

Design Principles for American Industrial Policy

Economic efficiency is not enough. To succeed, industrial policies must create broad constituencies of beneficiaries.

Industrial policy is back on the agenda in Washington. Joe Biden promised to “mobilize American manufacturing” during last year’s presidential campaign. He’ll find at least some support for his efforts across the political spectrum, including from “China hawks,” who view manufacturing as a national and economic security issue, and “Green New Dealers,” who worry about sustainability and climate change. Others will add their voices in light of the “supply chain turmoil” induced by the COVID-19 pandemic.

This political awakening is long overdue. The United States has been shedding factory jobs for most of the past half century. Manufacturing employment is down to about 10% of the labor force, and manufacturing itself now provides a mere 11% of economic output. Compare those numbers with Japan and especially Germany, where factories employ almost 20% of the workforce, pay better than their US counterparts, and produce almost a quarter of gross domestic product. And since manufacturing provides not only good-paying jobs and essential goods (e.g., personal protective equipment and medical technologies) but also spillovers to the service economy, the shortfalls are especially worrisome.

Manufacturing provides a much higher employment multiplier than other major sectors—it’s responsible for about 30 million “indirect” jobs as well as 20 million direct ones. Many of the indirect jobs are in high-paying producer services (e.g., engineering, consulting, programming). And many of the direct ones are performed by less-educated workers for better wages and benefits than they’d find elsewhere.

So calls for the revitalization of manufacturing aren’t surprising, in light of China’s economic rise, climate change, COVID, and inequality. But if policies designed to defend and develop industry were easy to implement, they’d be in place already. The principal challenge to their implementation lies in a mismatch between industrial policy’s *political* and *economic* requisites. The most politically practicable industrial

policies aren’t necessarily the most efficient. And the more efficient alternatives are often difficult to adopt or maintain. Policymakers are left to choose between politically viable initiatives that are economically risky and economically viable initiatives that are politically risky. They must find a compromise path between these two unpalatable options.

Two ways to fail

Consider import tariffs, which are among the best known and most powerful weapons in the industrial policymaker’s arsenal. Whether they’re used to protect infant industries or prop up mature ones, tariffs tend to create constituencies in their own defense, and thus lock in political support. This is precisely what the political scientist E. E. Schattschneider meant when he declared that “new policies create a new politics” in his classic study of the Smoot-Hawley tariffs in the 1930s. But tariffs also tend to provoke retaliation, elevate producer and consumer costs, and coddle inefficient industries, and in so doing they pose a threat—rather than a spur—to competitiveness. The Smoot-Hawley provisions, which dramatically raised tariffs on hundreds of imported goods, provide one illustration. Another is President Trump’s recent tariffs, which focus on intermediate goods such as plastics and semiconductors, as well as on capital goods such as industrial machinery. Like their Depression-era predecessors, Trump’s tariffs have not, on balance, benefited industry, consumers, or voters. Nonetheless, they have proven easier to adopt and implement than to abandon for a reason foreseen by Schattschneider: tariffs empower as well as enrich a small group of “winners,” and thereby reward and reinforce their will and capacity to mobilize in their own defense, and encumber a much larger and—for the most part—less prosperous group of “losers,” who lack the cohesion and capacity to resist. If the winners can play to patriotism and xenophobia, moreover, and portray themselves as champions

of the national interest, so much the worse for the losers.

Other industrial policies confront the opposite dilemma: they're economically viable but politically vulnerable. So, for example, open-economy industrial policies are designed to avoid the perils of protectionism by offering small firms, start-ups, and entrepreneurs, on a provisional or time-limited basis, the support they need to compete. Insofar as their beneficiaries tend to lack political clout and experience, however, open-economy industrial policies are vulnerable to attack and elimination by their enemies before they can lobby effectively for continued support.

Consider, for example, the Research Applied to National Needs (RANN) program at the National Science Foundation. Created by the first Nixon administration over the objections of establishment scientists, it made a costly and concerted effort to bridge the gap between so-called basic and applied research by allocating resources not only to NSF's core constituency of university laboratories but also to private enterprises that had traditionally been kept at arm's length by the foundation. Universities such as Carnegie-Mellon and the

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Massachusetts Institute of Technology established innovation centers that parlayed \$3 million of RANN funding into dozens of start-ups, in the short run, and helped turn engineers such as Romesh Wadhvani and Richard Eckhardt into successful entrepreneurs over time. Boeing partnered with the University of Washington to improve public transit and municipal service delivery in Tacoma. And Argonne National Laboratories received support for a battery-storage program that's still paying dividends today—and did so during a critical period when, if not for RANN's resources, “the effort might have ceased and the experienced manpower and laboratory facilities redirected to other research fields,” according to a 1975 assessment. Amid growing concerns about the trade deficit, moreover, RANN focused on manufacturing productivity, drawing on German and Japanese lessons in the process, and built extension services designed to boost demand for its discoveries among end-users.

