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MOVING THE CHAINS

9 Strategies for Retaking Global Leadership in Industry and Innovation

A FOREWORD ON THE RESHORING IMPERATIVE by David P. Goldman

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AMERICAN COMPASS is a 501(c)(3) non-profit organization, launched in May 2020 with a mission to restore an economic consensus that emphasizes the importance of family, community, and industry to the nation's liberty and prosperity—

REORIENTING POLITICAL FOCUS from growth for its own sake to widely shared economic development that sustains vital social institutions;

SETTING A COURSE for a country in which families can achieve self-sufficiency, contribute productively to their communities, and prepare the next generation for the same; and

HELPING POLICYMAKERS NAVIGATE the limitations that markets and government each face in promoting the general welfare and the nation's security.

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Edited by Wells King

Executive Summary

After decades of looking away as America's supply chains migrated overseas, policymakers are finally facing the reality that dependence on foreign producers has weakened the nation's resilience, its security, and its economy. When factories leave, not only the jobs but also the suppliers, the customers, the expertise, and the innovation go too. When a crisis strikes, vital supplies are unavailable. When productivity growth and innovation are needed, they are nowhere to be found.

This symposium gathers experts in many fields; working in think tanks, universities, and industry; starting from points across the political spectrum; to delineate and describe the levers available to policymakers in pursuit of reshoring supply chains and to offer concrete policy proposals for using each lever. Some proposals emphasize investments that the United States can make to improve its competitiveness—in people, in infrastructure, and in research. Others consider how better laws could attract or even force firms toward domestic production. Still others advocate reform for institutions themselves, from the federal government to the WTO.

RESEARCH & DEVELOPMENT

Willy Shih, Harvard Business School

The United States should use pre-competitive research consortia to bridge the gap between basic research and commercial competition. This model proved critical to establishing American leadership in the past, in fields from airplane engines to semiconductors. Policymakers should focus especially on the demand side, priming initiatives like biomanufacturing and grid modernization that will generate stable domestic demand for key domestic manufacturing capabilities.

TAX INCENTIVES

Rob Atkinson, Information Technology & Innovation Foundation

The United States should reduce the effective tax rate for companies when they invest in research and development, capital equipment, and workforce training. An American Innovation and Competitiveness Tax Credit would reduce a firm's tax bill by 30% of spending in those areas (above 50% of base-period levels), rewarding investment and closing the nation's gap with the majority of OECD countries that offer an R&D credit more generous than America's and the many that offer an investment credit too.

DOMESTIC SOURCING

Michael Lind, University of Texas

Rather than encourage reshoring, policymakers should in some cases simply mandate it, by establishing Local Content Requirements that require some or all of a final good's inputs to be manufactured domestically. While this approach appears blunter than reforms to cajole or incent or create an environment friendly to reshoring, it more directly and reliably achieves its stated purpose and allows policymakers to select and target particular supply chains of economic or strategic importance.

WORKFORCE INVESTMENT

Samuel Hammond, Niskanen Center

The United States has lost not only its supply chains, but also the skilled workforce and embedded industry expertise to support them. Its lack of active labor market policies compounds the problem, as workers cast out of disrupted jobs get little support in connecting to new ones. Policymakers should reform Trade Adjustment Assistance, a woefully outdated and underinclusive program, to instead provide training to people unemployed for any reason and help them navigate the path back to productive work.

REGULATORY REFORM

Oren Cass, American Compass

Environmental laws enacted 50 years ago have ratcheted continually tighter and specifically target efforts at expanding domestic industrial capacity. Policymakers should remove the excessive hurdles to construction and expansion imposed by the Clean Air Act and the National Environmental Policy Act, by allowing construction of new facilities on the same terms as existing ones, and creating streamlined permitting processes comparable to those employed in countries like Germany and Canada.

AGENCY STRUCTURE

Ganesh Sitaraman, Vanderbilt Law School

Policymakers are hampered in the development of supply-chain strategy and policy by the dispersion of responsibility and authority across a byzantine tangle of agencies. The United States should consolidate the Department of Commerce, U.S. Trade Representative, Small Business Administration, export promotion agencies, and economic sanctions authority into a Department of Economic Resilience with divisions for trade, export promotion, economic security, industrial policy, and statistics.

TERMS OF TRADE

Thomas Duesterberg, Hudson Institute

Three principles too long absent from American trade policy must return to the fore: Reciprocity, Security, and Democracy. The World Trade Organization's rules and procedures no longer uphold those principles, but its requirement of unanimous agreement has precluded reform. The United States should insist upon institutional reform of the WTO that creates a pathway to revising its rules, or else move beyond the WTO's structure to reassert its own interests.

