
PROJECT ON SCIENCE, INDUSTRY, AND THE STATE

# Does the CHIPS and Science Act Argue for Industrial Policy?

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# Executive Summary

In the past decade, two compelling changes have occurred that call for revisiting the old debate of open markets versus industrial policy: China's increasing economic role and political aggressiveness and the growing complexity, and hence vulnerability, of global supply chains. These changes do not negate the weakness of industrial policy, but they raise the value of reducing risks.

China has shown a rising capacity and a repeated willingness to disrupt global supply chains for political purposes. American vulnerability to these disruptions has become considerable and, without corrective action, will continue to increase. At a cost, industrial policy can limit American vulnerabilities, lowering the chances of crippling economic, social, and political harm.

The CHIPS and Science Act (CHIPS) illustrates industrial policy benefits. It has triggered large-scale private investment that has moved the US from completely lacking the ability to manufacture high-end semiconductors to potentially being the global leader. CHIPS also suffers from some standard industrial policy flaws and has its own particular drawbacks. The important question is whether, and to what extent, it's replicable in other industries, such as pharmaceuticals.

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The market-versus-state debate has often been useless. The same points are sent back and forth, and few meaningful shifts are made in American policy. Unstable American decision-making may still block changes in the market-state balance, but there are new points to make. China's behavior, especially since 2012, has provided stronger incentives for federal action, and new evidence indicates there are net benefits from possible responses to this behavior.

Examining partial results to date, the most important among these responses by far has been the CHIPS and Science Act (CHIPS), the biggest US experiment with industrial policy in decades.[1] CHIPS is not a definitive success, but it has been successful to this point in stimulating private investment in technology. Other sectors, such as pharmaceuticals, should be evaluated to see if similar conditions are present.

While China's behavior is an incentive to move forward with industrial policy, it's also a complicating factor. It calls for supporting a full US supply chain and substantial but targeted trade barriers against Chinese goods. Absent that, industrial policy is less likely to be worthwhile.

## Industrial Policy Justifications

Justifications for industrial policy often start with trade-balance protectionism, in which large aggregate and bilateral trade deficits are deemed damaging. Despite its current popularity, trade-balance protectionism is not sensible, especially for the US. As a technical matter, we should use a more sophisticated method of calculating trade balances to account for value added at stages of production located in different countries.[2] Doing so would reveal the true imbalances. The central claim that all imbalances are harmful is still not entirely sensible, but at least an accurate picture of where components of goods are being made would prevent the singling out of trade partners that are actually contributing to American value add. Further, as long as the dollar is the currency most accepted by others—the "reserve currency"[3]—the US has no need to fear trade payment outflows.

Most fundamentally, trade balances cannot simply escape savings balances. If the US for years or decades consumes more than the rest of the world, it will run trade deficits, regardless of the domestic or global policy mix. An obvious solution is to directly address

the savings gap, for instance by reducing net US government borrowing.[4] Some trade deficit critics are instead expanding government borrowing. Coercing other countries (for example, by using tariffs) would be appropriate only if American savings are adequate and the problem is that the rest of the world or larger economies are saving excessively.

There are much more compelling reasons for industrial policy interventions, arising from national security considerations. Because external developments threaten national security, many of these better reasons involve trade (though not simple trade balances). For example, the US must be able to supply a wartime economy and military with the key products of that time, not relying on any insecure foreign output. This need is more pressing when re-creating the required output is more difficult, as is the case with the more complex goods seen in technology sectors. The ensuing policies can be termed "strategic" protectionism.

Strategic protectionism has become painfully more salient since the People's Republic of China (PRC) replaced the US as the world's leading producer of many goods. From antimony and autos to turbines and yttrium, the cost and speed advantages of Chinese supply have led to the dependence of not only ordinary consumers and firms but even to some extent the American defense sector.[5] While there are understandable disagreements over the probability of a prolonged crisis or war, the likelihood has indisputably risen since Xi Jinping became secretary general of the Communist Party, a position he apparently intends to hold until death.[6] The spring 2025 fuss over magnet trade is a comparatively minor illustration of what could occur.[7]

National security may, of course, be an overused justification for protectionism or industrial policy more broadly. Being able to create new capacity quickly is normally boasted of. Yet when government support is on the table, intense support suddenly becomes indispensable for companies that claim to be otherwise helpless to respond to a crisis. There's also the question of scope—advocates overstate the importance of their respective industries.

