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Endless INDUSTRIAL POLICY

Science and technology policy is the wrong tool for delivering broad-based national prosperity.

Industrial policy refers to deliberate government actions that affect economic activity more narrowly than the usual run of macroeconomic measures—for instance, by guiding and perhaps forcing investment and innovation in particular technologies and industries. After a generation in the political wilderness, the term can again be uttered in polite political company, and not just among Democrats urging green energy and clean manufacturing. The conservative US senator Marco Rubio (R-FL) has begun to argue for an "American Industrial Policy" to combat the rise of China.

The term "industrial policy"—tarred by association with economic planning—had been largely unheard in American political circles since the Cold War ended, with unfettered capitalism seemingly triumphant. But the tools of industrial policy are an inescapable part of every market economy's policy kit. The question is not whether we should do industrial policy, but how to do it, and what ends it should serve. If the threat of China as Number One has been the most conspicuous spur to the rediscovery of industrial policy, another has been the nation's gaping inequalities in income and wealth. Indeed, these inequalities, growing in the United States for decades, and so brutally revealed this year, are traceable in considerable measure to the unacknowledged industrial policies whose ends were concealed by free-market dogma.

The current flurry of interest and attention seems a bit of a replay, with variations, of past debates. Those earlier in the Cold War were over the arms race and space race, putting a spotlight on technology and science. Later the arguments centered around deindustrialization and new competitors that arose in Asia. Now we hear of "advanced computing, 'big data' analytics, artificial intelligence, autonomy, robotics, directed energy, hypersonics, and biotechnology"—this from the Pentagon's most recent statement of *National Defense Strategy*—reminding us also of past episodes of spinoff from military spending, as in semiconductors and computing, jet propulsion, Earth-orbiting satellites, and the internet. All but lost is the fact that US defense and intelligence agencies lavish their billions almost entirely on private industry. Bills such as the Endless Frontier Act (S.3832), introduced in May 2020, would boost government funding for science and technology more generally, especially at universities. Their advocates spotlight the significance of such funding for productivity growth and wealth creation. But increased funding for science and technology by itself is a weak lever in industrial policy, one with limited potential to guide national economic performance.

In the beginning

Even if many political figures continue to say they reject the very idea of industrial policy, in practice it (or something a lot like it) it has long played a part in America's history. After independence, the new nation had weighed the claims of those broadly aligned either with Alexander Hamilton, who wanted industrialization, or Thomas Jefferson, who envisioned a future of agrarian populism and yeoman farmers. Hamilton thought government should build foundations for growth; so did financiers, merchants, and small manufacturers. His 1791 *Report on Manufactures* urged Congress to channel financial subsidies (at the time called bounties) to the new nation's infant manufacturing sector; within a few months lawmakers, though declining the recommendation for subsidies, had adopted most of the report's tariff proposals, with levels of protection calibrated to insulate domestic firms without cutting off imports needed for lack of locally produced substitutes—an early form of industrial policy. Jefferson's followers, in some respects not unlike today's libertarians, believed less government to be better government. So did slaveholding planters falling back on states' rights to safeguard their wealth and privileges.

When the nation was young, public funds paid for exploration and mapping of natural resources that allowed subsequent exploitation by private firms. Government-financed

There is only one important job in Apollo…everyone's!, 1968, NASA Collection of the National Air and Space Museum, Smithsonian Institution. Cartoonist Charles Schultz's Snoopy became the the mascot for job safety at NASA, after three Apollo astronauts were killed in a fire on Apollo 1, in 1967. NASA continues to give employees the Silver Snoopy Award for outstanding performance contributing to flight safety and mission success.

canals, harbor projects, and post roads as "internal improvements." Postal rates subsidized business-to-business correspondence. Amid corruption surrounding land grants for railway construction, the public turned away from government involvement in private business. Yet railroads were a transformative innovation, enabling manufacturers to expand beyond local markets, and farm products to be shipped over long distances. From the 1870s, states and the federal government supported agricultural research and extension, benefiting both farmers and the companies that sold them mechanized equipment and supplies and those that purchased, stored, processed, and marketed crops and livestock. Much later, the White House found in "the demands of catastrophe or defense, should an atomic war come," part of its argument for spending tax dollars on the Interstate Highway System.