INFRASTRUCTURE FINANCING

Terrence Keeley, BlackRock

Manufacturing and supply-chain professionals rank "investment in U.S. infrastructure" as their top priority, but underinvestment persists. The United States should create a national development bank to attract private capital into infrastructure projects, closing the funding gap and improving project outcomes. Such banks, already standard features in most national and regional economies, can operate with little to no taxpayer capital while leveraging public guarantees into enormous private-sector commitments.

ANTITRUST ENFORCEMENT

Matt Stoller, American Economic Liberties Project

Consolidation among hospital Group Purchasing Organizations (GPOs) provides a case study for how excessive concentration and market power discourages domestic production, suppresses price signals, and helps state-backed Chinese firms dominate supply chains. Sector-specific analysis of industrial organization can point toward opportunities for prohibiting anticompetitive practices and recreating both horizontal and vertical fragmentation to allow domestic producers back into the game.

FOREWORD: THE RESHORING IMPERATIVE

David P. Goldman
Asia Times

You may not be interested in supply chains, but supply chains are interested in you.

Until quite recently, the issue of supply chains has been absent from America's policy agenda. Our supply chains have been guided nonetheless by government action for the past twenty years—not ours, but Asia's and especially China's. America has an industrial policy, namely off-shoring. State support for capital-intensive manufacturing, the hallmark of the Asian model since Japan's 1868 Meiji Restoration, shifted industrial output from the United States to Asia. Together with this shift, American manufacturing employment fell to about 11.4 million from almost 20 million in 1980.[1] We also have a chronic trade deficit in manufactured goods, an accumulating foreign debt, a chronically low savings rate, an excessively consumption-based economy, and stagnant labor productivity. To paraphrase Leon Trotsky, you may not be interested in supply chains, but supply chains are interested in you.

The so-called neoliberal consensus in the economics profession rationalized the hollowing-out of America's industrial base. A liberal economist believes in free trade; a neoliberal talks about free trade while seeking rents from subsidies provided by foreign governments.

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For several reasons, America must reshore key industries. These include:

1. **National Security.** The COVID-19 epidemic showed America's dependence on imports of protective gear, medicine, and equipment, as well the prospective development of vaccines.

2. American "Soft Power." For example, America's lack of manufacturing capacity for 5G telecommunications equipment leaves us open to significant loss of influence to the benefit of China. The same problem will occur in other key industries without corrective action.

3. Productivity. Loss of high-tech manufacturing capability has a direct negative impact in productivity and important indirect effects, such as the loss of skills in support sectors.

4. Innovation. America's tradition of innovation from Thomas Edison through Bell Labs came from the cooperation of scientists, engineers, and production workers, rather than academic research in isolation.

5. Resilience. The off-shoring of American industry skews the American economy towards household consumption (70% of GDP vs. an OECD average of 60%), at the expense of investment.[2] This leaves the United States more vulnerable to shocks to consumer confidence, as in 2008-2009 and during the COVID-19 pandemic. Economic resilience requires a stronger investment component in economic growth.

America planted the seeds of the digital revolution but failed to harvest the fruits. We invented the semiconductor, but today we produce only 10% of the world's computer chips, down from 25% in 2015.[3] We invented all of the core digital technologies: flash memory, liquid crystal displays (LCDs), light-emitting diodes (LEDs), plasma displays, semiconductor lasers, and the solid-state sensors that power smartphone cameras. Virtually all of these products are now produced in Asia. The LCD market is divided among South Korea, Taiwan and China; LEDs are produced by China and Taiwan; Taiwan and Japan produce most sensors; and the U.S. share of flash memory production is down to 10%.[4] American firms still lead the world in chip-making equipment, but about 90% of equipment sales are to foreign chip fabricators.[5] In 1999, the American share of global high-technology exports was nearly 20%, and China's share was less than 5%.[6] By 2015 our share had fallen to 7% while China's rose to 26%, according to the World Bank.[7] As a share of U.S. exports, high-technology goods, including electronics and pharmaceuticals, fell to 19% in 2018—from 31% in 2007.[8]

Asia's ascent in manufacturing produced some benefits for the United States, or at least benefits for some Americans: American companies exited from hardware businesses and focused on "capital-light" software businesses, which are infinitely scalable and benefit from inexpensive Asian hardware imports. This pro-

duced enormous growth in the stock-market capitalization of a handful of software companies that captured network effects (e.g., Microsoft, Amazon, Google, Facebook). American consumers benefited from cheap products that would cost considerably more to make at home, although that is something of a devil's bargain; with declining manufacturing investment and employment we also had stagnant productivity growth and almost no growth in real household income. Real median household income declined from 1999 to 2012 and didn't regain its 1999 level until 2016.[9]

For several reasons, this symbiotic model—what Niall Ferguson dubbed "Chimerica"[10]—is no longer tenable. The disruption of economic and community life in former manufacturing hubs due to this shift helped to elect Donald Trump on a program of restoring American industrial employment. The COVID-19 pandemic revealed American dependence on China and other Asian countries for urgently required protective gear as well as basic pharmaceuticals. America's effort to suppress Chinese dominance in the next generation of mobile broadband revealed the lack of American hardware manufacturing—or even design—as a strategic weakness.