Even so, some stand out. For instance, semiconductors are among the strongest national security cases for a state intervening in a market. They are in everything, from weapons systems to consumer goods necessary to keep the economy and society moving.

CHIPS is thus a good test case for industrial policy. The act does not embody misguided trade-balance protectionism or, at least to this point, feature tariffs. Instead, it has a clear element of strategic protectionism in its push to replace imports of advanced semiconductors, as the US is currently dependent on a vulnerable supplier in Taiwan.[8] An informative wrinkle is that less-advanced chips are the most-used, even in the defense sector.[9] These are naturally easier to make, meaning pre-crisis intervention is less compelling for such goods. Hence, most American policy efforts have aimed at easing the more difficult, time-consuming task of creating advanced manufacturing capacity here at a large scale.[10]

CHIPS was primarily justified by national security concerns, but there is a secondary, purely economic component.[11] The PRC looms in both arenas—its missiles and revisionist political aims loom over Taiwan and, therefore, the US indirectly. And China's record of climbing the technology ladder through illicit means, then overproducing to winnow foreign competitors, looms over the viability of the global chip industry, among others.[12] If the government cannot effectively intervene in today's semiconductor industry, industrial policy advocates may have little room to maneuver.

## The Inevitable Flaws

Only the market's most myopic proponents deny there's any possible value to industry policy. Are there no sectors at all in which national security or fundamental economic and social well-being seem to call for state action? It's implementation that is the heavier burden. (See Table 1.) Just because state action is a good idea on paper does not mean it will ultimately bring net benefits. Perhaps laudable goals may be unlikely to be fully attained or cannot be attained at anything like a reasonable cost. The first obstacle is that available information about the relevant market may be adequate to identify a problem but inadequate to design a sound state-led solution.

**Table 1. Industrial Policy Knots**

| | |
|---|---|
| **Information** | Is there enough information to design solutions? |
| **Waste** | Inadequate information means resources will be wasted. |
| **Micro-Corruption** | Resources will be diverted to unproductive use. |
| **Systemic Corruption** | Broad industrial policy can skew the national interest. |
| **Overextension** | If all goes well, the incentive is to go further. |
| **Timeliness** | Even if done right, can it be done quickly enough? |

Source: Author.

Information imperfections, among other issues, mean industrial policy will not be nearly as efficient as a properly functioning market. This cannot be the standard. Intervention should occur when a market is not functioning or, as with advanced semiconductors, is plainly fragile. While inevitable and acceptable in principle, waste is more harmful when a government is borrowing heavily. Either the already painful burden of financing the government expands for domestic capital or, as in the American case, higher financial dependence on foreigners partly offsets the reduced dependence that accompanies industrial policy.

Related to waste is corruption, on a micro and macro level. Micro-level corruption is infamous—government employees and program beneficiaries exchanging favors at an individual or company level. This is a risk with most government activity, and high-cost industrial policies should include serious criminal penalties for abuse. Macro-level corruption is systemic—the government's and corporate sector's incentives shift over time in favor of continuing or expanding state assistance, even if it has proved ineffective or eventually has become ineffective or outright unnecessary. A key element of industrial policy must be to specify, at the outset, whether programs will achieve stated objectives and then sunset or continue indefinitely. This will frame the true costs, helping determine if benefits are indeed worthwhile.

Related to systemic corruption, in turn, is industrial policy's most threatening weakness: It requires the state to determine what is and is not worthy of support—"picking winners and losers." This would be difficult even if done contemporaneously. Given the slow pace of government programs, industrial policy requires an extended forecast of priorities, one that naturally gets cloudier over time. Correctly identified priorities at the time of program conception will eventually become incorrect; it's just a question of when. At some point, state intervention in the market will likely become harmful on a net basis.

