of economic development, moving resources from less- to more-productive domestic enterprises. This is true regardless of whether the enterprises are in manufacturing or other sectors.

MANUFACTURING JOBS

Manufacturing jobs cannot justify a new industrial policy push. It is highly questionable to assume that the significant decline in the number of factory jobs during the 1990s and 2000s could have been reversed via industrial policy because those same trends were happening in all industrialized nations, including those with robust industrial policies. American policy could, in theory, produce a one-time increase in overall manufacturing employment, but the long-term downward trend would continue. Furthermore, as shown in Table 1 and Figure 13, U.S. manufacturing workers continue to be among the most productive in the world, even accounting for a slowdown since the Great Recession.

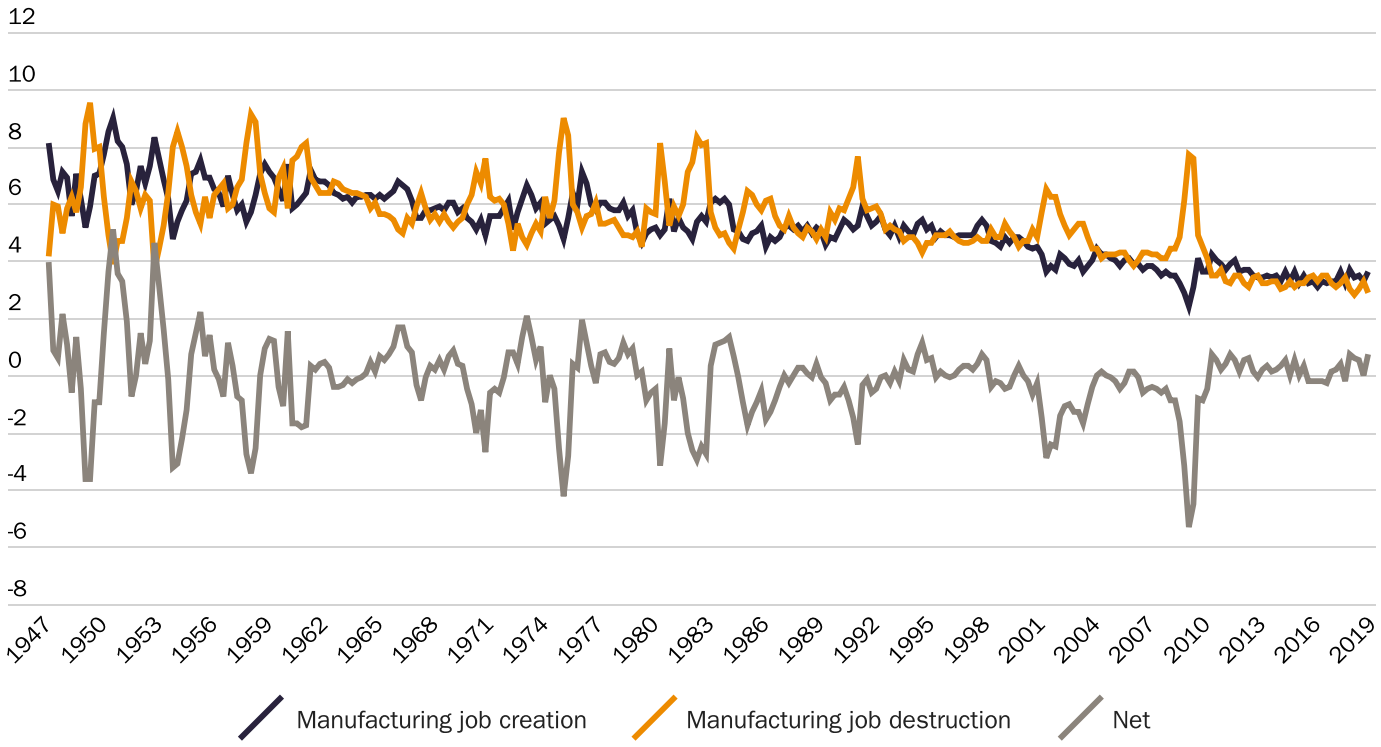
However, altering the composition of the 165-million-person American workforce to include an additional one or two million manufacturing jobs would not necessarily be better for the workforce or for the U.S. economy overall, because manufacturing jobs are not sufficiently special or economically beneficial as to warrant government industrial policy interventions, even assuming that such interventions would be successful.

As the Cato Institute's Ryan Bourne documented in 2019, manufacturing jobs are not significantly more stable or secure than jobs in other sectors, especially for low-skilled workers whose jobs have been disappearing for decades and who are most exposed to, and replaced by, automation and trade.[123] As shown in Figure 14, annual job creation in manufacturing has been low since the 1960s, and there was net job destruction from the 1960s through 2010.

Although the number of manufacturing jobs has increased since the Great Recession, the Bureau of Labor Statistics projects that the sector will resume its long-term trend of shedding manufacturing jobs (444,800 of them, to be exact) over the next decade due to international competition and productivity-enhancing technologies.[124] On the latter issue, for example, the number of man-hours required to produce a ton of steel in the United States dropped from 10 in 1980 to approximately 1.5 today. The *newest* steel plants, however, need even fewer workers—one Austrian mill needs only 14 employees to make 500,000 tons of steel wire per

Figure 14

Manufacturing job creation, job destruction, and net job creation rates in the United States



Sources: Ryan Bourne made these calculations using these sources: Steven J. Davis and John Haltiwanger, "Measuring Gross Worker and Job Flows," *Labor Statistics Measurement Issues* (Chicago: University of Chicago Press, 1998), pp. 77–122; and "National Private Sector Business Employment Dynamics Data by Major Industry Classification: Manufacturing," Bureau of Labor Statistics, https://www.bls.gov/bdm/bdmind.htm#MANUFACTURING.

year.[125] Because demand for steel is finite, steel industry employment will thus continue to decline while productivity continues to climb.

Indeed, American manufacturing jobs tend to be highly productive, but this benefit has a downside: it caps industrial employment. For example, U.S. manufacturing gained almost 1 million jobs between 2010 and 2018, outpacing job growth in China, Germany, and Japan in the process. However, over the same period, real manufacturing value-added per worker and per hour worked in the United States increased by only 0.3 percent per year and 0.1 percent per year, respectively, as compared to 5.6 percent and 5.7 percent per year between 2000 and 2008—a time of significant manufacturing *job loss* in the United States.[126]

In other words, American workers were improving their ability to produce manufactured goods at a much more rapid pace during the height of manufacturing job loss than during the subsequent period of reemployment. Thus, the goal of promoting high-productivity, high-innovation industries that need fewer higher-skilled workers conflicts with the goal of supporting numerous comfortable, stable, and secure jobs. An industrial policy that seeks to achieve the latter objective—for example by reshoring jobs in the textile, apparel, or consumer electronics industries—would inevitably sacrifice the former.