For strategic reasons, long-term structural reasons, and short-term economic reasons, the issue of supply chains has forced its way to the top of the policy agenda, where it will remain for a long time to come. President Trump recently asked during a press conference why the United States should have global supply chains, rather than make everything at home. But decoupling on a large scale is impossible in the foreseeable future, for a simple reason: America's imports from China in 2018 were equal to a quarter of our $2 trillion GDP in manufacturing, too large a portion to replace in the near future. The largest category of imports, about $70 billion of smartphones, cannot easily be relocated to the United States, as Apple CEO Tim Cook argues, because specialized engineering skills now abundant in China are scarce in the United States.[11] More broadly, genuine autarky is surely unnecessary and unwise. But targeted decoupling of strategically critical industries is long overdue.

For several reasons, this symbiotic model —what Niall Ferguson dubbed 'Chimerica'— is no longer tenable.

We have the opportunity to reshore key industries with a quantum leap in productivity driven by information technology. If we fail to grasp the opportunity, however, we confront the risk that our strategic rivals will increase their lead in advanced manufacturing techniques. China has committed vast sums to 5G broadband, artificial intelligence (AI), and STEM education with the goal of becoming the world's dominant power in high technology. America's competitive position in the world, long-term growth prospects, and national security all depend on maintaining our superior capacity for innovation.

Restoring American industry through innovation will require a visionary portfolio of policy initiatives, including tax incentives for R&D, direct subsidies for target projects, revisions to international trade policy, regulatory reform, and domestic content rules, among other measures. In this symposium a distinguished group of policy experts offers a range of recommendations to bring about the rapid reshoring of manufacturing.

When America Led the World

During the 1970s and 1980s, federal spending on basic research and development reached 1.4% of GDP, or the equivalent of $300 billion in current dollars.[12] Most of this was channeled through NASA or the Defense Advanced Research Projects Agency (DARPA). This sustained effort won the Cold War and created the digital age.

Among all postwar presidents, Ronald Reagan had the strongest commitment to free markets. But as his Treasury Secretary James Baker III noted, Reagan "granted more import relief to U.S. industry than any of his predecessors in more than half a century."[13] This included restraints on Japanese auto exports to the United States, "voluntary" restraints on 18 countries' steel exports to the United States, anti-dumping tariffs on Japanese computer chips, and numerous other measures.[14]

Major corporations that maintained large-scale labs, including the Bell System, General Electric, RCA, IBM, and DuPont, absorbed most of DARPA's grants. Scientists and engineers worked with production personnel to determine the practicality of innovations. Although "Big Science" dominated the grants, the venues gave rise to an unprecedented wave of entrepreneurship, as entrepreneurs formed new firms to commercialize the discoveries. Employment growth during the 1980s was among the highest of the postwar decades, with employment at new companies more than offsetting declining employment at large companies.[15] A clear division of labor separated government subsidies for basic research from private risk-taking in commercialization.

Two facts about this great surge in innovation are noteworthy. The first is that, without exception, every important technology of the digital age began with a DARPA or NASA subsidy: the semicon-

Entrepreneurs will risk the unknown, but they will not risk money for unknown unknowns—possible discoveries whose commercial application cannot be imagined because the underlying science has not yet been discovered. Indeed, by definition the outcome of basic innovation cannot be predicted in advance.

ductor, CMOS manufacturing of semiconductors, the graphical user interface, semiconductor lasers, optical networks, LED and plasma displays, and the Internet itself. The second fact is, that without exception, the original grants in every case did not envision the enormous commercial potential of these technologies. The discoveries were the "accidental" result of basic research with a different initial goal. For example, DARPA funded a study of night-time battlefield illumination and got the semiconductor laser and, with it, optical networks and the cable television industry.

These two observations illustrate the inadequacy of classical free-market theory. Entrepreneurs will risk the unknown, but they will not risk money for unknown unknowns—possible discoveries whose commercial application cannot be imagined because the underlying science has not yet been discovered. Indeed, *by definition* the outcome of basic innovation cannot be predicted in advance.