The RANN program was in many ways ahead of its time, and thus illustrates the dilemma of open-economy industrial policies in miniature: it received positive independent evaluations when it was operating, and is well regarded in retrospect; but it provoked opposition from legislators, scientists, and rival NSF program administrators, who worried

that it would divert resources from their traditional efforts, at the outset—when its most immediate beneficiaries were both few in number and small in size. As a result, the program never developed a broad political constituency and was eliminated at the dawn of the Carter administration.

As German and Japanese manufacturers continued to consolidate their hold over the US market for cars, consumer electronics, and capital goods, however, the political classes began to take notice, and by the late 1980s Congress responded with the Omnibus Trade and Competitiveness Act of 1988. While President Reagan originally vetoed the bill, deriding it as a move toward “discredited industrial policy,” he would eventually sign a compromise version and in so doing earn the opprobrium of his conservative allies. Among their most serious concerns was the legislation's ambition to help firms develop advanced technologies.

The Advanced Technology Program (ATP) was housed at the National Institute of Standards and Technology (NIST). Intended to bridge what would eventually come to be known as the valley of death between scientific discovery and new product development, the program allowed corporations and consortia to compete for the funding they would need to develop precommercial technologies with broad-based applications subject to a cost-sharing requirement: large firms were required to cover 60% of total project costs, and small firms had to cover only their indirect costs. In an effort to avoid capture by private interests, moreover, the ATP was subject to rigorous performance reviews by public as well as private experts, and was widely regarded as effective. In fact, one study found that the program not only jumpstarted projects that would otherwise have gone unfunded, but generated a “halo effect” such that award winners attracted private funding as well.

But the program was nonetheless derided as corporate welfare by conservatives, who were especially incensed by NIST's willingness to support large firms, and after years of attacks by congressional Republicans it was eliminated during the George W. Bush administration.

Some observers have traced the ATP's demise to its visibility. Unlike more sustainable outposts of US industrial policy, argues the policy analyst Marian Negoita, the ATP was exposed to public scrutiny, and thus fell victim to political attacks on corporate welfare that would eventually prove fatal. If only the program had been hidden from public view, he implies, it could have survived indefinitely—and industrial policymakers should therefore take heed by keeping a low profile today.

Dare to be popular

But the more sustainable outposts of US industrial policy aren't necessarily low profile. On the contrary, several have gone out of their way to capture the public imagination. Consider the Manufacturing Extension Partnerships (MEPs)

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that help disseminate new techniques and technologies to small and midsize manufacturers in all 50 states and Puerto Rico. They were also mandated by the Omnibus Trade and Competitiveness Act, were also administered and funded by NIST subject to a cost-sharing requirement, and were also derided as corporate welfare by conservative critics. MEP officials nonetheless came to believe that the program was threatened more by too little than too much exposure. “We’re always being told that we’re the best kept secret in California, and that annoys the hell out of me,” explained the head of the California MEP in the mid-1990s. He and his counterparts therefore joined forces to get the word out in the decades to follow. They issued advertisements and press releases to draw attention to their accomplishments and participated in Manufacturing Day events the first Friday of every October and Hill Day every spring.

Why is the MEP still delivering low-cost consulting services to small and midsize manufacturers, when the ATP is a distant memory? And what are the implications for industrial policy more generally? First, unlike the ATP, the MEP mandates the presence of a partnership in every state and can thus build support among beneficiaries in every congressional district. When the program’s champions want to bring pressure to bear on tightfisted or conservative legislators, they’re better able to do so. Second, the MEP’s services are available exclusively to small and midsize manufacturers. Small firms are not only more numerous than large-scale corporations such as IBM, General Electric, and Xerox, but also less vulnerable to vilification. And, finally, the MEP is effective. The program is not only subject to regular performance reviews, but distributes the bulk of its funding to manufacturing-heavy regions, where it buttresses existing supply chains, while sending a disproportionate share of its funding to less industrialized states, where it builds additional support among more vulnerable, less mature firms.