Yet fear of the heavy hand of government has contributed to a widely held sense that industrial policy means, or could mean, an end to economic freedom, creeping socialism, and an inexorable slide down Friedrich von Hayek's 1944 *Road to Serfdom*, a road ending in loss of personal freedoms as well.

For fear of knowledge translating into government power, some political figures in the early years opposed even the decadal census. Later, businesses often tried to limit collection of information. In the 1930s, when there were no reliable statistics even on employment, the Roosevelt administration set out to better understand the functioning of the economy as an aid to finding a way out of the Great Depression. Many business leaders bridled, afraid of exposing the inner workings of their companies. In a little-known but telling example from the 1950s, Secretary of Defense Charles E. Wilson, former president of General Motors, blocked funding for data collection and analysis in support of defense production at a time of rapid

Cold War buildup, despite the concerns of procurement officials in his own department fighting bottlenecks in supply chains numbering thousands of firms.

Business interests sought government favors, beginning with trade protection and infrastructure development, yet they also wanted a minimally regulated economy, or at least one in which they could write, influence, or tweak whatever rules and regulations seemed desirable to protect their property rights, while safeguarding their "right to manage." Business has never been wholly united—small firms resent the influence of big corporations, regional interests surface, and views on trade policy vary with product lines, export potential, and dependence on international suppliers—but nearly all oppose labor unions and collective bargaining. No doubt, too, many resist industrial policy because they believe it easier to get what they want through lobbying, public relations campaigns, political contributions, ties cultivated with officials responsible for regulatory oversight, and other tactics less visible to the public. From such perspectives, the more open and analytical approach necessary for pursuing genuine industrial policies holds dangers best avoided.

What is industrial policy?

The distinguishing feature of industrial policy lies in efforts to provide some form of goal-directed analysis and decision-making for whatever it is that government ends up doing that affects business decisions and behavior, directly or indirectly, and thus national economic performance. The usual inventory of tools includes research and development funding, public procurements, capital allocations and controls, trade measures, certain sorts of regulation, and targeted tax measures and subsidies. Appropriately combined, such measures can boost innovation, competitiveness, and productivity growth, altering economic dynamics at the level of individual firms. As the dynamics change, the structure of the economy will change too. Some firms, hence some sectors, will grow faster, others more slowly. There will be regional impacts, the more so in a country as large as the United States, where Sunbelt states, for instance, benefited disproportionately from military expenditures during World War II and after. Trade protection sometimes aims to slow or reverse the decline of industries threatened by import competition, a goal in the 1970s and 1980s and desired again by some today as a putative remedy to continuing contraction and job loss in manufacturing. Alternatively, trade measures can be deployed to shield infant industries while they grow and mature, as Hamilton urged.

There is no real question that industrial policy *can* work, for it has, in some places and for a time, as I'll describe. Officials in Washington often deny pursuing industrial policy, yet almost anything government does under a different rubric (trade policy, for instance) that affects business activities will have such effects. The federal government repeatedly finds justifications for trade barriers, tax legislation that benefits some firms and industries more than others, and regulations with differential impacts, often putting forward dubious economic reasoning. Even if businesses are intended to benefit across the board, as with corporate tax cuts, some will gain more than others depending on their financial situation and product lines. Boosting the federal minimum wage helps employers that already pay at these levels, perhaps because of higher state minimums or collective bargaining contracts, since other companies now face higher labor costs. Firms and trade associations lobby knowing all this. The US political economy is a mix of politics and policy creating a setting unique to this country in which private firms compete in markets and also for political favors.

Hard-and-fast distinctions between industrial and many other types of policies are thus pointless. Almost any policy that affects business activity will have differing impacts on firms even in the same industry. Antitrust and patent policies sometimes encourage technological advance and sometimes stifle it. Rules, regulations, and technical standards can be and have been deployed for industrial policy purposes, by governments and sometimes by industry associations. Early standards for electrical voltage and frequency, for instance, were set to drive up costs for imported equipment, serving as trade barriers. Foreign-based automakers must satisfy US-specific safety and fuel economy standards; those without the scale of Toyota or Hyundai must choose between higher sticker prices or lower margins.