The final risk is overextension, across and within sectors. Overextension across sectors is obvious: Companies will ask, "If they're worthy of government support, why not us?" If semiconductors, why not steel? Or solar power? Or shipbuilding?[13] Large-scale government support for four industries can certainly be reasonable; support for 40 undermines a market economy, making innovation and productivity increases more costly.

Nor does it follow that support for a sector must always be intense. The single most likely outcome is that intervention in an important industry has high fixed costs and high initial returns, then declining returns as the state tries to shape the market too precisely (for example, hiking the share of domestic firms from crisis requirements toward market dominance). This is plainly related to systemic corruption: National interest calls for a certain level of intervention, but narrow interests win actions beyond the correct industrial policy initiative.

CHIPS illustrates some of these challenges. The size of the semiconductors being targeted for new production will no longer represent advanced chips in a decade. If the program continues, will it adjust, or will original recipients remain winners at others firms' expense? More subtly, the Biden administration gave additional opportunities to certain groups of workers.[14] This may serve a useful social function.

However, not only does it have no security rationale; it may be detrimental to security by discriminating against potentially better workers. Industrial policy is a tempting site at which to graft on purely political goals.

With CHIPS, the US is wisely not trying to pursue full self-sufficiency, even in the advanced semiconductors being targeted. In light of Chinese ambitions in semiconductors,[15] curbing some foreign competition is necessary to achieve CHIPS goals. Self-sufficiency would call for more money and mandates blocking foreign competition. That should not be the first step, when information is scarcer.

Even if the original act is deemed successful, it does not follow that it should be expanded or extended. This applies broadly: All newly constructed capacity should be evaluated against the up-to-date set of risks, or initial industrial policy success will lead to costly failure.

## The China Effect

The full gamut of industrial policy options would fill multiple books. The principal force behind new arguments for industrial policy is China's rise. One set of policy options involves the US emulating the PRC. This is an immediately bad approach. The US is a rich democracy; China is a middle-income dictatorship. As presumptive ruler for life, Xi can easily sacrifice prosperity[16] for what he perceives as political or strategic gain. America's position at or near the top of the technological ladder rules out obtaining much industrial policy benefit through theft, and profit seeking rules out achieving leadership by sacrificing earnings for market share, as many Chinese firms do.

Another angle is the US responding to China's industrial policy impacts through trade. (Two-way investment has not been important in this sense in the past few years.)[17] The standard challenge to the simple free trade view is that national income maximization at a single point in time is not the state's only responsibility. While accurate, this challenge usually leads to near-philosophical debates over the state's proper role. More tractably, trade could be unreliable for some reason, threatening long-term national income maximization. The idea that "free trade is always better" then becomes "free trade with reliable partners is always better."

The difficulty is that partner reliability is a variable. In the well-established vital category of goods needed for war, what changes principally is the likelihood of war with major trade partners. But technological progress, especially in goods and transportation, introduces another dimension of partner reliability. Complex, multi-segment supply chains offer actors the opportunity to disrupt trade that, by value, they may seem barely involved in. This phenomenon understandably does not appear in simple free trade models and further incentivizes self-reliance.

The PRC stands out on the war and supply-chain fronts. (See Table 2.) It arguably constitutes the only large-scale military threat to the US. It's the top global exporter while barring competition with large state-owned enterprises at home,[18] and not coincidentally, it has long been the biggest global subsidizer and thief of intellectual property.[19] The simple model says ignore partner behavior; free trade is the best unilateral strategy. The PRC has the goals and size to push that claim beyond its limits. An explicit Chinese objective since 2018 has been to reduce its reliance on the world while making the world more reliant on it.[20] What does a nation do if its trading partner can undermine its very ability to trade?

Continued US vulnerability, in this sense or in a future crisis, could prompt China to place durable bans on exports that are key inputs to American production and exports, causing societal dislocation. The headline example from mid-2025 is magnets, which control electrical components and include rare earth elements (REEs). The immediate risk was said to be auto production,[21] though that's certainly not the only risk. Perhaps the single most disturbing illustration is US dependence on the PRC in pharmaceuticals, a long-standing direct problem in antibiotics and elsewhere.[22] Supply chains have made this worse.