There is also little to indicate that boosting nominal manufacturing employment would solve the sagging labor force participation, even among less-educated male workers. For starters, the labor force participation rate hit 63.4 percent in January 2020, which was lower than its 2000 peak but was at approximately the same level as in June 1979, when U.S. manufacturing jobs were at an all-time high in nominal terms. The prime-age (25–54) employment to population ratio, by contrast, was far higher in January 2020 (80.5 percent) than it was in 1979 (around 74.5 percent).[127] Only male prime-age employment dropped from 1979 to January 2020, but a 2020 Bureau of Labor Statistics review of the increase in male prime-age nonworkers attributes the rise to issues other than deindustrialization, most notably health issues and past incarceration.[128]

Previous research by the American Enterprise Institute's Scott Winship, moreover, finds that most (56 percent) prime-age men who were inactive or not in the labor force in 2014 reported that they were disabled, while another third were retired, enrolled in school or training, or taking care of a family member.[129] Just 1 in 10 prime-age men not in the labor force fell outside of these categories, while about one-quarter of them said they wanted a job. Leaving aside what may be driving these trends, nothing here supports an *industrial policy solution*—whether it targets low-skill, labor-intensive jobs or higher-skill, grey-collar jobs that require advanced training. Indeed, even in late 2018, when both the U.S. labor market and manufacturing sector were booming, there were approximately 500,000 manufacturing job openings (a 3.9 percent opening rate)—the highest levels ever recorded, dating back to 2000.[130]

Thus, the connection between male prime-age employment and nominal manufacturing jobs may be weak today, and there is no reason to think that targeted policies to *boost manufacturing jobs,* as opposed to broad macroeconomic policies that produce a strong labor market generally, will increase male labor force participation.

Finally, wages and incomes, both in and out of manufacturing, do not justify new industrial policies. Contrary to the conventional wisdom, middle-class compensation has not been stagnant, nor has significant "wage polarization" (i.e., increasing numbers of high and low wage jobs) occurred over the last several decades.[131] Economist Michael Strain finds, for example, that median production and supervisory wages have increased by more than 30 percent since the early 1990s, and total personal compensation—wages, benefits (an increasing portion of pay), taxes, and transfers—is up 61 percent. Instead, stagnation occurred between the late 1970s and the early 1990s, long before the largest declines in manufacturing jobs and before the advent of modern globalization. Ironically, it was during this stagnation period that the United States last became enamored with industrial policy.

In general, most Americans are becoming financially better off over time, although they may be doing so through different jobs.[132] Among them are e-commerce warehouse jobs, which have increased substantially and are increasingly well-compensated. In fact, the average hourly pay for blue-collar and administrative jobs in the warehousing industry now exceeds the average pay for similar jobs in both manufacturing and the private sector overall (Table 4); it is now more lucrative to transport and deliver the proverbial "cheap T-shirt" than it is to make it (Figure 15).

The growth of these and other well-paying services jobs underscores that the manufacturing wage premium today is small, if it exists at all. According to a December 2019 report by the Bureau of Labor Statistics, for example, by the end of 2018 "average hourly earnings of production and nonsupervisory workers in the total private sector had surpassed those of their counterparts in the relatively high-paying durable goods portion of manufacturing" (nondurables pay was even lower).[133] As shown in Table 5,

Table 4

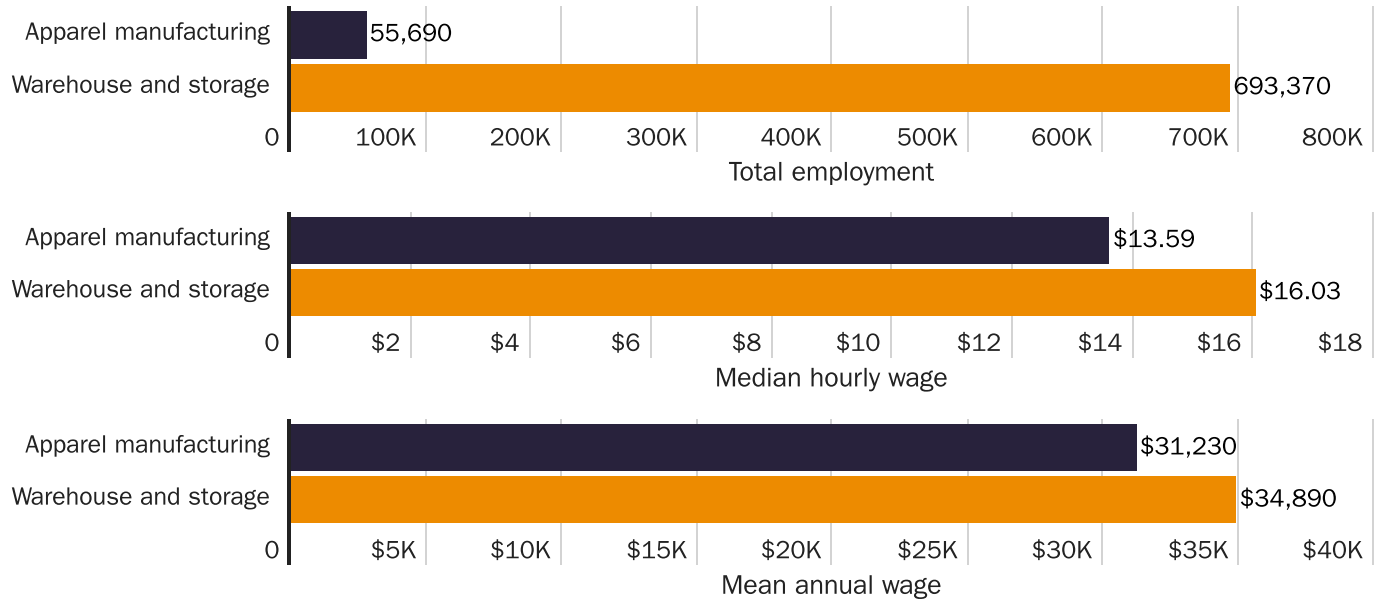
2019 U.S. average hourly pay (dollars)

	Warehousing	Manufacturing	Private sector
All occupations	19.77	26.09	25.20
Management occupations	52.65	65.11	60.26
Business and financial operations	31.99	36.92	37.92
Computer and mathematical occupations	33.56	49.38	45.88
Office and administrative support	19.62	20.91	19.46
Installation, maintenance, and repair	24.82	25.98	23.95
Transportation and material moving occupations	17.96	17.58	18.01
Laborers and material movers	16.19	15.78	14.64
Packers and packagers, hand	15.01	13.94	13.30

Source: "Occupational Employment and Wage Statistics," Bureau of Labor Statistics.

Figure 15

Apparel manufacturing jobs versus warehousing jobs, 2020



Source: "Occupational Employment and Wage Statistics," Bureau of Labor Statistics, https://www.bls.gov/oes/.
Note: Apparel jobs are in "production occupations" (51-000), https://www.bls.gov/oes/current/oes_nat.htm#51-0000; warehousing jobs are in "laborers and material movers" (code 53-7060), https://www.bls.gov/oes/current/oes_nat.htm#53-0000.

many blue-collar services jobs in the United States not only have grown faster than manufacturing jobs since 1990, but also pay higher hourly wages and have faster wage growth. The number of these jobs is also expected to increase in the future.

The Bureau of Labor Statistics reports that manufacturing workers continue to have higher weekly earnings, but only because they work more hours per week to compensate for the relatively low hourly pay. The report adds that manufacturing employment declined across virtually all industries since 1990, and that manufacturing hours are more volatile from month to month.