Regulatory policies enacted for any number of reasons drive technological change in particular directions, in the motor vehicle case toward air bags, catalytic converters, and now hybrid and battery-electric powertrains. Regulation also shapes innovation in pharmaceuticals, agrochemicals, and service-producing industries including health care, banking, and telecommunications. Federal agencies issue something over 3,000 rules annually. Even so, and despite complaints by conservatives and whining by businesspeople, the United States remains lightly and laxly regulated by the standards of other wealthy democracies. Employers feel free to wink at many labor laws. Politics has meant 16 agencies now share enforcement of food safety and quality standards (the Food and Drug Administration regulates frozen cheese pizzas, the Agriculture Department those with meat), making it easier for companies to evade them. An awkward division in motor vehicle rulemaking between the Environmental Protection Agency and the National Highway Traffic Safety Administration leads to drawn-out negotiations to find acceptable compromises. These sorts of ambiguities, overlaps, and conflicts feed into swelling bodies of legal interpretations, findings, and precedents, opening the way for further challenges by lobbyists and lawyers.

In sum, declining to talk about industrial policies has not meant that the United States does not pursue them by other names and other means. It does mean that thoughtful approaches to industrial policy, supported by sound analysis, evidence-based reasoning, and vigorous open debate, have rarely been pursued.

Does it work?

Sometimes, in some places, as indicated by the usual criteria: growth in wages and productivity; dominant firms in internationallyw traded sectors; militarily effective weapon systems. Yet every political economy is different and there is no universal recipe, as illustrated by the contrasting paths of Japan and Germany after World War II.

Japan's government channeled capital to favored industries including textiles and apparel, steel, shipbuilding, and electronics, protected these and others (including autos) from foreign competition, and helped neutralize once-militant labor unions. Domestic policies with real bite provided additional aid for automakers, with required inspections so strict that vehicles even a few years old could not pass, forcing early replacement; used cars were exported to developing countries, boosting new-car sales, hence scale economies and profits for Japan's auto firms. On this basis, they quite quickly mastered low-cost, high-quality production and learned to design vehicles attractive to Americans. Consumer electronics and semiconductor firms followed suit. All this despite a one-party state dominated by political insiders, few with much claim to visionary leadership.

South Korea, starting later and with little pretense to democratic rule before the 1980s, followed a generally similar route, although its dominant industrial conglomerates, the *chaebol*, were organized and managed differently than Japanese firms. Neither country spent much on defense. Both invested heavily in education. Other Asian nations adopted their own variations on these themes, some with greater success than others.

In West Germany, the hand of government was rarely so evident, even in firms with high levels of public ownership. Along with heavy industries such as electrical equipment and chemicals, smaller manufacturers, many of them specialized suppliers of intermediate and capital goods such as the machine tools needed to build other machines, have been a lasting source of export strength. Competitive prowess rested on a skilled workforce, the foundation of which was Germany's well-known dual-track system of education. Unlike vocational training in the United States, all too often leading to a dead-end future, German apprenticeships opened doors to jobs paying middle-class wages and prepared young people to continue to learn, contribute, and advance their careers. The difference? Accommodation between employers and employees came to be broadly accepted in postwar Germany, as in much of Europe. This never happened in the United States, where businesses reinvigorated their attacks on labor standards and worker bargaining rights after the brief interregnum from Roosevelt's New Deal and the wartime push to boost output of military equipment for supplying US and allied forces. The continuing spread of "right-to-work" laws attests to the success of these attacks.

In some contrast to the stagnation afflicting Japan's industries since the early 1990s, the German economy has sometimes faltered but not for that long. This despite real challenges: the fiscal strains of absorbing East Germany, for one. For another, what more than a few observers have seen as an absence of entrepreneurial vigor and arrangements among government, business, labor, and a financial sector that can seem too cozy, contributing to scandals at big firms including Siemens (bribery to win foreign sales) and Volkswagen (cheating on emissions standards). Germany just seems to march along. And so for that matter do smaller European economies including those of Austria, Switzerland, and the Nordic states.