To see how and why this matters one needs to consider the differences between universal and targeted programs, and their respective costs and benefits, a distinction originally made evident in the realm of social policy. Universal programs, such as the United Kingdom’s National Health Insurance system or Canada’s single payer system, are made available to individuals on the basis of their nationality or citizenship, and therefore have broad bases of support made up of their millions of beneficiaries. But insofar as they offer

services to middle- and upper-class consumers, who don’t really need public provision, and allegedly create perverse incentives (e.g., for doctors to order too much diagnostic testing) along the way, they’re also inefficient, at least from an economic standpoint. By way of contrast, targeted programs such as Medicaid or food stamps in the United States tend to prioritize efficiency by limiting eligibility to the most needy—which makes them unpopular with the middle and upper classes and underfunded by Congress. “Programs for the poor are poor programs,” as policy analysts say.

Fortunately, the history of social policy offers an alternative both to wasteful, universal programs and to unpopular, targeted ones, and in so doing goes a long way toward reconciling the goals of efficiency and viability: programs that are broadly available, in theory, and targeted, in practice. The best-known example, in the US context, is Social Security, which is available to middle- and upper-class Americans, and thus earns their support, but offers lower-income pensioners higher benefits relative to past wages, and thus combats poverty as well. The political scientist Theda Skocpol has referred to this combination as “targeting within universalism,” and argued that it accounts for much of Social Security’s success.

The MEP is in many ways similar. It makes federally funded services available to small and midsize manufacturers throughout the country, and thereby builds broad support. But its funding formula (which involves federal, state, and private cost-sharing) ensures that an outsized share of its resources flow toward more vulnerable manufacturers in less industrialized states. In 2020, for example, NIST allocated \$500,000 to the MEP in Alaska, where there are a mere 503 small and midsize manufacturers, and a bit more than \$15 million to the MEP in California, where there are more than 38,000. Californians might therefore bemoan the “misallocation” implied by NIST’s funding formula. Why does the agency spend twice as much per small and midsize manufacturer in Alaska, they might ask, as in the Golden State, which has a larger manufacturing economy than all but five sovereign nations? Alaskans might respond by asking why NIST spends anything at all in California, given their own outsized need for support. And NIST might respond by noting that \$15 million goes further in California, where small and midsize firms are involved in automobile, aerospace, and additive manufacturing, among other things, and that half a million dollars a year is a small price to pay for the support of Alaska’s legislators, and in that sense a political win.

Good enough for government work

In short, the MEP isn’t trying to optimize. Some people might say it’s satisficing—or giving new meaning to the old expression “good enough for government work.” Others might question the very meaning of “optimum” in this context, noting that the choice of Alaska or California is as much

a normative question as an empirical one—and a political tension that dates to the nation’s founding. Do we double down on the winner or try to bring up the rear? The answer is yes, we do both. The MEP has survived politically and contributed economically by allocating some of its resources to every state, most of its resources to manufacturing-intensive states, and a lopsided share of its resources to lagging states—in effect, targeting within universalism.

The ATP offers a striking contrast. With a smaller target population, the program had a smaller and narrower political constituency, and it therefore could be eliminated by Congress in 2007, leaving a lesson—if not necessarily a legacy—in its wake: efficient programs aren’t optimal if they’re eliminated by partisan politicians.

The merits of targeting within universalism are nonetheless underscored not only by the negative examples of the ATP and RANN before it, but by the distinct histories of two successful programs that trace their origins to the NSF in the early 1970s: the Established Program to Stimulate Competitive Research (EPSCoR), and the Small Business Innovation Research (SBIR) program.

EPSCoR is explicitly designed to address the “undue concentration” of federal research spending by targeting additional resources at states and territories that receive less than 0.75% of NSF’s overall “research and related activities” funds. It traces its roots to the Experimental Program to Stimulate Competitive Research launched in the early

1970s, when NSF found itself under assault by legislators in both parties—accused of profligacy by fiscal conservatives, depravity by social conservatives, and complicity by critics of the military-industrial complex—in an era of profound political and economic crisis. While NSF personnel portray EPSCoR as an effort to bring underutilized resources to bear in underfunded states, and thereby offer an efficiency rationale for their efforts, a committee empaneled by the National Academy of Sciences in the early 2010s portrayed EPSCoR as a “defensive measure” designed to head off more threatening congressional action.

After all, the 1970s marked a difficult moment for science and technology policy. EPSCoR’s architect, John Talmadge, who had previously worked at RANN, describes his career at NSF as an effort to deal “with programs and issues in which the political aspects outweighed the scientific aspects.” And his solution, in essence, was targeting within universalism. By guaranteeing underserved states a disproportionately large (but still rather modest) share of an already large pie, he and his allies could make sure that the pie stayed large or even grew—which is precisely what happened. Between 1978, when EPSCoR was formally established by NSF director Richard Atkinson (who had earlier presided over RANN’s liquidation), and 2017, when the American Innovation and Competitiveness Act finally declared the experiment a success, and substituted “established” for “experimental” in the program’s name,

the foundation's budget almost tripled in real terms.