In the face of these realities, manufacturers routinely report having difficulty attracting workers, even when offering higher wages, which is consistent with the data on labor force participation and job openings. Prior to the COVID-19 pandemic, for example, finding workers was consistently the biggest problem that manufacturing employers reported to the Federal Reserve's *Beige Book* survey, and the Department of Defense explained in its 2019 *Industrial Capabilities* report that one of the defense industrial base's biggest needs was "increasing the prestige of manufacturing as a profession in order to inspire more prospective workers to choose it as a career."[134] Meanwhile, *Bloomberg* reported in 2019 that furniture manufacturers in trade-impacted Hickory, North Carolina, which had an unemployment rate of 4.3 percent, could not find local workers willing to do physically demanding work that sometimes entailed risk, even by offering $2,000 hiring bonuses and paying $35 an hour wages.[135] The *Wall Street Journal* found a similar dynamic nationwide in January 2021: despite a red-hot sector and increasing wages, manufacturers reported difficulties in finding qualified workers, which was due in part to competition from warehousing jobs, and had resorted to waiving drug-use restrictions and tapping local jails' work-release programs.[136]

Finally, it is essential to note that the United States has been trying to increase manufacturing jobs for decades with little avail. As a 2013 Congressional Research Service report concluded about the state of American manufacturing, "Although Congress has established a wide variety of tax preferences, direct subsidies, import restraints, and other federal programs with the goal of retaining or recapturing manufacturing jobs, only a small proportion of US workers is now employed in factories."[137]

This again indicates that, even if manufacturing jobs deserve to be saved, a U.S. industrial policy would be unable to

Table 5

Employment and average hourly earnings of production and nonsupervisory workers in selected industries, 1990 versus 2018

	1990		2018		Annualized percent change, 1990–2018	
Industry	Employment	Average hourly earnings	Employment	Average hourly earnings	Employment	Average hourly earnings
Total private	73,721,000	$10.20	104,319,000	$22.71	1.2%	2.9%
Manufacturing	**12,669,000**	**$10.78**	**8,899,000**	**$21.54**	**–1.3%**	**2.5%**
Durable goods	7,397,000	$11.40	5,463,000	$22.51	–1.1%	2.5%
Wood products	451,500	$8.82	319,000	$17.88	–1.2%	2.6%
Nonmetallic mineral products	413,200	$11.11	309,900	$21.41	–1.0%	2.4%
Primary metals	525,100	$12.97	293,600	$23.31	–2.1%	2.1%
Fabricated metal products	1,190,100	$10.64	1,084,900	$20.55	–0.3%	2.4%
Machinery	938,900	$11.73	718,200	$23.06	–1.0%	2.4%
Computer and electronic parts	980,200	$10.89	613,100	$25.09	–1.7%	3.0%
Electrical equipment and appliances	465,200	$10.00	260,500	$20.59	–2.0%	2.6%
Transportation equipment	1,473,400	$14.44	1,188,300	$26.32	–0.8%	2.2%
Motor vehicles and parts	869,500	$15.00	778,700	$22.77	–0.4%	1.5%
Furniture and related products	475,200	$8.53	291,500	$17.86	–1.7%	2.7%
Miscellaneous durable goods	484,200	$8.87	384,100	$19.14	–0.8%	2.8%
Nondurable goods	5,272,000	$9.87	3,436,000	$19.96	–1.5%	2.5%
Food manufacturing	1,165,000	$9.04	1,271,500	$17.49	0.3%	2.4%
Textile mills	417,900	$8.17	87,700	$16.46	–5.4%	2.5%
Textile product mills	194,900	$7.37	85,600	$15.31	–2.9%	2.6%
Apparel	805,200	$6.22	80,900	$15.32	–7.9%	3.3%
Paper and paper products	493,200	$12.06	276,100	$21.88	–2.1%	2.2%
Printing and related support activities	597,600	$11.11	294,900	$18.74	–2.5%	1.9%
Petroleum and coal products	97,500	$17.00	77,400	$40.32	–0.8%	3.1%
Chemicals	620,300	$12.85	547,700	$25.46	–0.4%	2.5%
Plastics and rubber products	646,700	$9.76	548,100	$18.49	–0.6%	2.3%
Miscellaneous nondurable goods	233,800	$10.28	165,700	$20.11	–1.2%	2.4%
Mining and logging	**538,000**	**$13.40**	**544,000**	**$28.30**	**0.0%**	**2.7%**
Construction	**4,115,000**	**$13.42**	**5,438,000**	**$27.74**	**1.0%**	**2.6%**
Wholesale trade	**4,167,500**	**$11.55**	**4,698,000**	**$25.18**	**0.4%**	**2.8%**

Table 5 (continued)

	1990		2018		Annualized percent change, 1990–2018	
Industry	Employment	Average hourly earnings	Employment	Average hourly earnings	Employment	Average hourly earnings
Retail trade	**11,311,000**	**$7.71**	**13,529,200**	**$15.91**	**0.6%**	**2.6%**
Transportation and warehousing	**2,943,200**	**$12.5**	**4,721,000**	**$21.84**	**1.7%**	**2.0%**
Utilities	**584,900**	**$16.14**	**444,700**	**$36.77**	**–1.0%**	**3.0%**
Information	**1,866,000**	**$13.4**	**2,278,000**	**$31.93**	**0.7%**	**3.1%**
Financial activities	**4,973,000**	**$9.98**	**6,637,000**	**$26.94**	**1.0%**	**3.6%**
Credit intermediation and related services	1,808,100	$9.06	2,015,000	$23.72	0.4%	3.5%
Real estate	849,100	$8.71	1,255,800	$21.69	1.4%	3.3%
Rental and leasing	415,000	$8.49	458,400	$20.45	0.4%	3.2%
Professional and business services	**8,915,000**	**$11.15**	**17,123,000**	**$26.81**	**2.4%**	**3.2%**
Professional and technical services	3,499,800	$14.00	7,255,900	$35.41	2.6%	3.4%
Management of companies and enterprises	1,279,900	$11.11	1,540,200	$28.86	0.7%	3.5%
Administrative and waste services	4,135,100	$8.48	8,326,700	$18.32	2.5%	2.8%
Education and health services	**9,784,000**	**$9.98**	**20,788,000**	**$23.65**	**2.7%**	**3.1%**
Health care	7,344,400	$10.42	14,121,200	$25.92	2.4%	3.3%
Social assistance	966,900	$6.99	3,478,400	$14.84	4.7%	2.7%
Leisure and hospitality	**8,299,000**	**$6.02**	**14,382,000**	**$13.87**	**2.0%**	**3.0%**
Other services	**3,555,000**	**$9.08**	**4,839,000**	**$20.78**	**1.1%**	**3.0%**

Source: Bureau of Labor Statistics.
Note: Numbers are not seasonally adjusted.

achieve that objective. Perhaps for these reasons, even some industrial policy advocates have stopped citing manufacturing jobs as a core industrial policy objective.[138]

LIVING STANDARDS

American living standards also cannot justify industrial policies. In terms of basic necessities such as food, clothing, and home goods, Americans today are absurdly rich as compared to only a few decades ago. According a 2016 report from Southern Methodist University, the share of American households with access to telephones or cell phones, electricity, air conditioning, home appliances, TVs, computers, and other common household goods is at or approaching 100 percent.[139] Research from economist Bruce Sacerdote finds the consumption gains for below-median income families to be particularly impressive: low-income consumption (adjusted for inflation) increased between 62 percent and 164 percent between 1960 and 2015, not fully accounting for improvements in quality (which for some items, such as cars and homes, have also been substantial).[140] Accounting for these consumption improvements also dramatically narrows inequality, especially for single parents.[141]

The improving quality of life for low- and middle-income Americans has not been fueled by new debt, but instead

by a combination of higher incomes and lower prices. According to the Cato Institute's Marian Tupy, for example, the average amount of time that unskilled American workers had to work to earn enough money to buy a long list of everyday items has declined by 72 percent since the late 1970s, when manufacturing jobs were at their zenith.[142] That means that, for the same amount of work that allowed unskilled workers to purchase one item in 1979, they could buy 3.56 items in 2019, on average. Tupy has found similarly impressive gains for food consumption, helping to explain why food insecurity reached an all-time low before the COVID-19 pandemic hit.[143] The United States' poverty rate also hit a record low in 2019, and one recent study found that only 2 percent of Americans were living in poverty (as it was defined in 1963, when it was almost 20 percent).[144]

Of course, some consumption challenges remain, particularly in health care, higher education, and housing. However, each of these sectors is already highly subsidized, protected, and regulated, and new industrial policies targeting them, especially trendy "worker-centric" approaches, could just as easily raise prices and discourage innovation rather than the opposite. Market-oriented improvements to tax, trade, immigration, and regulatory policy are far more likely to improve these sectors—and thus raise American living standards—than any new industrial policies targeting them.