Dirigisme in France, on the other hand—state-led growth guided by elite ministries and empowered civil servants, as in Japan—did not last. In efforts to meet what the journalist and sometime political official Jean-Jacques Servan-Schreiber called "The American Challenge," French industrial policy sought to build national champions in "strategic" sectors through capital allocations, coerced mergers, and nationalization. This at a time when IBM dominated the world computer industry, Boeing the market for jetliners, and gangsters in French New Wave films drove big American cars. French policies led to some gains in rates of gross domestic product and productivity growth. But nationalized French firms soon were losing money at rates the nationalized banking system could not sustain. The Airbus Industrie consortium did become a potent rival to Boeing, aided by massive early subsidies from multiple countries, but the fuel-guzzling supersonic Concorde did not sell and Bull, the French national champion computer firm, never came close to the targets set forth in *Le Plan Calcul*, the government's program to advance the industry.

Neither Germany, France, nor Britain managed to turn early contributions to computing technology into sustainable market advantages. Only firms based in Japan, which were latecomers, and Japan's Fifth Generation Computer program created anxiety in the United States. Organized in the early 1980s, the Fifth Generation program, with related policies supporting microelectronics, deployed measures including R&D funding, forced cooperation among nominally competing firms, and capital flows steered to the Japan Electronic Computer Corporation for purchase of equipment then leased to other companies. Highly visible in the United States, indeed overhyped, the effort was presented as a threat justifying responses, including by the Defense Advanced Research Projects Agency (DARPA) through its Strategic Computing program. With digital ubiquity already on the way and continuing innovation on multiple fronts driven by broad-based market demand, none of these undertakings—in Japan, the United States, or elsewhere—accomplished all that much. On the other hand DARPA's less targeted and more variegated R&D, stretching back to the 1950s and continuing today, helped build technological infrastructure and university research capabilities, nourishing the ecosystems that spawned numerous commercial ventures in computer hardware and software, graphics, the internet, and artificial intelligence. By and large, the economic spillovers of these

Precious Human Cargo, Our lives are in your hands, The Apollo Astronauts, ca. 1968, NASA, Collection of the National Air and Space Museum, Smithsonian Institution. This poster depicts three astronauts from Apollo 7: Walter "Wally" Schirra, Donn F. Eisele, and R. Walter "Walt" Cunningham. This poster was designed to remind NASA employees and contractors to be careful while shipping spacecraft parts.

efforts were incidental to DARPA's mission to push advanced technologies into the military; this was not truly industrial policy, even if a few enthusiasts thought of it that way.

Forced industrialization under Stalin had enabled the Soviet Union, by itself, to outstrip Germany in aircraft production during World War II, yet a population that was supposed to benefit at some point never did. China pursued its own variant of Marxist/Leninist-derived policies and following Mao's death allowed enough trickle-down to create hope of a better future for a slice of the populace. The Communist Party suborned others in building what some have come to call crony capitalism with Chinese characteristics. To this point, then, China stands as perhaps the sole example of an authoritarian state that has managed rapid economic growth even though run from the top by a tiny cadre. And now it is China that has replaced the long-vanquished specter of Japan as Number One, and is provoking a new set of responses from US policy-makers.

Industrial policy, American style

Each country has its institutions and its histories: written laws, unwritten norms, culture and traditions. These condition its markets and set the context for industrial policy. Because economies are too complicated for full understanding and constantly in flux, policies often have unexpected outcomes, the more so for innovation, unpredictable by definition. Even so, as the previous examples suggest, it is possible at least in the abstract to devise policies that with some plausibility ought to lead to outcomes thought desirable.

Implementation is the greater difficulty, beginning with politics. All this has been especially difficult for the United States, given its uniquely high-entropy approach to governance, with responsibilities touching on industrial policy widely scattered across agencies, and mechanisms for coordination few and weak. For example, a succession of compromises intended to build support for the Affordable Care Act (Obamacare) watered down its provisions yet failed to mollify conservatives in Congress and opponents in the insurance and health care industries. The notoriously bungled rollout of the online enrollment website that followed made things worse, underlining the importance of effective administration of whatever policy emerges.