Thus, basic R&D requires state support. Before the "accidental" invention of the semiconductor laser, it was impossible to imagine a commercially viable optical network; no one could—let alone would—invest to develop and build one. As a practical matter, national security has been the driver of basic R&D for two reasons: First, because taxpayers are willing to accept expenditures with no specific benefit as a matter of national defense, and second, because the constant drive for progress in weapons systems and cryptography provides a concrete target for innovation that pushes at the frontier of science.

For the pipeline from basic R&D through commercialization to flow, policymakers must also ensure the private sector stands ready and able to participate. Efforts to protect established industries do not directly produce innovation, of course. But it is critical to note that the main venue for innovation at the dawn of the digital age was the corporate labora-

tory. Research isolated from production facilities—at universities, for example—is not as effective. The interaction of scientists with production engineers and skilled workers is an indispensable part of innovation. Scientists generate countless promising ideas every day; it takes experienced engineers and skilled personnel to sift out the few practical innovations from those of mere academic interest. If the United States loses the most advanced production capabilities and disperses its skilled workforce, our ability to innovate will be crippled.

Regaining the Lead

It is important to be clear about the different goals that bear on the onshoring of supply chains and to devise policies that address these objectives in the most direct way. Where the rationale is national security, onshore production may be considerably more costly than imports, but worth paying for strategic reasons. Where the rationale is economic, greater precision about both goal and mechanism is necessary. Protection of existing industrial jobs or subsidies for new jobs may be desirable in some contexts, but we should be aware that we simply may transfer income from one group of Americans (consumers who pay higher prices for the same goods and taxpayers who pay the subsidy) to another (investors and workers in protected industries).

A separate and often better economic rationale is that, as we have seen, a strong and diverse industrial base is a precondition for innovation and growth in labor productivity and incomes. Innovation does not occur in a vacuum. The collaboration of scientists, engineers and production workers is required to identify innovations that have commercial value. High-tech manufacturing depends on a complex set of supply chains, and industrial innovations require a critical mass of domestic inputs.

For instance, at the urging of the Trump Administration, Taiwan Semiconductor Manufacturing Corporation agreed in May 2020 to build a chip fabrication plant in Arizona at a cost of $12 billion.[16] Although the plant's expected output will be small compared to total American demand, it will help to secure a supply of computer chips for American military applications, an important precaution because undetectable backdoors can be secretly inserted into complex chips at the production level. Intel plans to build an onshore chip foundry in Oregon.[17] A similar rationale could support is onshore production of medical equipment and medicines even at substantial cost.

"Jobs," while frequently cited as a motivation for industrial policy, play little direct role in a case like Taiwan Semiconductor's new plant. It will employ 1,600 workers, with combined annual pay of less than 1% of the total investment.[18] In general, innovation in manufacturing does not support employment growth. Indeed, while the United States could subsidize manufactur-

ing employment, for example, through a tax credit for new jobs or direct subsidies or subsidies for specific industries, that might reduce rather than accelerate productivity growth, and conflict with the strategic goal of increasing America's competitiveness against an aggressive and potentially hostile Asian challenger.

But a reshoring policy that keeps key industries in business in the face of heavily subsidized foreign competition is more than an overpriced welfare policy for industrial workers. It is a necessary condition for future innovation. The indirect impact of new technologies on employment is likely to be far greater than the direct impact. The production of 5G devices and their embedded semiconductors is highly automated, but the installation of millions of ground stations will require enormous amounts of labor, including a good deal of skilled labor, just as the buildout of fiber optic networks for cable television created hundreds of thousands of jobs in the past.

A reshoring policy that keeps key industries in business in the face of heavily subsidized foreign competition is more than an overpriced welfare policy for industrial workers. It is a necessary condition for future innovation.

The good news is that a revolution is underway in manufacturing that will change the economics of off-shoring. The migration of manufacturing jobs from the United States to China and other countries is often explained as the result of relative labor costs. That surely was the case for some industries, but labor costs cannot explain the shift in capital-intensive industries, and key manufacturing processes are only becoming more capital-intensive with time. The application of AI to robotics sharply reduces the importance of relative labor costs. Dr. Henry Kressel, the former director of RCA Labs, explains, "this change makes manufacturing closer to home practical for some industries and creates a competitive advantage by allowing a much more nimble business compared with relying on offshore production." Changes in tooling can be programmed quickly and cheaply, reducing dependence on offshore production lines and traditional labor skills.

The bad news is that America has failed to prepare for capital-intensive competition. Our competitors subsidize capital-intensive industry. We subsidize sports stadiums. Correspondingly, the United States invests a far lower portion of its GDP than China or South Korea.