COMMUNITIES

Finally, industrial policy will not solve the problems of struggling communities in the United States. To begin with, most American localities that once centered on low-skill manufacturing have since transitioned to other industries and are doing well today. A 2018 Brookings Institution report, for example, found that 115 of the 185 counties with a disproportionate share of manufacturing jobs in 1970 had successfully transitioned away from manufacturing by 2016.[145] Forty of the remaining 70 older industrial cities, moreover, exhibited strong or emerging (average) economic performance. Overall, only 30 of the original 185 manufacturing communities were still struggling. Anecdotal evidence reiterates these findings: towns such as Greenville-Spartanburg, South Carolina, or Pittsburgh, Pennsylvania, which once depended on low-skill manufacturing, have since adapted and are now home to thriving companies and modern workforces. The contrast between these localities and those still reeling from decades-old economic shocks indicates that the latter's problem is not a lack of federal industrial policy, but instead one of local policies and these specific communities' inability to adjust to global economic forces *and* competition from other states.

> "The improving quality of life for low- and middle-income Americans has not been fueled by new debt, but instead by a combination of higher incomes and lower prices."

Additionally, as the Peterson Institute's Adam Posen recently explained, "there are precious few examples of a government successfully reviving a community suffering from industrial decline."[146] He cites failed U.S. efforts to revive the Massachusetts textile towns of Lawrence and Lowell, and similar futile efforts in the Midwest. Then there are the continued struggles of former steel town Youngstown, Ohio: "A succession of presidents has promised—and failed—to turn around Youngstown, which, despite all the political attention and federal dollars lavished upon it, doesn't have a supermarket in the residential neighborhoods closest to downtown."[147]

Posen details similar failures to revive struggling communities or regions in Germany, Italy, Japan, the United Kingdom, and even China— a nation that has pursued unprecedented levels of industrial subsidization and government intervention and that runs perpetual manufacturing trade surpluses.[148]

Thus, leaving aside whether national economic policy should relieve states and towns of their responsibilities to create viable commercial centers, little evidence indicates that it can.

Do Other Countries' Industrial Policies Demand a U.S. Industrial Policy?

Finally, the industrial policy experiences of other countries, particularly China, cannot justify similar policies in the United States. Significant political and economic differences limit the extent to which these experiences can inform U.S. industrial policy efforts. Regardless, other countries' industrial policy successes have been exaggerated, while numerous failures have been ignored. This includes China, which has commonly been cited to justify new U.S. industrial policy, yet has a spotty industrial policy record and faces numerous economic challenges in the years ahead—some caused by its own industrial policy efforts.

THE PERILS OF CROSS-COUNTRY COMPARISON

In general, real or perceived industrial policy successes in other countries cannot inform whether similar results are possible in the United States or whether the federal government should adopt industrial policy as broadly defined. For example, reviews of the economics literature conclude that the empirical studies of industrial policy are limited and, of the few that have been published, they primarily assess specific cases, industries, and policy episodes. These papers cannot, therefore, predict whether the analyzed cases would translate to the United States. As José Luis Ricón explained, "If there is one conclusion from the recent empirics of [industrial policy] it's that it's pretty much dependent on which industry, which country, in which period of development it is applied."[149]

This challenge is particularly significant for proposed U.S. industrial policies, given our political system and the special obstacles that industrial policies face here. As economist Nathan Lane explained in 2020 after reviewing the academic literature, "Without a doubt, future research must do more to understand the interaction between political economy and industrial policy. Because industrial policy is state policy, its success, scope, and efficacy is sensitive to institutional context."[150] He adds that, thus far, few empirical papers have examined how politics affects industrial policy, leaving it an open question.[151]

The American political system is particularly susceptible to public choice problems due to the short duration of many elected federal positions and our well-developed lobbying and special-interest group system. One would also need to consider the specific laws and regulations, such as Buy American restrictions and NEPA, and the sheer size and diversity of the U.S. economy (as opposed to, say, Israel)—both of which would further diminish assertions that industrial policy can work in the United States simply because specific programs worked in other countries.

"In general, real or perceived industrial policy successes in other countries cannot inform whether similar results are possible in the United States or whether the federal government should adopt industrial policy as broadly defined."

Industrial policy successes abroad are routinely exaggerated. Numerous analyses, for example, have punctured the myth that Japanese industrial policy was primarily responsible for the country's impressive growth and productivity during the 1970s and 1980s.[152] As the *Wall Street Journal* reported in 2002, Japan's Ministry of Finance admitted that the Ministry of International Trade and Industry's interventionist and protectionist policies had "eroded the competitiveness of the industries the government had sought to support."[153] Economist Saul Lach's 2003 assessment of

much-heralded R&D subsidies for Israeli manufacturers found that such funds did benefit small firms, but it had negative effects on large firms, and, because most subsidies went to the large firms, they generated statistically insignificant improvements in company-financed R&D.[154]

In his 2019 book, *Free Trade and Prosperity*, New York University's Arvind Panagariya shows that the supposed industrial policy success stories of South Korea and Taiwan, both of which experienced rapid, manufacturing-led economic growth in the mid to late 20th century, are less accurate than alleged.

"Industrial policy successes abroad, such as in Japan, Korea, and Taiwan, are routinely exaggerated and must be balanced against other countries' numerous failures."

Taiwan's growth should be attributed to a general shift in trade policy away from import substitution toward trade and investment liberalization, particularly for industrial inputs, and to various domestic policies and outcomes, such as political stability, labor market flexibility, macroeconomic stability, infrastructure expansion, and secondary education.[155] Government intervention, moreover, did not cause economic outcomes to differ from that of a neutral policy regime. Instead, sectors that had the best export performance were labor intensive ones not subject to government targeting via industrial policy, and the public sector's share of manufacturing output declined significantly over the growth period examined.[156]

The South Korean government intervened heavily in its economy, promoted exports, and maintained import restrictions from the 1950s through the 1970s. However, when considering the economy as a whole, South Korea's policy regime was only slightly biased toward exports when compared to a hypothetical free trade alternative.[157] In other words, the overall industrial policy effects were modest. Moreover, the exported goods that grew rapidly during the 1960s—plywood, woven cotton fabrics, clothing, footwear, and wigs—were labor intensive and not subject to state targeting.[158] The South Korean government also implemented domestic policies similar to those in Taiwan, and pushed industrial targeting in a limited number of sectors. The government pursued greater targeting of the heavy and chemical industries between 1974 and 1982, but the supported industries performed poorly during this period, with relatively low total factor productivity as compared to unsupported industries. The nation's overall GDP growth rate was significantly below that achieved during the previous, less-interventionist period. Economic growth returned to this level and heavy and chemical industries' performance improved only after the government ended specific support for those industries in 1983 through 1995, ceased promoting strategic industries more broadly, and liberalized both import restrictions and the country's financial sector.[159]

In both cases, Panagariya's evidence leaves those crediting industrial policy with Taiwan and South Korea's growth to argue not that government interventions boosted growth above that which a more liberalized regime would have produced, but instead that such benefits cannot be dismissed as implausible.[160] Such a standard is hardly a ringing endorsement of industrial policy, but even it is too kind, given that—as Panagariya also shows—the less-interventionist Singapore, Hong Kong, and Taiwan grew faster than the more interventionist South Korea.[161] Indeed, a 1991 analysis from economists Jaime de Melo and David Roland-Holst finds that South Korea's industrial policies in the 1970s erected barriers to entry and allowed incumbent firms to exploit their policy-induced market power, and that additional liberalization would have increased national welfare by as much as 10 percent of GDP.[162]