In 2024, Ireland accounted for more than one-third of American pharmaceutical imports,[23] and it needs Chinese chemical inputs. Ireland's other major pharmaceutical supplier—and a sizable finished-drug supplier to the US—is India, which also gets its chemicals

**Table 2. US Goods and Services Deficit with China (Billions of Dollars) and US Navy Size vs. China (Number of Vessels)**

| Year | Goods and Services Deficit | Number of US Naval Vessels Compared with China's |
|---|---|---|
| 2004 | −$161 | +76 |
| 2005 | −$201 | +60 |
| 2006 | −$233 | +59 |
| 2007 | −$257 | +46 |
| 2008 | −$264 | +20 |
| 2009 | −$221 | +9 |
| 2010 | −$264 | +12 |
| 2011 | −$283 | +13 |
| 2012 | −$299 | +14 |
| 2013 | −$298 | +2 |
| 2014 | −$318 | −5 |
| 2015 | −$336 | −32 |
| 2016 | −$310 | −42 |
| 2017 | −$337 | −27 |
| 2018 | −$377 | −49 |
| 2019 | −$302 | −43 |
| 2020 | −$283 | −52 |
| 2021 | −$333 | −57 |

Source: US Department of Commerce, Bureau of Economic Analysis, "International Trade in Goods and Services," August 5, 2025, https://www.bea.gov/data/intl-trade-investment/international-trade-goods-and-services; and Ronald O'Rourke, *China Naval Modernization: Implications for U.S. Navy Capabilities—Background and Issues for Congress*, Congressional Research Service, August 16, 2024, https://sgp.fas.org/crs/row/RL33153.pdf.

from the PRC.[24] New, advanced drugs require complex development and are more dependent on China, with US venture capital in on the act.[25] (This supplements other companies' desire to benefit from Chinese subsidies in computational technologies,[26] yielding a pro-PRC financial lobby.) Beyond agriculture, it's not clear what comparative advantage Chinese state action will permit India, Ireland, or the US to keep. It is clear Beijing would like the capacity to disrupt foreign production and export of cars, pharmaceuticals, chips, and so on.

Some industrial policy critics minimize the PRC's behavior, though this is becoming more awkward. Others argue Chinese market distortions undermine the free trade model but are still best handled by the private sector. Yet supply-chain vulnerabilities stem largely from years of private-sector shortsightedness.[27] For those who don't believe private enterprise can make long-term mistakes, consider US-based auto companies. Magnets are a minute fraction of vehicle cost.[28] Yet not only did automakers open themselves to coercion; they failed so completely that their initial response to being cut off by China was to ponder moving production there, increasing dependence. This is less "free trade" and more "abusive relationship."

The last, most absurd argument is the US should avoid industrial policy to set a good example for China. Someday, Beijing will see the light and become a good partner. From the start of his time as general secretary, Xi made clear his aversion to *his own* private sector.[29] The PRC remains convinced of the state's superiority over the market and will inflict this view on others, with the weight of the world's second-largest economy behind it.

## What to Do, Broadly

The casual response to American dependence on Chinese goods is "make it here!" This may succeed only through an expensive expansion of American production that still needs Chinese cooperation. Subsidizing alternative energy is out of fashion for now, but when it was in vogue, it suffered from obvious vulnerability to Chinese predation, given the PRC's demonstrated competitive advantages and desire to dominate such industries.[30] A far better case is the US military decreasing its dependence on China. This becomes industrial policy when, as is unavoidable in modern economies, defense-driven intervention for complex components and the like must encompass the civilian sector for demand to be sufficient.

Industrial policy to reduce American dependence on China must first designate strategic sectors, as defined in the Defense Production Act (DPA). Then the following steps should be taken in these sectors:

- Guarantee durable (not market-clearing) government demand for goods.
- Waive the National Environmental Policy Act.
- Offer tax or zoning incentives for domestic production.
- Penalize the direct use of Chinese supply via domestic taxes.
- Apply high tariffs when China otherwise participates in foreign production.
- Apply zero tariffs for partners that replace Chinese supply.
- If still needed, subsidize output across the full supply chain.