In the late 1970s and early 1980s, the Carter administration flirted with industrial policy as it struggled to address stagflation, escalating trade deficits, and deindustrialization. It conducted a wide-ranging Domestic Policy Review of Industrial Innovation leading to a number of modest policy changes. When Ronald Reagan took office confronting these same economic dilemmas, the White House sought responses, or at least political cover, naming a high-profile President's Commission on Industrial Competitiveness. The commission led off its recommendations by calling for a cabinet-level Department of Science and Technology to "transform the current fragmented formulation of policies," a proposal hardly likely to attract support from an administration opposed to "big government."

Yet the recommendation underscored an important characteristic of the American approach: visceral reactions against industrial policy do not extend to scientific and engineering research. Along with generalized support for technology and science tied to national security, what has sometimes been called generic or precompetitive technology policy—labels adopted in the 1990s to neutralize the stigma associated with industrial targeting—has found acceptance, though grudging in some political circles. The National Nanotechnology Initiative exemplifies recent initiatives of this sort, aimed at advancing a broad field rather than a particular technology or sector. NNI dispensed funds through a multitude of agencies for a multitude of stated reasons, the dollars flowing to many congressional districts, gaining endorsement even by Newt Gingrich, a conservative apostle yet technology enthusiast. Also in the 1990s, the prospect of gaps opening in defense-related technologies that none of the military services chose to support led Congress to require yearly reports from the Pentagon

on "technologies most essential to ensure the superiority of our weapons systems." Although the mandate did not last, it prefigures today's calls for greater focus and more money for artificial intelligence, quantum computing, robotics, and such.

What Vannevar Bush really wanted

The belief that more government support for science and technology can substitute for industrial policy is traceable to the argument laid out in Vannevar Bush's *Science, the Endless Frontier*. But to substitute for actual industrial policy Bush's rhetoric and argument is to misunderstand his objectives. Bush knew how poorly the United States had been prepared for war at the time of Pearl Harbor. With few exceptions, US weapons were no better than those of its allies and adversaries, and some were worse. And this was still true, if to a lesser extent, in 1945. The White House had charged Bush, as head of the wartime Office of Scientific Research and Development, with rectifying these shortcomings, by speeding military technological innovation and pushing sometimes reluctant procurement officials to move new weapons into production after the engineers and scientists recruited into Bush's organization had finished their development work.

After the war, Bush was determined that the United States not fall behind again. He believed, correctly, that a far stronger science base and durable ties between the research community and the military—almost entirely absent prior to the war—would be essential. Military officers had learned firsthand the value of superior weaponry. They had been converted; it was scientists, some of them dismayed by the atomic bomb, who needed coaxing. Money was the carrot, and *Science, the Endless Frontier* provided the argument for delivering it. Powerful reinforcement came with the Korean War, as US and allied forces, once again poorly equipped (the defense budget had been slashed after 1945), were forced into a near-disastrous retreat by Chinese troops who, despite even poorer equipment, flooded down the peninsula in overwhelming numbers. From 1950 to 1952, US military spending more than tripled, with greatly increased sums for R&D on new weapons. Soon the new pattern had solidified, characterized above all by enormous investments in military R&D and procurement. The objective was to establish and maintain overwhelming technologically based advantages in weaponry over any and all potential adversaries.

After World War II the military establishment, and the civilian-run Atomic Energy Commission (AEC), responsible for nuclear weapons, funded R&D quite broadly. They did so in part to support weapons programs directly, in part to build an expansive base of technical knowledge as a hedge against an uncertain future, and in part to build bridges to research communities, bridges nonexistent before Pearl Harbor but now regarded as indispensable.