The capital intensity (the ratio of total assets to earnings before interest and taxes) of the components of the S&P 500 Index has fluctuated around the same level during the past twenty years, while the

capital intensity of the components of China's Shanghai Composite Index has nearly tripled during the same time period.[19] Corporate accounting for assets, to be sure, is unreliable, but the trend nonetheless is striking. Financing for large Chinese companies comes mainly from state-owned banks at fixed interest rates—that is, through an industrial policy. This is not a Chinese, but rather an Asian phenomenon; South Korea subsidizes capital-intensive industries, and the capital intensity of its KOSPI Index is close to that of China.[20]

The place to begin is at the source of the problem, namely the tilted playing field. No American company can compete with a Huawei or Samsung in hardware because the Chinese and Korean governments provide a capital subsidy. The industrial policies that cause the least distortion of the economic as well as the political process tilt the playing field in favor of capital-intensive industry by lowering the cost of capital, and support innovation by subsidizing basic R&D. The most effective government intervention into industry has fostered transformative innovations through public-private collaboration in basic research.

Several remedies are available. The simplest is to reduce taxes on capital income. The most important form of subsidy that the federal government can offer, though, is generous support for basic R&D. Industries that receive such subsidies are a self-selecting group of prospective innovators. As in the past, the Department of Defense remains the most effective agency for the distribution of such subsidies. By its nature, warfare pushes the boundaries of science in the development of new weapons systems. Military objectives such as laser defenses for American ships, anti-missile systems able to stop hypervelocity missiles, drone swarms guided by AI, submarine detection, cryptography and so forth pose scientific challenges and are likely to elicit fundamental breakthroughs.

An important indirect subsidy to high-tech industry is education and worker training. With shrinking capital commitment to manufacturing, colleges do not attract the brightest American students to engineering. America's technology industry is increasingly dependent on foreign workers. Only 5% of American college students major in engineering, compared with 33% in China; as of 2016, China graduated 4.7 million STEM students versus 568,000 in the United States21 as well as six times as many students with engineering and computer science bachelor's degrees.22 Meanwhile, foreign students earned 73% of the doctorates in electrical engineering at American universities in 2017.23 Essential to any program of industrial recovery is an educational reform comparable to our 1957 National Defense Education Act as well as increased technical training for computationally intensive, skilled industrial jobs.

Then there are cases in which direct subsidies to specific industries—"picking the winners"—are required for national security or other reasons. Direct subsidies are a problematic policy tool. They inevitably invite rent-seeking behavior by corporations, subsidies to particular groups of workers, and a politicized division of spoils. There are some forms of employment that are senseless to subsidize. Robotics will replace the dirty, dangerous business of sending men into coal mines before long as white-coated technicians with virtual reality visors manipulate underground machines. Dependence on Canada and Mexico for steel is not a major national security concern. On the other hand, dependence on China or even South Korea for semiconductors is. Despite these concerns, direct subsidies are sometimes required to prevent the loss of key industries and the dispersion of skilled labor.

Alongside these targeted efforts at lowering capital costs, accelerating R&D, improving skills, and boosting targeted industries, policymakers can also take action to alter the environment in which investment decisions occur in order to make the building of industrial capacity a more attractive bet. And they can reform the institutions within which they act to improve their own coordination, their international negotiation, and their efforts at regulation.

The essays offered in this symposium cover a broad range of topics, including pre-competitive R&D as a driver of long-term productivity gains (Willy Shih), tax incentives for private-sector investment (Rob Atkinson), local content requirements (Michael Lind), active labor market policy (Samuel Hammond), regulatory reform (Oren Cass), administrative structures to coordinate policy planning (Ganesh Sitaraman), international trade reforms (Thomas Duesterberg), infrastructure financing (Terrence Keeley), and antitrust enforcement (Matt Stoller). Hopefully, these papers will provide a resource for policymakers now grappling with the decisive economic issue of our time. ■

Endnotes

1 U.S. Bureau of Labor Statistics, "All Employees, Manufacturing," St. Louis Federal Reserve Economic Research (FRED).

2 World Bank, "Households and NPISHs final consumption expenditure (% of GDP)," World Bank Data Indicators.

3 International Business Services estimate.

4 International Business Services estimate.

5 Bloomberg geographic data for LAM Research (7.8% US sales); Applied Materials (12.8% US sales); and KLA-Tencor (13% US sales).

6 World Bank, "High-technology exports (% of manufactured exports)," World Bank Data Indicators.

7 Ibid.

8 Ibid.

9 U.S. Census Bureau, "Real Median Household Income in the United States," St. Louis Federal Reserve Economic Data (FRED).