For sustained benefits, industrial policy must mandate and encourage certain full supply chains, either in the US or with reliable nations that commit to keeping China out. The US should employ policies to phase China entirely out of vital chains—such as defense goods, including magnets; other high-value goods purchased by the US government; and commercial products like semiconductors that are universally seen as crucial. Ex-Chinese supply will then have to soar to meet demand, creating undistorted competitive markets with reliable supply. The first tool to employ is the DPA, applied to whole supply chains. Progress would be much faster[31] and cheaper if DPA designations were partly or wholly exempted from the National Environmental Policy Act's purview, particularly to make it harder to file blocking lawsuits.

If Congress cannot act so cleanly, there are more complicated steps to unwind PRC influence over important markets.[32] Countries' and companies' records show many gestures toward less China dependence followed by inaction or reversion in the face of Beijing's sticks and carrots.[33] For companies, sustained tax penalties are necessary to put national interest over the cost savings brought by tapping Chinese output. In the selected industries, firms should face tax penalties that rise over time, put in law by Congress, until partnering with China in those industries becomes prohibitive. One advantage of domestic taxation over tariffs is the comparative political ease in removing penalties when compliance is achieved.

American trade partners do not have to choose one country over the other. But access to the US market for the designated goods should depend on blocking PRC participation in their production. It's a far more strategic application of tariffs than that of the Trump administration in spring and summer 2025. When applied to many countries, tariffs aimed at bilateral trade deficits essentially make the PRC more competitive in the American market. Tariffs should return to pre-Trump levels for partners willing and able to substitute for Chinese goods.

Compared with 2025 tariff "sticks," this last is a carrot for partners. President Donald Trump's initial skepticism toward CHIPS shows disregard of carrots, possibly arising from a long-standing belief that new US manufacturing can appear in months.[34] In fact, foreign production is likely to be first replaced by other foreign production. Whenever possible, allies are far better choices to trade with than the PRC. Protecting their access to the US market, combined with displacing China's share, would incentivize allies to fill supply gaps. For American firms, implementing tax penalties first will stop firms from insisting that the process will take a decade,[35] then creating tax breaks will speed the creation of China-free supply chains. Federal action allowing quicker local commercial permitting and zoning may also help.

The REE supply chain is the premier current illustration of dependence on China and a potential site of industrial policy action. The issue is not a lack of REEs. At present, firms do not search thoroughly for REEs in the US, much less mine, refine, and make magnets, battery components, or other derivative products. One reason is environmental restrictions reducing or killing the profitability of mining and refining. Removing at least some of these restrictions

**Table 3. Select CHIPS Grants (March 2025)**

| Use | Company | Grant Size (Millions of US Dollars) | Project Size (Millions of US Dollars) |
|---|---|---|---|
| **Research** | Arizona State University | $100 | $100 |
| **Materials** | Global Wafers | $380 | $4,000 |
| **Equipment** | Entegris | $77 | $722 |
| **Modernization** | Micron | $275 | $2,000 |
| **New Output** | Texas Instruments | $700 | $11,000 |
| **Packaging** | SK Hynix | $458 | $3,870 |

Source: Semiconductor Industry Association, "America's Chip Resurgence: Over $540 Billion in Semiconductor Supply Chain Investments," March 7, 2025, https://www.semiconductors.org/chip-supply-chain-investments; and Semiconductor Industry Association, "Tracking the Progress of the CHIPS R&D Initiatives," March 12, 2025, https://www.semiconductors.org/chips-rd-programs/.

is an industrial policy step, inasmuch as the goods ultimately produced are strategic—worthy of government intervention despite costs.

The other inhibitor of REE-related supply is deliberate PRC distortions. China's acceptance of ecological harms as part of its comparative advantage is compatible with markets, but output subsidies and ensuing price predation are not. Such subsidies are ubiquitous in Chinese mining and refining,[36] an attempt to cap considerable dependence on foreign iron ore, bauxite, and so on. The PRC's predatory behavior jumped into prominence recently but has a history dating back to a foreign policy incident with Japan in 2010.[37] Critics of industrial policy must accept that an authentic, global REE market will not exist for the indefinite future.