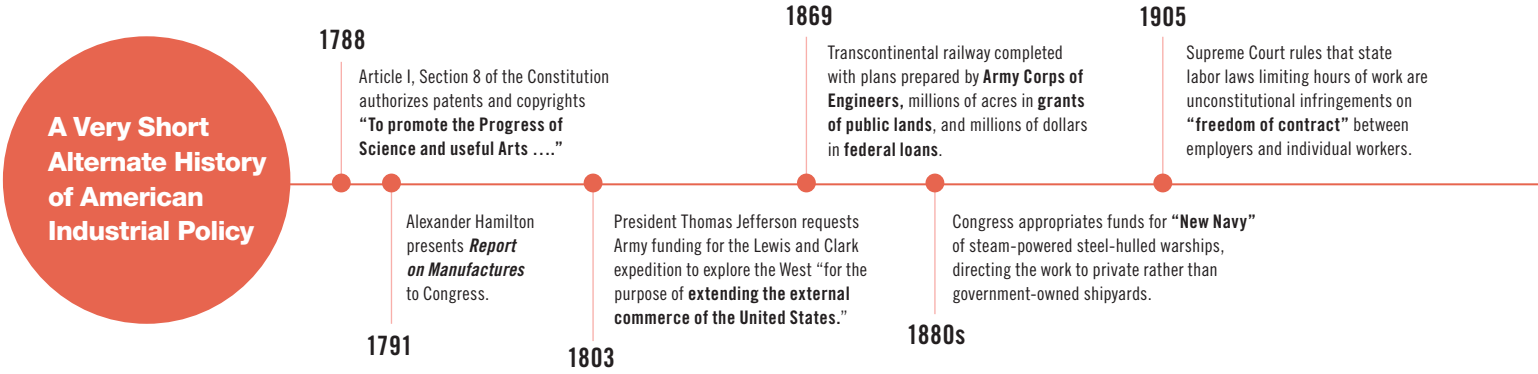
Since World War II, national security has been widely accepted politically as justification for military funding of R&D. Outside of the security mission, for the past 75 years, US policies have been based on a misconception: that research is the starting point in essentially all innovations, and that a flourishing economy, one in which the rewards of productivity growth will find their way to all US residents, can be created simply by upping government research investment, with much of the money going to universities for quite basic science. This of course is not how military R&D and procurement work; for those, it is the end-objective, warfighting, that motivates investment and innovation. System design and development accounts for the great bulk of the Pentagon's R&D dollars, just as in purely private endeavors aimed at bringing new goods and services to market. Even so, outside the national security realm, US policy-makers have been notably reluctant to do more than fund research, the supposed seed corn.

In some contrast to a number of other wealthy countries, policy-makers have meanwhile neglected the true seed corn for even the discovery-based innovations that Bush championed: a multidimensionally skilled workforce in which employees at all levels can learn and advance, contributing, if anonymously, to technological advance and wealth creation. Even in the research laboratory, as practicing engineers and scientists well know, much of the work of discovery would stall without the highly skilled and experienced technicians who build apparatus, troubleshoot it, and keep it working. Similar, and similarly unsung, contributions take place in manufacturing and in service-producing industries such as health care where much actual care delivery is in the hands of nurses, nurse aides, and, increasingly, home health workers.

Taking industrial policy seriously

If a skilled workforce is the necessary infrastructure, any smart industrial policy must start with understanding how business and industry function, because technological innovations come almost entirely from private firms, even if they draw on federally funded R&D. This sort of understanding can be hard to come by. Every firm is different, as is every industry and every technology. Economies are always changing, never in equilibrium. Statistics reflect the past and models cannot predict the future with much certainty, while statistical data itself may be scarce, flawed, or uninformative.

Yet good data of the right sort can help. In the 1980s, studies conducted as part of the Census of Manufactures found many smaller firms lagging badly in costs and quality for reasons including inefficient work organization and obsolescent machinery and equipment. Automakers and end-product manufacturers in other troubled industries bought parts and components from many of these smaller enterprises at prices higher than those paid by foreign-based firms with more efficient suppliers, contributing to the cost and quality disadvantages of US-based manufacturers. Legislators heeded the findings in crafting what is now called the Manufacturing Extension Partnership, a program that, if perhaps too small



in scale to have much impact on US manufacturing overall, continues to provide meaningful assistance to thousands of companies each year. According to more recent but less than authoritative accounts, many small manufacturers remain well behind "best practice" standards, yet no similarly rigorous studies have been conducted. Census and other agencies that might take on such special studies are starved for funds and, in some administrations, political support as well. For similar reasons the Bureau of Labor Statistics has not collected data on employer-provided workforce training since the 1990s, despite an avalanche of business complaints over skill gaps and shortages, and anecdotal reports that these same firms have cut back on their own training.