10 Niall Ferguson, "Niall Ferguson Says U.S.-China Cooperation Is Critical to Global Economic Health," *The Washington Post* (November 17, 2008).

11 "Tim Cook: China a leader in many fields," *China Daily* (Dec. 7, 2017).

12 Matt Hourihan and David Parkes, "Federal R&D Budget Trends: A Short Summary," American Association for the Advancement of Science (January 2019).

13 Sheldon L. Richman, "Ronald Reagan: Protectionist," *The Free Market* 6, no. 5 (May 1988).

14 Ibid.

15 Larry Schweikart and Lynne Doti, *American Entrepreneur: A History of Business in the United States* (American Management Association 2009), 386.

16 Bob Davis et al., "Taiwan Firm to Build Chip Factory in U.S.," *The Wall Street Journal* (May 14, 2020).

17 Mike Rogoway, "Intel confirms plans for huge Oregon factory," *The Oregonian* (February 5, 2019).

18 Martin Baccardax, "TSMC Plans $12 Billion Arizona Plant, Will Create 1,600 Jobs in Latest U.S.-China Tech Skirmish," *The Street* (May 15, 2020); author's calculation.

19 Ratio of total corporate assets to aggregate Earnings Before Interest and Taxes as reported by Bloomberg

20 Ratio of total corporate assets to aggregate Earnings Before Interest and Taxes as reported by Bloomberg.

21 World Economic Forum/Statista. World Economic Forum, "The Countries with the Most STEM Graduates (2016)," Statista.

22 In 2016, the U.S. graduated 200,721 students with bachelor's degrees in engineering and computer science, whereas China graduated 1,180,000. National Science Foundation, "Table S2-15. S&E first university degrees, by selected region, country, or economy and field: 2010-16," National Center for Science and Engineering Indicators (NCSES).

23 National Science Foundation, "Table S2-10. Doctoral degrees awarded, by citizenship, field, race, and ethnicity: 2000–17," National Center for Science and Engineering Indicators (NCSES).

COMMENT

Willy Shih

As David P. Goldman points out in his foreword, government funding for basic scientific research is an important public good that the U.S. has benefited from enormously during the postwar era. Support for funding was built on the consensus that science had won the war – not just the atomic bomb, but technologies like radar, the production of antibiotics like penicillin, and the digital computer. Other countries have seen the benefits and have followed suit with significant investments of their own in basic research. While NASA and DARPA have been important forces on the forefront of many pioneering innovations, we should not overlook the extensive research support from the National Science Foundation, the National Institutes of Health, and the Department of Energy (as a successor to the Atomic Energy Commission and the Energy Research and Development Administration) and the National Labs, all of which have contributed substantially to America's global leadership.

The grant of subsidies to competing manufacturers in China, and the tolerance for losses among the firms that ultimately do not survive the competition, leads to a robust Darwinian pressure that produces strong global competitors.

I also want to reinforce Goldman's comments on subsidies for capital-intensive industries. This is one of the most pernicious issues in world trade. While Chinese companies have benefited considerably, there are several challenges with addressing this issue:

In China there is a general lack of transparency on the size and terms associated with most subsidies. Many are provided by provincial or local governments and can take the forms of land grants or the construction and equipping of factories. It is very difficult to assess their magnitude, but I have seen cases that include a substantial majority of the capital costs.

The grant of subsidies to competing manufacturers in China, and the tolerance for losses among the firms that ultimately do not survive the competition, leads to a robust Darwinian pressure that produces strong global competitors. This kind of portfolio approach parallels the way venture capitalists invest, but in the United States there is little to no tolerance for the inevitable failures (e.g., Solyndra) that a public investment approach would bring. That means we can't pursue high-risk, but potentially high-reward, breakthrough innovations. There is little real comprehension in the U.S. of how the Chinese mod-

Willy Shih comment, continued

el works, which should be a prerequisite to understanding how to compete with it. In that regard, "Made in China 2025" investments in semiconductors would be perceived as very wasteful, but substantive strategic capabilities will (and already have) come out of it.

It's hard to be critical of subsidies when we use them ourselves. Most countries, including the U.S., participate in subsidy or tax benefit schemes. Maybe it's a question of scale. When the State of Wisconsin provided $4 billion in subsidies to Foxconn to build a Gen 10.5 LCD factory in the southeastern part of the state, my reaction was the state had not ponied up enough to be a serious player in that game. If it really wanted a Gen 10.5 factory located in the state, Wisconsin should have put up at least $6 billion and included critical suppliers like Corning in the largesse.