Protecting against Chinese manipulation requires a China-free supply chain, from raw material to the final product—in this case, from mining to goods with embedded REEs. In an economy driven by profit-seeking firms (unlike the PRC's state-driven economy), the starting point is a sustained and identified demand signal. Specialization in advanced production makes generating the demand more difficult—it may be low for some intermediate goods, weakening the signal throughout the supply chain. The PRC's sweeping overcapacity stems from disregarding demand;[38] in the US, the government can maintain or bolster demand within the supply chain if demand for final products warrants intervention. Then the DPA or a set of lesser authorities can address supply.

## CHIPS in Particular

Compared with broad government intervention into or control of markets, industrial policy is intended to be limited to crucial activities. These can range beyond advanced technology, from narrow industries such as ship propulsion to broad fields such as biotechnology. Semiconductors are the poster child for a crucial technology product. Now described as "the new oil," semiconductors may be closer to "the new steel"—filling the industrial policy role that steel occupied in many minds in the 20th century. (See Table 3.)

Centrality is insufficient to merit industrial policy, of course; the market must also at least appear to be failing in some respect. In the US semiconductor market, we can point to a simple trade component—American semiconductor imports rose 85 percent from 2019 to 2024.[39] By itself, that's also unconvincing, but there's also a strategic aspect. In 2022, the US designed the most advanced semiconductors available, but it could not make the equipment needed to fabricate them, nor did it have any domestic manufacturing facility even using imported equipment. The equipment alone was close to a single point of failure,

with the Dutch company ASML being the only provider of the most advanced machines.[40]

Advanced production was worse in a crucial respect. While other foreign firms could produce the most advanced chips in 2022, the Taiwan Semiconductor Manufacturing Company (TSMC) had dominated the global market for some time. Its plants were not safely in the Netherlands but across the Taiwan Strait from the People's Liberation Army and its rocket force,[41] charged with preventing Taiwanese independence under any circumstances. If TSMC were lost, phone capabilities would regress and AI development would be delayed, among other things. The US did not have a single high-end production facility in 2022; if TSMC had been unavailable, the US would have been left hoping Samsung and others would move quickly and make American demand a high priority.

In addition to a Chinese military threat in semiconductors, there is a looming Chinese commercial challenge. As with many other industries, the PRC has prioritized climbing the semiconductor value chain, starting in earnest in 2014 with its first dedicated state investment fund. Especially under Xi,[42] the elevation of some industries in policy priorities is a standard signal that legal and not-so-legal technology acquisition is also a priority. As with many other industries, the result has been technological progress; in a decade, the PRC cut its deficit versus global leaders to about five years.[43]

While often characterized as seeking global co-leadership or even dominance, Beijing's primary goal for most of its strategic goods is to secure as much self-sufficiency as possible (see, for example, the long-standing commitment with regard to grain).[44] This is the case in semiconductors.[45] The PRC's printed circuits imports fell by more than half from 2017 to 2024.[46] Its imports from the US in particular peaked in 2021 and were 25 percent below that by 2024.[47] They will fall further. The PRC's export performance when it comes to chips is less impressive, but only for the moment.

China's mixed economy essentially guarantees priority industries will see large-scale overcapacity. In the simplest terms, market discipline becomes overmatched by state incentives, with state-supported private firms absorbing losses rather than curbing output and state-controlled firms being entirely protected from bankruptcy. This can be shown mathematically and empirically, with steel being perhaps the longest-running example.[48] When possible, excess output is sent overseas, as with solar panels.[49] Given the spread of semiconductor use by country and product, large exports of PRC chips are inevitable. China is already exporting substantial amounts of low-end semiconductors[50] and will soon increase intermediate technology chip exports, as discrete goods or in embedded products.

The road being traveled is familiar: The PRC is making costly and imperfect state interventions into the market, boosting its technological level and production capacity in semiconductors at a scale consistent with its size, to the point where production in the US and many other economies is crowded out. One added risk is that the PRC's military could destroy factories in Taiwan that it cannot compete with.