Finally, industrial policy successes must be balanced against the numerous failures of such policies in countries around the world. This includes not only the U.S. policies noted in this paper, but also well-known debacles abroad, such as British automotive, aviation, and computer efforts in the 1960s and 1970s; French "national champions" in computers and machine tools during the same period; numerous European technology projects in the 1990s and 2000s; Argentina's national smartphone initiative (and several other consumer electronics failures); Tunisia's "Ben Ali"

firms (named after the country's leader, who owned most of the favored firms); India's Planning Commission and License Raj between the 1950s and early 1990s; and numerous iterations of Brazilian automotive policy.[163] Other, lesser-known industrial policy failures are also plentiful.[164]

THE CHINA THREAT

American industrial policy advocates, including high-level officials in the Biden administration, routinely cite China's growing economic and geopolitical power—both supposedly fueled by Chinese government industrial policy—as necessitating urgent federal government action.[165] China's recent and troubling embrace of illiberalism and expansionism, as well as the COVID-19 challenges to U.S. and global supply chains, have amplified these views and lead to a bipartisan push for American industrial policy in order to counter the China threat.

> "While China's deepening authoritarianism surely warrants criticism and attention, the view that Chinese industrial policy is an urgent threat to the United States—one justifying a broad rejection of free markets and strong embrace of American industrial policy—is misguided."

However, while China's deepening authoritarianism surely warrants criticism and attention, the view that Chinese industrial policy is an urgent threat to the United States—one justifying a broad rejection of free markets and strong embrace of American industrial policy—is misguided. Similar to that of its Asian neighbors, China's rapid growth since the 1980s can be largely attributed to market-based domestic reforms following decades of self-imposed poverty, and its general liberalization of trade and investment policy, including its accession to the WTO—*not* industrial policy. Despite this "catch-up growth," moreover, China still lags behind the United States in both GDP per capita and in many important industries. Chinese industrial policy may have helped some other industries, perhaps even overtaking Western competitors in the process, but the cost of doing so was enormous, and those policies have introduced systemic challenges that could hamper future growth. China also faces several other headwinds, financially and demographically, that could derail its ascension to the top of the global economic order.

Combined, these facts rebut the all-too-common perception in the United States of China as an unstoppable economic juggernaut that—fueled by industrial policy—will inevitably overtake the United States unless we adopt similar policies here. American industrial policy should be considered on its own merits, not on the basis of an overwrought fear of the China threat.

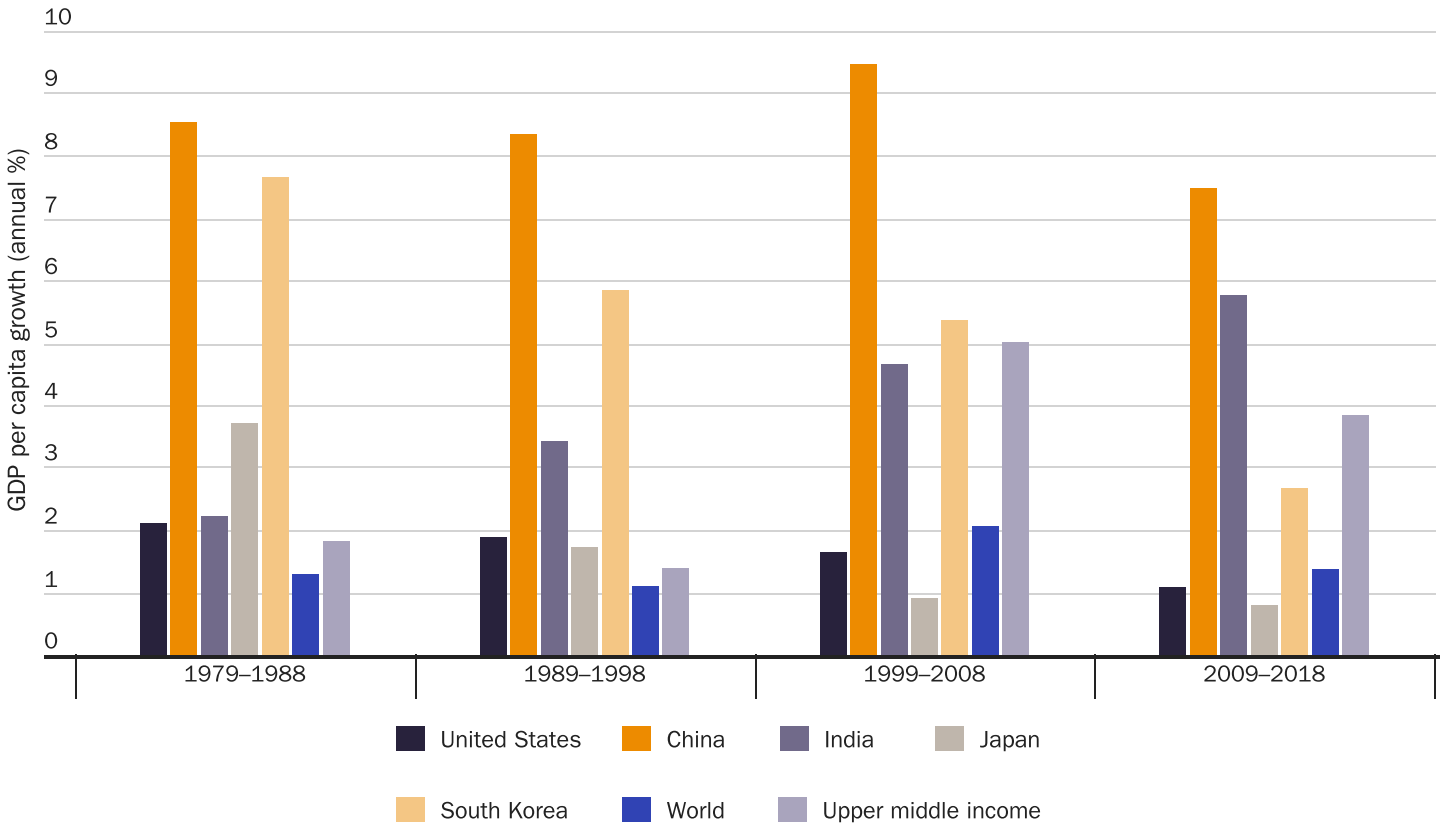
China's Rise and Subsequent Embrace of Industrial Policy

China's economic rise is undeniable. Growth in GDP per capita over the past four decades has been relatively steady, with a slight decline over the past decade (see Figure 16), at rates easily surpassing the United States and other countries. Furthermore, China's share of global trade grew from 3 percent in 1995 to 12 percent in 2018, and China is now the world's largest manufacturing nation, with growing high-tech and internet industries. Over the same period, China became the world's second largest economy and the largest trading partner of many economies, including the European Union.[166]

Little of China's impressive historic growth, however, can be attributed the nation's industrial policies. Instead, China's economic outperformance began during its period of reform and opening up in 1978 (starting from a very low, communism-induced baseline), followed by its integration into the multilateral trading system—that is, the World Trade Organization—in 2001 and the requisite structural and economic changes that accession required. For example, a 2012 study by the University of Toronto's Xiaodong Zhu concluded that China's growth was driven not by capital investment but by productivity growth, which can

Figure 16

Growth in gross domestic product per capita, select countries and periods



Source: The World Bank, https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG.