The point is not that EPSCoR is uncontroversial. Critics such as Democratic Representative Bill Foster of Illinois say the program is hard to justify “from a scientific point of view,” and ask why researchers in the EPSCoR-eligible Oklahoma panhandle or Rhode Island should receive access to funds that are unavailable to their ineligible counterparts in the Texas panhandle or Massachusetts. Despite his party affiliation, moreover, Foster even uses the language of “takers” and “payers” employed by conservative critics of social spending. Defenders of EPSCoR respond that the program has been imitated at the National Institutes of Health, the National Aeronautics and Space Administration, and three cabinet-level agencies, and that several states have “graduated” from EPSCoR at NSF by growing their own research capacities and thereby exceeding the 0.75% eligibility threshold. If the program is really just an unwarranted handout to undeserving states, they argue, the beneficiaries would become permanent wards of the federal government—not scientific success stories.

Good politics makes good policy

My point is not to take a position in this debate. Like the debate over the MEP, it's as much normative as empirical and the answers are likely to depend on one's goals. Do we reward the winners or try to bring up the rear? But the broader point is that EPSCoR, like the MEP, is able to target resources at lagging states because it's embedded in a universal program

that's available to all states, and vice versa. Just as it's hard to imagine the survival of a targeted program such as EPSCoR that wasn't embedded in NSF, it's hard to imagine the growth—and perhaps survival—of NSF in the absence of EPSCoR. If programs for the poor are poor programs in the realm of social policy, programs for the privileged are poor programs in the realm of industrial policy—and the addition of targeted benefits for less privileged parties will therefore serve their political goals at a minimum.

The Small Business Innovation Research program combines aspects of the MEP and EPSCoR. Like the MEP, it distributes its benefits exclusively to small firms. Like EPSCoR, however, it imposes its mandate on federal agencies, rather than state governments, and traces its roots directly back to RANN.

Under RANN's Small Business Innovation Applied to National Needs program, developed by Roland Tibbetts in 1977, NSF set aside 10% of the RANN budget to make competitive awards to small firms and start-ups in high-risk, high-return activities. The program funded a number of success stories, including the drug-delivery company Bend Research, the aerospace company Scientific Systems, and the computer programming firm that would become Symantec. Recognizing this success, in 1982 Congress mandated that *all* federal agencies with extramural research budgets in excess of \$100 million develop a similar small business set-aside, or SBIR program. When President Reagan declared himself happy to support the small firms “that dot our land” by signing the Small Business

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Innovation Development Act midway through his first term in office, the set-aside was a mere 0.2%; it has since grown to 3.2%, in part due to the ongoing success of the program.

What does that success entail? The sociologists Fred Block and Matthew Keller note that approximately 25% of the recent winners of *R&D Magazine's* prestigious R&D 100 Awards came from SBIR-nurtured firms. And more recent and rigorous evidence suggests that SBIR winners are indeed the most promising applicants, a finding that underscores the value of public funding.

Furthermore, SBIR funding isn't nearly as concentrated as private venture capital, more than 80% of which accrues to a mere five metro areas: Boston, Los Angeles, New York, San Francisco, and San Jose. While the bulk of SBIR funding lands in large, metropolitan areas that are already high-tech hubs, awards have been made in all 50 states, expanding economic opportunity and broadening the program's base of support.

In fact, SBIR's logic—the logic of targeted universalism—is as much political as economic. By targeting a mere 3.2% of agency research budgets at politically popular small firms that are found in every state and most congressional districts, SBIR

builds political support for research and development funding that's available to large firms and universities as well.

Contemporary policymakers would therefore do well to take a lesson from recent history. Industrial policymakers have achieved more success by targeting within universalism than by targeting alone. The histories of the MEP, EPSCoR, and SBIR speak to the wisdom of the former approach; the fates of RANN and the ATP highlight the liabilities of the latter.

A standard critique of targeted programs is that they get politically captured by their beneficiaries. But RANN and the ATP were not captured by their clients; they were attacked by their enemies and abandoned by their advocates long before their—for the most part politically callow—clients had the wherewithal to mount a defense, let alone threaten program capture. And insofar as open-economy industrial policies have survived and flourished, they owe their success to the breadth, rather than the power, of their beneficiaries. After all, the MEP and SBIR are targeted at small firms, start-ups, and scientists, and EPSCoR is targeted at small states, such as Delaware and Wyoming, in part to build legislative support for programs that rebound to the benefit of large states, such as New York and California. Whether their administrators at NIST, NSF, and related agencies have developed new industrial clusters in states such as Kansas and Kentucky is in that sense beside the point—though at times they've done so. A very small share of a very large budget is a small price to pay for political viability and growth.