But the main argument for American industrial policy is the ubiquitous nature of chips. From autos to wind turbines, the proliferation of "smart" devices means picking semiconductors eligible for government aid is less picking a single winner than it is avoiding many losers. In late July 2022, Congress started to address the various, sometimes intense economic risks the PRC presents through semiconductors when it (easily) passed CHIPS.[51] It's not a comprehensive solution; industrial policy aimed at comprehensive solutions will likely fail and be extremely costly. But CHIPS does touch on and can be assessed in light of the macroeconomic fundamentals of capital, labor, land, and innovation, followed by ensuing external competitiveness.

## Capital

Like much industrial policy, public action to trigger much larger amounts of private action is at the core of CHIPS.[52] And CHIPS has done this. The value of private computer and electronics construction increased by a factor of 10 to $127 billion from 2021 to 2024.[53] The trough was as recent as 2016, at $2 billion; the last pre-COVID figure was barely over $8 billion. (See Table 4.) In 2024, computer and electronics

**Table 4. Value of Private Construction (Billions of US Dollars)**

| Year | Electronics | The Rest of Manufacturing |
|---|---|---|
| 2014 | $5.1 | $55.0 |
| 2015 | $3.5 | $78.9 |
| 2016 | $2.0 | $78.7 |
| 2017 | $2.1 | $67.8 |
| 2018 | $5.5 | $66.5 |
| 2019 | $8.3 | $72.2 |
| 2020 | $9.2 | $65.9 |
| 2021 | $12.1 | $69.5 |
| 2022 | $42.7 | $81.8 |
| 2023 | $101.6 | $91.5 |
| 2024 | $127.4 | $104.7 |

Source: US Census Bureau, "Construction Spending: Historical Value Put in Place," https://www.census.gov/construction/c30/historical_data.html.

construction was more than half of all manufacturing construction (a double-edged sword, to be sure).

To date, this has been the best possible industrial policy—the state is not displacing but genuinely spurring the market. Of course, the pace must be maintained. A construction spending decline in early 2025 is not extensive enough to be a concern yet.

### Labor

One threat to sustained spending and construction is the Trump administration reversing CHIPS. Another is a lack of skilled labor. Here, the Biden administration's implementation of CHIPS created a problem not present in its legislation: adding social policy via provisions that encourage workforce diversity.[54]

Adding social goals to economic and strategic goals increases the odds of failure and undermines claims that state intervention is driven by national security. These social policies have had only a minor impact on CHIPS, but if industrial policy extends beyond semiconductors—say to pharmaceuticals, materials, or shipbuilding—the US will need large quantities of skilled labor. Training the workforce will be difficult, and social mandates would push industrial policy gains below their potential while driving up costs.

### Land

America is rich in land, yet using it can take an absurdly long time.[55] The main reason is ecological concerns. If industrial policies are deemed important enough for costly state intervention into markets, they should face looser-than-normal environmental restrictions and proceed more quickly, without nuisance lawsuits. If all environmental exemptions are unjustified, industrial policy is likely unjustified.

Unfortunately, CHIPS has faced something of a yellow light in terms of land use. Certain facilities have been exempted from federal review under the National Environmental Policy Act, on a bipartisan basis, but not all.[56] The private-sector response to industrial policy will, of course, fall short if such support is uneven or uncertain.

### Innovation

In general, a government role in research distorts markets less than in output, and might not even qualify as industrial policy. For CHIPS, the research role is fairly limited because US deficiency and vulnerability are heavily concentrated in actual production. Nonetheless, $11 billion was appropriated for research and development broadly construed (for example, research into materials and substrates).[57] In industries in which American companies are less proficient—raw material refining and shipbuilding come to mind—research and development programs must be a more important component of industrial policy or failure is more likely. Such work may be cheaper and more politically palatable than manufacturing subsidies.

### Competitiveness

Capital, labor, land, and innovation ultimately determine competitiveness, but specific aspects of CHIPS and broad trade policy are salient. Trade tools complement domestic actions in industrial policy and can potentially complement CHIPS. Despite President Trump's belief, tariffs cannot immediately create manufacturing capacity, especially for advanced

products like high-end semiconductors. Firms exporting to the US may respond to semiconductor tariffs by producing semiconductors here, but not on our desired schedule or with our desired range of chips. Moreover, tariffs (or quotas) cannot be raised too high, too quickly or they will inhibit domestic chip consumption and attempts at production, which may initially use foreign inputs.