Goldman's recommendations to provide generous support for R&D and to invest in education and worker training represent a leadership strategy that plays to American strengths. It has some chance of restoring our position in fields where we can invest in new manufacturing process technologies that might obsolete existing competition. Equally importantly, we should be forward-looking and strengthen our leadership in areas where we are still strong—biologics, aerospace, advanced materials, and others—with a special focus on general purpose platform technologies. This was one of the pillars of the President's Council of Advisors on Science and Technology January 2017 report on ensuring long-term U.S. leadership in semiconductors: to catalyze transformative semiconductor innovation over the next decade. If we look forward and invest in future platform technologies, we can maintain a position where the world turns to us for leadership. ■

COMMENT

Ganesh Sitaraman

The "Moving the Chains" symposium offers a variety of ideas on how to think about global competitiveness and supply chains. While I do not agree with all of the ideas offered, the conversation is essential – and common themes are emerging, such as opposition to the idea that the aim of trade policy should be efficiency, with little regard for other factors.

Rather than respond to a particular essay, I wanted to outline two other areas that are important but were not covered in the symposium.

The first is the direct public provision of goods and services. For example, the federal government has the power under existing laws to license a patented product, like a pharmaceutical drug. Public production – whether of medicines or

Ganesh Sitaraman comment, continued

other essential goods – has a variety of benefits. Domestic production creates resilience from global shocks; public capacity enables scaling up production in a crisis; public production gives government an understanding of cost structures that can serve as a "yardstick" for costs and prices in contracting decisions; and the public option can compete against private actors and push monopolists to lower their prices.

A second area is infrastructure regulation, sometimes called public utilities regulation or regulated industries law. The basic idea is that there are some businesses that serve as infrastructure, and they should be regulated to ensure public access on non-discriminatory terms. For example, the 1906 Hepburn Act prohibited railroads from owning companies that produced goods that shipped on the railways. Why? Because without a separation between the railroad and commercial activity that travels across the rails, railroad companies would be able to give special privileges to their own vertically integrated goods. Other producers would face higher costs to move their goods around. Favoritism of this type tends to build a monopoly and deprives the country of competition, innovation, and resilience. This tradition of American regulatory practice has implications for tech platforms.

These two pathways – public production and infrastructure regulation – come at the problem of weakened supply chains in a different way than many of the proposals offered in the symposium. But both can help to make America more competitive and more economically resilient. ■

The public option can compete against private actors and push monopolists to lower their prices.

RESEARCH & DEVELOPMENT

Willy Shih
Harvard Business School

Pre-competitive research consortia are vital to sparking innovation.

More than a decade ago, I pointed out the critical need to restore American manufacturing capabilities that had withered away.[1] The COVID-19 pandemic has exposed how lost capabilities have impaired our nation's ability to manufacture critical healthcare supplies, pharmaceuticals, and medical equipment, as well as our dependence on interruptible foreign sources for everything from telecommunications equipment to auto parts.

We should harness the lessons learned from the crisis to take stock of our manufacturing capabilities and rebuild them in critical areas. While we can't expect to manufacture everything ourselves, leadership in critical areas can ensure greater resilience during the next crisis and greater competitiveness for the geo-economic challenges ahead. In that spirit, I propose two key ideas for American policymakers: focus on the demand side of the equation, and foster and fund more pre-competitive partnerships.

Focus on the Demand Side

Most prescriptions for rebuilding American manufacturing focus on the *supply side*,

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A more sustainable approach would be to focus on the demand side, growing domestic demand in early markets for new technologies as a way of incenting the growth of local supply.

incenting manufacturers to move production to the U.S. and then potentially erecting trade barriers to protect resulting higher-cost positions. A more sustainable approach would be to focus on the *demand side*, growing domestic demand in early markets for new technologies as a way of incenting the growth of local supply.

If we look historically at industries in which the U.S. has led—automobiles in the 1920s, computers, telecommunications, integrated circuits (ICs), the Internet, products using the global positioning system (GPS)—large early markets drove consumption and gave American firms incentives to innovate. Often, as was the case for ICs and GPS, it was the U.S. military or the space program. A recent example is NASA and the Air Force securing long-term contracts with SpaceX to deliver payloads to orbit—including Crew Dragon in May—and providing cash flow for the company to develop innovations like reusable vehicles that have changed the game in space launch.

Demand provides economic motivation to manufacturers, and proximity to production is valuable for early-stage products for which dominant designs haven't emerged. Close interactions between product developers, manufacturers, and consumers facilitate rapid iterations and product refinements. Having a large home market in which to "practice" is also a significant advantage. As long as consumers will buy interim products as the manufacturer improves its production processes, demand can generate the cash a firm needs to grow, learn, and improve. A large domestic market served the United States well during the twentieth century, and it is now a substantial advantage for Chinese manufacturers.