Designed to last

Where does this leave us? It seems likely that the United States will move toward a more coordinated industrial policy in the years ahead, whether explicitly or not. Senators Marco Rubio (R-FL) and John Warner (D-VA) proposed a White House Office of Critical Technology and Security in early 2019, and their rhetoric has intensified in the era of the pandemic. Senators Chuck Schumer (D-NY) and Todd Young (R-IN) introduced the Endless Frontier Act in 2020, with an eye toward allocating more than \$100 billion to a revamped “National Science and Technology Foundation,” and they too view the pandemic as a spur. And there’s ample reason to expect similar proposals with different sponsors and rationales in the months ahead.

Rob Atkinson of the Information Technology and Innovation Foundation has catalogued current industrial policy proposals and distinguished five different rationales for their adoption: first, the promotion of competitiveness; second, the prevention of climate change; third, the provision of social goods; fourth, the protection of workers; and, fifth, the provision of opportunities for women and people of color. And the risk, Atkinson believes, is that policymakers will squander the opportunity to prioritize the first goal in an ill-considered, if perhaps well-intentioned, effort to pursue the other four.

Industrial policy is not an end in itself, according to Atkinson, but a means to the paramount and indispensable goal of competitiveness. Without an internationally competitive economy, he argues, there’s no hope for sustainability, social protection, or social justice, let alone national security, and goals two through five must therefore take a backseat to goal one. Otherwise, we’ll let disputes over the division of the fruits of industrial policy prevent us from adopting the policy itself.

Insofar as competitiveness is neither a necessary nor a sufficient basis for equity, sustainability, or security, however, Atkinson’s argument cuts both ways. While industrial workers in Slovenia and Spain are less productive than their US counterparts, on average, they also emit less carbon dioxide, lay claim to a much higher share of national income, and have access to universal health insurance. China’s industrial policy has improved neither equity nor sustainability. Russia’s economic collapse has done little to erode its national security. And skeptics might therefore ask not whether to subordinate their own priorities to the pursuit of the “targeted national industrial strategy” favored by Atkinson and his increasingly bipartisan allies, but whether to adopt an industrial policy at all. Why not just get straight to the point of social, environmental, and military protection?

In principle, the United States could let manufacturing decline and adopt compensatory or targeted social, environmental, and security policies to protect the

disadvantaged, the environment, and the borders—just as in principle we could adopt the ideal industrial policy now in an effort to generate the resources needed to promote equity, sustainability, and security later. But we don’t live in principle; we live in practice, and in practice all these policies are harder to adopt and defend than design. Industrial policymakers may therefore decide to exploit the current moment to build a broad coalition of disparate actors marked by diffuse goals—including geopolitical competition, environmental sustainability, economic security, and social justice—in an effort to pursue their shared vision. That’s what effective policymakers do, and efforts to keep industrial policy “pure” or “efficient” in this context may well backfire.

Whatever their motivations, however, industrial policymakers in the new administration and Congress can’t be myopic either. Industrial policies that are designed exclusively for today’s political landscape are unlikely to survive, let alone succeed, in the future. New policies create new politics, and means (e.g., policies) and ends (e.g., social and political goals) will blur together and reconstitute each other over time in a world of feedback effects and unforeseen consequences.

In the real world, therefore, industrial policies may prove popular to a broader (or different) range of constituencies today than tomorrow. They will not only advantage and empower some interests but disadvantage and antagonize others—and that fight will continue long after the policies themselves have been adopted. Some initiatives will survive and grow, like the MEP, EPSCoR, and SBIR, in part because they create their own constituencies. Others will perish, like RANN and the ATP, in part because they provoke their own enemies. And industrial policymakers should therefore do everything in their power to anticipate the winners and losers of their initiatives—big business or small, rural interests or urban, workers, environmentalists, women, men, rich, poor, the military, bureaucrats, and so on and so forth—not only to address genuine concerns about sustainability, social justice, and security, but to design the initiatives to withstand the unpredictable politics that they themselves will create.

In short, I worry that the architects of industrial policy are paying too much attention to the current window of opportunity and too little attention to the aftermath. At the dawn of the Biden administration, politicians are coming together to support industrial policy for a wide variety of reasons. If lawmakers are willing to pursue a broadly targeted approach that trades short-run efficiency for long-run effectiveness, they’ll have a much better chance of achieving a sustainable compromise, one that leads not only to successful legislation, but to achieving the diverse and largely laudable goals that brought them together in the first place.

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