be attributed to "gradual and persistent institutional change and policy reforms that have reduced distortions and improved economic incentives."[167] Numerous other economists have found that most of China's export competitiveness stems from internal, market-based reforms—on property rights, privatization, price controls, trading rights, and import liberalization, for example—that are often initiated in response to new WTO commitments.[168]

Along the same lines, Barry Naughton, an economist specializing in China, and author of *The Rise of China's Industrial Policy*, explains that China's impressive pre-2010 economic growth did not result from the type of top-down industrial planning and state intervention that has become prevalent in China today. He notes that

> there is a huge disconnect between the success that we attribute to the Chinese economy today and the orientation of Chinese policy today. China's emergence as an economic and technological super-power is due primarily to the policy package that it followed from 1978 through the first decade of the 21st century, that is, until about 2006–7. China's policy package today—that is, the policies that started tentatively after 2005 but were fully in place by 2008–2010—are radically different. Because of this, it is a mistake to attribute China's success to the policies China is currently following.[169]

By contrast, Naughton agrees with many other economists that the driving force of Chinese industrial development was market-oriented reforms, with the government primarily relying on market forces and minimizing direct interventions; economic success was particularly tied to China's WTO entry.[170] "How much of that success could be attributed to industrial policy and planning?" Naughton asks. "The answer is simple: none."[171]

As Naughton notes, the Chinese industrial policies that American critics are targeting today only began in 2006,

when Beijing adopted plans focusing on innovation and seeking to match the industrial capabilities of advanced economies. The 2008 global financial crisis amplified these efforts, and by 2010 China established innovation priorities for strategic emerging industries programs with its desire to surpass, not merely match, other nations.[172] Five years later, China adopted a new wave of industrial policies that were focused on emerging and general-purpose technologies and supported by new public-private industrial guidance funds, which allowed it to become a technological frontrunner.

Today, Chinese industrial policy covers a wide range of government actions, including direct investments, budgetary support, cheap loans, tax breaks, and regulatory preferences, and it is therefore difficult to estimate these initiatives' total price tag.[173] However, the industrial guidance funds offer some insights into the magnitude of China's industrial policy: by June 2020, these funds had raised approximately 40 percent ($672 billion) of a targeted $1.55 trillion goal, the majority of which (61 percent or possibly higher) is dedicated to high technology and advanced manufacturing, with infrastructure, agriculture, and other services also prioritized.[174]

Chinese Industrial Policy's Mixed Record

While American politicians and pundits often portray Chinese industrial policies as uniformly successful, the reality is much more complicated. Surely, not all Chinese industrial policies have been costly failures. The China State Grid Corporation, for example, developed ultra-high-voltage transmission projects and is now a world leader in the field.[175] Similarly, industrial planning and subsidies have helped cultivate China's renewable energy sector, which now leads the renewable energy output worldwide.[176] China's industrial policies in steelmaking, high-speed rail, and machinery have also helped the nation become a global economic power in those industries.[177]

However, Chinese industrial policy successes are matched by failures. Perhaps the most notable example is China's unsuccessful decades-long quest to be a global leader in semiconductors, an industry considered by U.S. industrial policy advocates as "too critical to fail."[178] Despite receiving billions of dollars in government funding and being prioritized in government policy documents, such as the Guidelines to Promote a National Integrated Circuit Industry, Made in China 2025, and the Technical Area Roadmap, China's domestic players are still, by most expert accounts, decades behind the world's best producers.[179] Its share of the global installed semiconductor capacity jumped from 1 percent in 2000 to 15 percent by 2020, but three-fourths of that capacity is owned by foreign multinationals.[180]

"Chinese industrial policy successes are matched by failures. Perhaps the most notable example is China's unsuccessful decades-long quest to be a global leader in semiconductors."

Government support also has not stopped six multibillion-dollar Chinese chip projects from failing over the past two years, and high-profile manufacturers, including Wuhan Hongxin, Tacoma, and Dehuai, have dissolved or declared bankruptcy.[181] The manufacturers that have survived are still two to three generations behind the United States, not to mention the current industry leader, Taiwan Semiconductor Manufacturing (TSMC), and China's national champion, Semiconductor Manufacturing International Corporation (SMIC), are developing facilities to produce chips that are much smaller and less technologically developed than the world's leading firms.[182] By contrast, China's major advances have come in the form of less technically challenging and more labor-intensive back-end manufacturing and "fabless" design companies that have low barriers to entry because of widely available design tools.[183]

China's Semiconductor Manufacturing International Corporation and other producers also remain heavily reliant on the United States and other countries for semiconductor manufacturing equipment, which is why current Chinese industrial policy is focused on simply surviving U.S. sanctions, rather than leading the world.[184] According to a 2021 report in Japanese newspaper *Nikkei*:

U.S. research firm IC Insights in January predicted that China's self-sufficiency ratio for semiconductors would be only 19.4% in 2025. This was a slight downward correction after the firm in 2020 predicted the ratio would rise to 20.7% by 2024. It also noted that over half of the ratio was accounted for by mainland China units of overseas manufacturers, such as Taiwan Semiconductor Manufacturing (TSMC), and South Korea's SK Hynix and Samsung Electronics, with the self-sufficiency ratio that involves only Chinese manufacturers estimated at around 10%.

China's government under Xi had put large amounts of subsidies into semiconductor projects across the country until 2020, but the results of the funding were limited, with many projects failing. The government now seldom mentions the 70% self-sufficiency target laid out in its Made in China 2025 industrial policy.[185]

Indeed, industrial policy shoulders much of the blame for the current state of the Chinese semiconductor industry, which features rampant misallocation of resources, ineffective implementation, corruption, and a significant shortage of human capital, as well as heavy reliance on well-funded but uncompetitive state-owned enterprises (SOEs).[186] Future success is also far from guaranteed. According to Christopher Thomas from the Brookings Institution, most segments of China's semiconductor industry trail its foreign competitors and face numerous economic obstacles to catching up.[187]

Industrial guidance funds were intended to combine government direction with private capital and market forces, and have also proven to be unsuccessful. In particular, they have not met their objective of attracting private investors and instead rely on state-owned entities for funding.[188] Because of poor management and risk assessment, moreover, many funds are underinvested, redundant, or wasted on illicit activities.[189] It is also unlikely that these investments, if they materialize, will be profitable, because the government is targeting only a 5 percent rate of return in order to focus on social objectives like acquiring intellectual property and expanding domestic output rather than profits.[190] Even these alternative goals, however, could prove to be wishful thinking, because history has repeatedly shown that new general-purpose technologies spread slowly through an economy and have effects that were often difficult to foresee.[191]

Even where Chinese industrial policy has developed a competitive industry, its efforts in electric vehicles show that the costs can be astronomical, successes modest, and future, market-based growth uncertain. The Chinese government started providing subsidies to the EV industry in 2009, aiming to develop quality domestic manufacturers and a domestic supply chain ecosystem.[192] These subsidies helped Chinese firms to go from 10 percent of global market share in 2011 to 53 percent in 2019, with 1.5 million electric vehicles sold in China in 2018 alone.[193]

"Even where Chinese industrial policy has developed a competitive industry, its efforts in electric vehicles show that the costs can be astronomical, successes modest, and future, market-based growth uncertain."

It is estimated, however, that the Chinese government spent nearly *$60 billion* cultivating its EV industry between 2009 and 2017, through a mixture of R&D grants, consumer subsidies, public procurement, and local protectionism. These subsidies may have created an EV market from scratch, but they also produced numerous problems that made the Chinese government fear that it was repeating the same mistakes it made when trying to boost its traditional auto industry. In particular:

Instances of fraud and collusion were made public by a 2016 government investigation. In several instances, manufacturers received subsidies for vehicles that existed only on paper or that were equipped with batteries that didn't meet subsidy eligibility requirements. In some cases, vehicles were sold to companies related

to the manufacturer so they could pocket the subsidies.