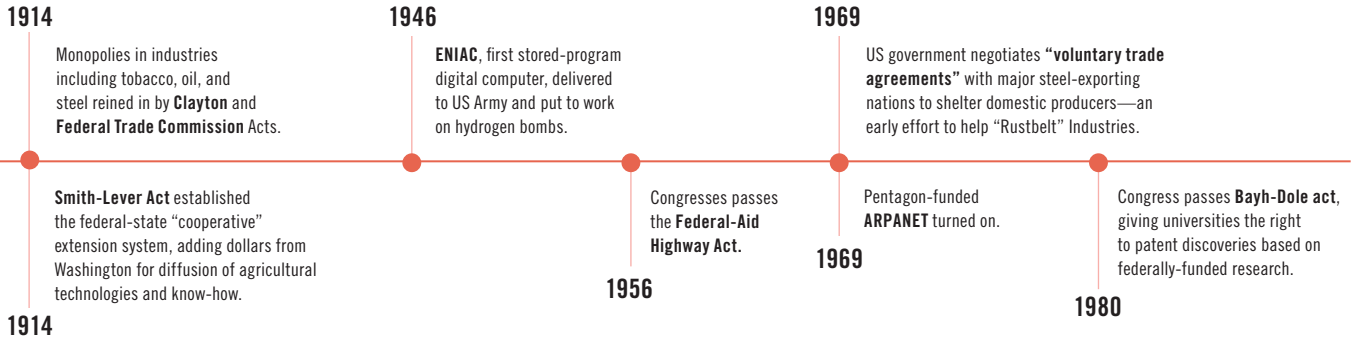
Industrial policy depends also on agency capability and competence, which varies widely across government. The Defense Department employs some 100,000 engineers and scientists. The Treasury Department is powerful, with plenty of well-trained economists, although not necessarily with much interest in or understanding of business. The Commerce Department, nominal home of such expertise, has been something of a backwater, in part because companies pay little attention unless seeking favors within the agency's limited range (e.g., on trade). The Labor Department has more of a constituency than Commerce, but when Republicans capture the White House it loses influence over policy.

The Department of Energy and its predecessors illustrate the difficulties of implementing effective industrial policies in the US setting. Every president, Democrat and Republican, going back to Nixon, has talked up energy self-sufficiency as a political goal. Reducing dependence on foreign oil, whether justified by national security or environmental rationales, is a good example of the sort of thing that industrial policy might aim at. DOE, like other agencies shaped by history, was not designed for this purpose. The Atomic Energy Commission, DOE's ancestor, was established by Congress after World War II to place civilians in charge of nuclear weapons. This has left DOE with two big missions, the nation's nuclear stockpile and research in the physical sciences, funded by the AEC from the beginning to cement ties with experts in universities who could help meet the incessant demands of the armed forces for ever smaller yet ever more powerful warheads. Except for subsidization of commercial nuclear power in the 1950s and 1960s, a spinoff from bomb-related reactor work and submarine powerplants, energy itself has never been a mission in the usual sense of the term.

Instead, DOE has funded an often-dissonant collection of programs—for example, both fossil fuels and renewables. And though the fiscal 2021 budget request for DOE's Office of Science comes to $5.8 billion (and weapons-related programs to $26.4 billion), the White House would again zero out the Advanced Research Projects Agency-Energy (ARPA-E), a DOE program created in 2008 on the model of DARPA specifically to instill a sense of purpose and direction otherwise lacking in energy technology development. Congress gave ARPA-E $425 million in 2020 and will no doubt continue to fund it. Still, this sum is only one-twelfth of DARPA's appropriation, and continuing resistance by powerful forces inside and outside government points to the sort of difficulties industrial policy faces in the United States.