As is almost always true, strategic choices will prove superior to trade-balance protectionism. For high-end semiconductors, the US does not need to be—and should not attempt to be—100 percent self-sufficient. Only a few countries should play a role in our chip production, and they should see unimpeded access to the American market if they're law-abiding, particularly regarding price predation and other foreign actions that can undermine industrial policy goals.

Regarding low-end chips, American companies will need help against Chinese exports. Texas Instruments and GlobalFoundries, for instance, are using CHIPS's support to expand low-end chip production in multiple states.[58] Tariffs or quotas should be introduced for made-in-China semiconductors to ensure that American industry does not become dependent on low-end Chinese chips. Trade restrictions aimed at better partners, based on a Section 232 inquiry or otherwise,[59] are misguided unless they are aimed at PRC transshipments.

US automakers' vulnerability to PRC magnet quotas[60] reinforces that industrial policy, certainly including trade components, must consider supply chains, or any new American output could face foreign coercion. In addition, without a domestic supply chain, much of the value of new production could be captured overseas.

Congress did not consider this when it passed CHIPS, but the Department of Commerce has taken multiple steps to address this. For one, the semiconductor supply chain starts with silicon, a material China dominates in the global market.[61] Under CHIPS, polysilicon will be produced in Michigan and silicon wafers in Texas.[62] The supply chain ends with packaging. Amkor is building a packaging facility in Arizona to avoid sending finished chips overseas and is developing a more advanced semiconductor packaging facility in the state.[63] Industrial policy must embrace the full supply chain, and CHIPS is making the attempt.

## Conclusion: Some Encouragement

It's too early to call CHIPS a smashing success, especially if it's suspended or altered. But what has happened constitutes proof of concept: CHIPS has started to revitalize the US semiconductor industry and protect Americans from crisis shortages. American leadership in high-end semiconductors, not just their design, is conceivable now when it was not in 2021. As clear evidence, TSMC's Arizona plant now has a comparable production yield to its Taiwan facilities.[64] At the low end and in the supply chain, there's a long road yet to travel; nonetheless, CHIPS has improved a poor US position. Americans have wanted to reverse outsourcing for decades; a partial reversal is happening in semiconductors.

CHIPS's results justify expanding the program. This could look like more environmental waivers, money to secure the supply chain or low-end chips, or trade barriers, all with the intent of triggering private-sector spending. These amounts should be smaller than the original disbursement. Another adjustment should be on the labor side, where more training funds should be made available, if the Biden administration's social engineering is set aside.

A CHIPS expansion may be seen as endorsing state intervention, but an industrial policy expansion to pharmaceuticals (with its own high- and low-end products) or other industries is inherently a different exercise. It does not follow that the same conditions exist, without which industrial policy could be the expensive failure its critics fear. CHIPS shows that industrial policy achievements, such as protecting the economy from malign foreign actors, can justify costs. What's required is substantial and long-term domestic demand, experienced firms with deployable capital, an adequately sized and trained labor force, less prohibitive land restrictions, and existing US technological capacity. As examples, materials may be

challenged by land restrictions, and shipbuilding by labor shortages. When conditions are met, the US can relatively quickly create or re-create even complex production.

Industrial policy would be less popular if international economics was benign. It has not been so since China joined the World Trade Organization and began combining coercive intellectual property behavior with massive state-enabled increases in output.[65] Not only does predation of American firms and workers weigh in favor of considering industrial policy, but that policy may be effective only with international trade and investment provisions. These can feature tariffs, though trade-balance protectionism does not complement industrial policy and could undermine it, if all partners are treated as equally risky.

For decades, the PRC has inhibited US-based production through nonmarket means. It is now explicitly seeking to make the US and other countries dependent. To avoid this, US policy must limit revenue and supply-chain vulnerability to China, going beyond CHIPS.[66]

## About the Author

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