The cost of subsidies may have been worthwhile if the irrational exuberance that accompanied this "let 100 EV firms bloom" period also led the way in technological superiority. Yet even as registered EV firms mushroomed to more than 400 by 2018, according to some estimates, only about 15% of them are actually manufacturing cars. The vast majority of these firms appears to have either not reached the production stage or have products of questionable quality.[194]

The Chinese government quickly curtailed EV subsidies and shifted to a market-based program emphasizing quality, fuel efficiency, and competition.[195] (It is far from certain that the U.S. political system could so quickly permit the same.) The EV sector, however, may not be sustainable in the absence of state interventions, as consumer subsidies alone accounted for one-quarter of total EV sales. Indeed, sales in China declined by 20 percent in 2019 compared to 2018, shortly after subsidies to private passenger EVs were terminated in June 2019.[196] Chinese EV companies still lag behind the world's leaders, and the United States' Tesla is venerated there.[197]

"Not only do projects' direct costs often outweigh their benefits (if there are any), but the broader costs imposed by China's industrial policies may actually hinder rather than accelerate China's economic development."

China's shipbuilding sector offers another example of industrial policy subsidies not commensurate with returns. According to a 2019 study from Panle Jia Barwick and colleagues, Chinese industrial policy generated more production and investment in the domestic shipbuilding industry, but not only did it come at a very high cost; it also generated "sizable distortions," industry fragmentation, and increased idleness. The authors estimate that, between 2006 and 2013, the Chinese government directed policy support totaling 550 billion renminbi (RMB) (approximately $80 billion at the time) to the shipbuilding industry, but these subsidies generated only 145 billion RMB ($21 billion) of net profit for domestic producers. Furthermore, a large share of the subsidies (230 billion RMB/$33 billion) went to global ship owners—of which Chinese shipping companies are a small share—via lower ship prices.[198]

Similar evidence of Chinese industrial policy problems can be found in its domestic aircraft and automotive manufacturing industries, as well as 3G mobile technologies.[199] These and other examples call into question the overall economic benefits of China's recent embrace of industrial policy. Not only do projects' direct costs often outweigh their benefits (if there are any), but the broader costs imposed by China's industrial policies may actually hinder rather than accelerate China's economic development. In particular, China's industrial policies have been shown to create the following problems that hinder stable, long-term economic growth.

Resource misallocation

According to a 2013 government audit, for example, the new energy sector generated 1.6 billion RMB (approximately $258 million) of misallocated funds between 2011 and 2012.[200] A 2021 paper from Chong-En Bai and colleagues finds significant talent misallocation in China, with potential entrepreneurs instead being attracted to the large state sector.[201] Given the extent of Chinese industrial policy activities since 2010, not to mention the Chinese government's penchant for downplaying economic problems in official statistics, the total amount of resource misallocation—capital, labor, materials, equipment, and time—caused by such policies is likely substantial.

Corruption

Corrupt behavior stems from the state's control over resources and financing, and is evident in Chinese sectors such as tobacco, banking, and infrastructure, in which state monopolies dominate.[202] In general, corruption is more

prominent in countries with active industrial policies, and this is appears to be the case in China, too: according to Transparency International's Corruption Perceptions Index, China ranks 87th out of 180 countries, indicating a fairly high level of corruption.[203] Such corruption slows economic growth and development by thwarting competition, deterring investment, exacerbating market distortions, and reducing tax revenue.[204]

Investment bubbles

Chinese industrial policies also have created investment bubbles and overcapacity in many targeted industries—bubbles that Beijing is now trying to deflate. For example, both China's semiconductor and EV industries show signs of irrational exuberance and financially stressed "paper companies" that will never be productive. The large-scale bankruptcies and business failures associated with Chinese industrial policies contribute to broader financial challenges in China, such as its growing debt load and share of nonperforming commercial loans.

Overcapacity

Meanwhile, the subsidized companies that survive may engage in duplicative projects or produce *too many* goods, resulting in overcapacity (where supply exceeds demand). We can find evidence of subsidy-induced overproduction in China's steel, cement, chemical fiber, aluminum, solar panel, and other industries.[205] This not only threatens China's economy, but also fuels tensions among China's trading partners and generates global economic distortions. Chinese government efforts to rein in overcapacity have thus far had limited success.

Finally, one must consider whether the United States *could* emulate Chinese industrial policy, even if doing so were desirable. China's industrial policy model is unique: the Chinese government controls a large share of the economy and therefore has an enormous amount of money at its disposal. As Naughton explains, this "puts limits on the degree to which industrial policies can impose costly distortions on the economy."[206] The U.S. system—thankfully—lacks such characteristics and would therefore suffer far more damage from "China-style" industrial policy interventions. As noted above, moreover, the United States also differs from China in that our political system is less tolerant of costly public failures, particularly in the commercial (as opposed to, say, national defense) arena. Popular backlash, which the U.S. system fortunately permits (again, unlike China), would be all but guaranteed.

China's Systemic Challenges

China also faces broader systemic challenges that call its future global economic dominance into question. First, China is experiencing significant demographic headwinds that will only accelerate in the coming years. Despite relaxing its decades-long family planning policy, China continues to have a falling birth rate. Last year, its population rose to only 1.41 billion from 1.40 billion in 2019, with individuals over 60 now accounting for almost one-fifth of the population.[207] An aging China creates pressures on its health care system and the overall economy.[208]

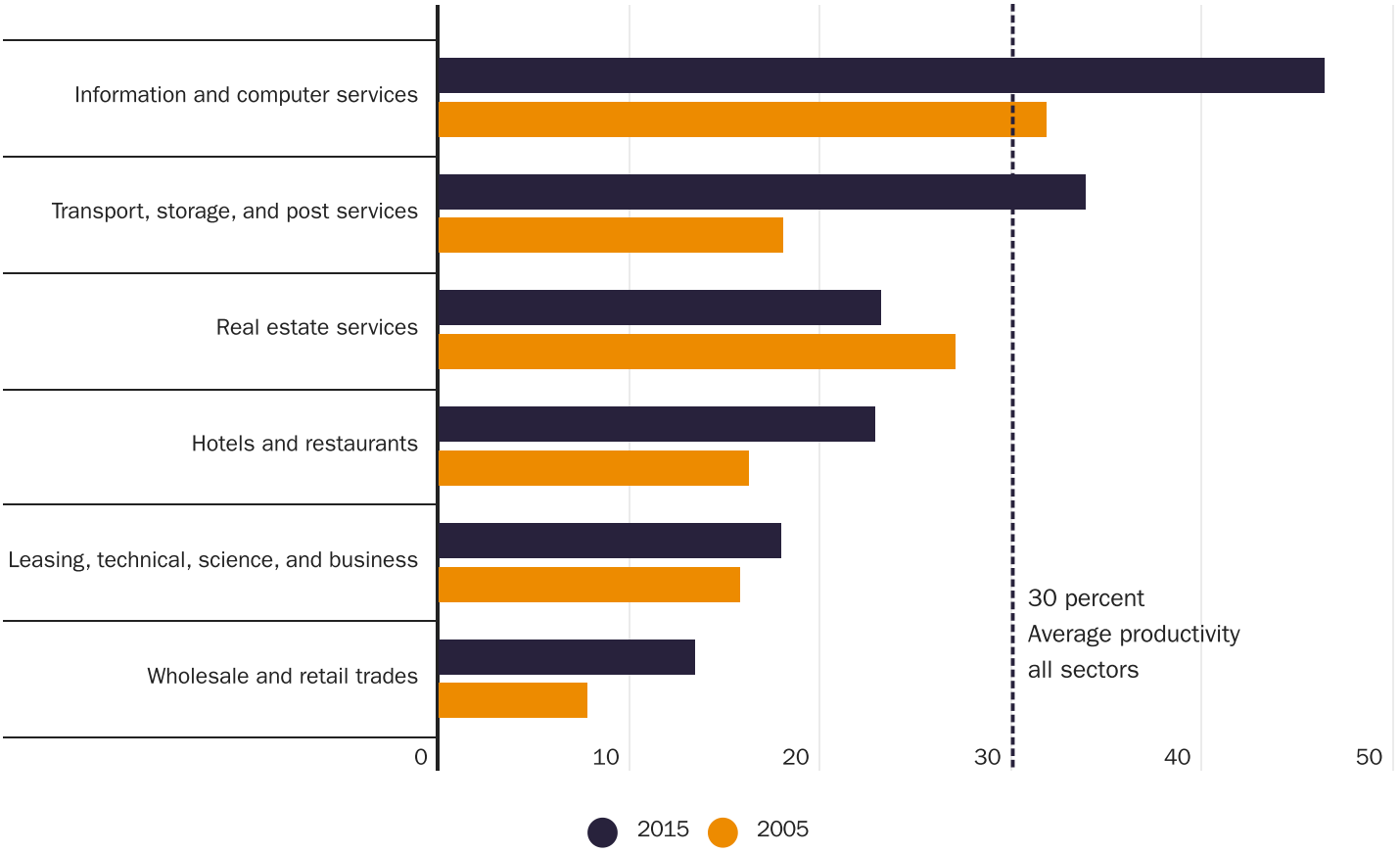
"China also faces broader systemic challenges that call its future global economic dominance into question."