These capsule accounts add up to a bigger point. Missions cannot simply be declared; public and political support must be built and maintained. For the Defense Department, this is close to automatic. Not so elsewhere, as suggested not only by DOE but by the inability of the National Aeronautics and Space Administration to follow up the Apollo moon landings with anything even remotely as compelling.

In a contrary example, the National Institutes of Health, born over a century ago as a tiny laboratory attached to the Public Health Service, managed to almost totally alter its original mission. Under powerful and persuasive administrators, and with a vocal constituency in research universities and medical schools, NIH expanded into a vast research enterprise, leaving public health as remnant for others to worry over. If nominally aimed at understanding diseases and their causes, biomedical sciences at the agency have been cloaked as generic, with profit-seeking companies free to pick over the findings. Although Washington on occasion has declared "wars" on disease, to prosecute a war takes strategy, planning, and hard decisions, risking conflicts with firms in the health care industry—and such battles have never been part of these wars. Public health itself has suffered by all the evidence on costs and quality of care, the COVID-19 disaster the latest episode. That is to say, NIH has in its own way been as much of a failure on the health front as DOE on the energy front. Neither one can be said to have pursued anything remotely resembling coherent industrial policy directed at widespread needs among the general public.



The winners have picked the losers

Expecting technology and science policies to do the job of industrial policy is wrongheaded for still deeper reasons. Markets themselves exist in a framework of laws and institutions that create basic structure and sometimes prescribe details too. Perhaps the most obvious demonstration is Wall Street securities trading on the stock market. As for labor markets, American courts and legislators have structured them since the nineteenth century to favor the interests of employers over those of employees. A 25% tariff on imported light trucks (a legal category), in force since imposed in 1964 to retaliate against European restrictions on US food imports, coupled with more demanding safety and fuel economy standards for passenger cars than light trucks, has decisively altered market dynamics, and at the same time encouraged foreign-based firms to build factories on US soil. These firms mostly located in low-wage states unfriendly to organized labor, increasing downward pressure on wages in US manufacturing generally. Agribusiness interests have pushed not only for policies that benefit them at the expense of small farmers but for subsidized corn ethanol in gasoline blends (and for biodiesel), driving up food prices (much corn otherwise goes for animal feed and corn syrup sweeteners). Antitrust enforcement has affected industries including computing, airports financed by municipal governments subsidize air travel, and patent policies enable pharmaceutical firms to reap monopoly profits from drugs stemming from publicly funded research. None of this is hard to grasp—and in all of these cases government has acted to shape how markets function.

Voices that say "let the market decide" are positing an ideal unattainable except in the most austere of economic theories. Adopting such views, famously pushed by Milton Friedman and others proffering abstract and unrealizable notions of free markets, simply opens doors for corporations to lobby out of sight for their interests over those of ordinary Americans. Like all governments, Washington is always picking winners and losers—something that everyone involved in politics and policy knows, whether or not willing to state it aloud. Denial leads to America's hidden industrial policies, outgrowths of the vagaries of influence and inside deals, a jumble of measures essentially invisible and undemocratic.

Effective industrial policy depends on identifying viable political architectures and assembling policy tools that will push the United States back toward the sort of broad-based prosperity that seemed in reach for perhaps two decades after World War II. Technology and science cannot do this alone; indeed, their fruits often go to those who need them least. Calls for rapid increases in university-based R&D investment, such as the proposed Endless Frontier Act, are unequal to the task at hand and unable to mobilize constituencies that could push forward more powerful policy options. With inequality rising since the 1970s and "good" jobs, those that offer wages and benefits adequate to support middle-class living standards, hard to find, such proposals seem a bit empty, positing as they do that more money for R&D and administrative reorganizations such as another DARPA clone (this one within the National Science Foundation) will trickle down to yield the "shared prosperity" listed among the "national goals" in the bill's language. That is chimerical thinking in a labor market of some 160 million people. Political reconfiguration that reduces the influence of business interests and the wealthy relative to that of the great mass of US residents is the prerequisite.

***John Alic** has been exploring industrial policies as they affect economic performance since working on a study at the congressional Office of Technology Assessment, published in 1981 as* U.S. Industrial Competitiveness: A Comparison of Steel, Electronics, and Automobiles**.**

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