China could offset demographic concerns with rising productivity (it appears uninterested in immigration), but this factor is also lagging—likely due in part to Chinese industrial policy. According to a 2020 International Monetary Fund Report, China's average productivity rate, as shown in Figure 17, is only a third of that in other developed economies—including Japan, Germany, and the United States.[209]

A 2014 study published by Europe China Research and Advice Network corroborates the International Monetary Fund's findings: although Chinese Global 500 firms grew from 3 in 1995 to 89 in 2013, these firms compared unfavorably to their Western counterparts, with larger payrolls, less capital intensity (assets/employees), lower profitability, and fewer innovation capacities.[210]

Figure 17

China productivity, percent of the global frontier level



Source: "People's Republic of China: Staff Report for the 2020 Article IV Consultation," International Monetary Fund.

It is an open question as to whether China will catch up to more productive developed economies. China's productivity growth has stagnated in recent years, with average annual growth dropping from 3.5 percent between 2007 and 2012 to only 0.6 percent from 2012 to 2017.[211] Growth in total factor productivity is now only a third of what it was before the Great Recession, a much sharper decline than other countries have experienced.[212] As noted by the *Wall Street Journal*, much of China's productivity slowdown is attributable to the government's "massive stimulus program to prop up economic growth" instituted after the financial crisis, and productivity has further deteriorated under President Xi Jinping.[213] Other contributors to China's slowdown include recent government efforts to control private businesses, especially technology firms, and growing bureaucratization, which has confounded central government efforts to implement economic and social reforms that might boost national productivity.[214]

Inefficient SOEs are also a significant cause of China's productivity issues. Despite constituting a smaller share of China's economy today as compared with decades ago, "SOEs are dominant in key industries, including energy, aviation, finance, telecoms and transportation."[215] A 2021 Bruegel study similarly finds that "China's competitive environment is generally poor," with Chinese SOEs generally in an "advantageous position" across most economic sectors.[216] However, even though SOEs benefit from privileged access to credit and other resources, they lag in productivity behind privately-owned counterparts by 20 percent.[217] As noted by Cato adjunct scholar Terence Kealey, "as judged by the numbers of patents granted for every unit of investment in R&D, private companies in China are three times more efficient than are state-owned enterprises."[218]

Unfortunately, Chinese SOEs' economic prominence appears to be growing, with the government increasingly favoring these entities, while cracking down on private firms

and entrepreneurs and limiting foreign investment. As explained by China expert Nicholas Borst, much of SOEs' rise is attributable to Chinese industrial policy: "State-owned firms have been at the forefront of the Chinese government's drive to develop domestic sources of key technologies, such as semiconductors."[219]

Finally (and in part due to the aforementioned issues), China faces a growing debt burden that will, unless tamed, weigh on future growth. China's debt-to-GDP ratio reached approximately 280 percent in 2020 (295 percent if foreign debt is included), the majority of which is in the form of corporate bank loans. However, China's banks—long considered tools of Chinese industrial policy (via, for example, low-interest loans to preferred industries)—are showing signs of strain. In 2020, Chinese banks had a record high of $466.9 billion in nonperforming assets—a number that is expected to continue rising.[220] According to the Bank of Finland, moreover, "China was already engaged in efforts to bail out small and medium-sized banks before covid-19 struck," and stress tests released by the People's Bank of China in November 2020 showed that 10 of 30 banks—including all of China's systemically critical banks—would fail under even mild stress scenarios.[221]

Chinese government debt may be more manageable (constituting approximately 70 percent of GDP), but it is expected to expand significantly in the coming years as the government funds a social safety net for its aging population.[222] Certain Chinese industrial policy projects, such as high-speed rail, also contribute to China's growing public debt burden.[223] As the same Bank of Finland analysis explains, China's substantial increase in debt has long concerned observers of the Chinese economy, because similar trends in other countries' indebtedness have typically led to economic collapse or banking crises. While a crisis seems unlikely in the near term, such concerns are almost certain to weigh on future growth and other government initiatives.

"China's economic challenges, caused in no small part by its relatively recent embrace of industrial policy, argue strongly against the implementation of a U.S. industrial policy as a last-ditch effort to counter an unstoppable global hegemon."

It is possible that China can overcome these economic headwinds and others, including environmental degradation, overseas project failures, restive populations, alienation of foreign firms, and increasing illiberalism.[224] It is undeniably a large economy with an increasingly educated population. But China's economic challenges, caused in no small part by its relatively recent embrace of industrial policy, argue strongly against the implementation of a U.S. industrial policy as a last-ditch effort to counter an unstoppable global hegemon.

Conclusion

Resurgent calls for American industrial policy suffer from several flaws. They depend on a malleable definition that prevents legitimate analysis, omits past industrial policy failures, and takes credit—often absurdly—for innovations only tangentially related, at best, to government action. They ignore the many economic, political, and practical obstacles that have historically prevented U.S. industrial policies from producing market-beating outcomes. They claim, often without support, to solve problems—deindustrialization and declining American innovation, the disappearance of good jobs, the erosion of middle-class living standards, and the destruction of American communities—that are often exaggerated or most likely cannot be solved via industrial planning. And they erroneously use the experiences of other countries, particularly China, to justify new American industrial policy.

In reality, industrial policy, as properly defined, has an extensive and underwhelming history in the United States, featuring both seen and unseen high costs, failed objectives, and political manipulation. Surely, not every U.S. industrial policy effort has ended in disaster, but facts both here and abroad argue strongly against new government efforts to boost critical industries and workers and thereby fix alleged market failures. Such efforts warrant intense skepticism—skepticism that today is unfortunately in short supply.

"Surely, not every U.S. industrial policy effort has ended in disaster, but facts both here and abroad argue strongly against new government efforts to boost critical industries and workers and thereby fix alleged market failures."

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