Foster and Fund Pre-Competitive R&D

Much has been written about the economic benefits of public funding of basic research.[2] American strength in sectors like life sciences and biotech, materials, computing, communications, and aerospace

came from public investments in basic research. But in many fields today—especially those at the frontiers of science and technology—investment needs to bring pioneering discoveries to market that are beyond the reach of even the best-funded firms. The U.S. should encourage the formation of more pre-competitive research consortia as a way of helping to commercialize innovations in critical areas to cement global leadership.

In pre-competitive R&D, partners work together on a common technology platform with which they intend to independently develop differentiated downstream products. This pre-competitive model maintains proprietary access to the intellectual property and learning that might result. The obvious benefit is increased research efficiency, increasing scale and scope while reducing duplication through the pooling of resources and capabilities.[3] Participants share knowledge and mitigate risk, leveraging a larger scale and scope of information, resources, and capabilities across firm boundaries. They share lab space, instruments, tools, materials, and all the infrastructure for collaboration. They also share people, and this has the benefit of broadening the pool of ideas. For firms where the incentive to do research may not necessarily be high, being able to tap into a broader knowledge base widens exploratory activities and the development of new ideas.[4]

Two circumstances, in particular, favor such collaborations: when the scale and complexity of R&D needed to remain competitive outpace individual firms' in-house capabilities, and when the target area for partnering is some distance from downstream product markets, focusing on enabling technologies rather than specific market segments or niches.

An example of such a collaboration was SEMATECH, established in 1987 as a way for U.S.-based semiconductor manufactur-

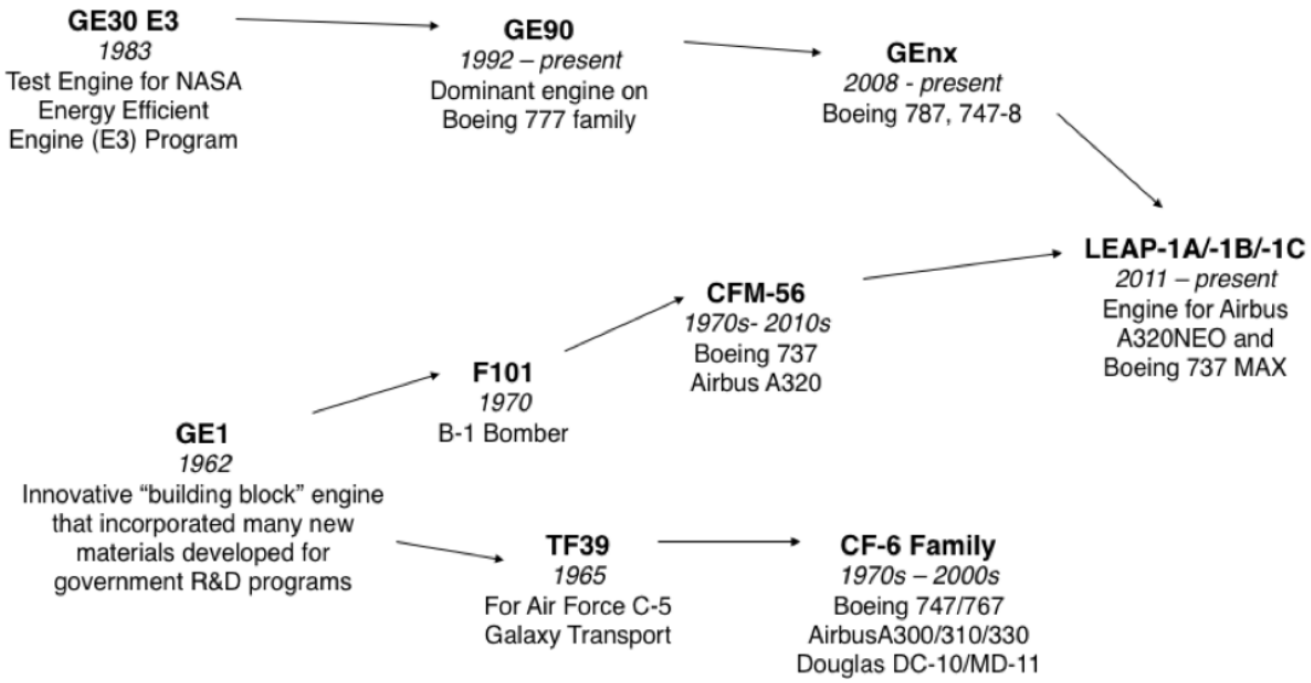
ers to respond to Japanese competitors. The 14 participants felt that no firm acting on its own could compete effectively, so pooling resources and sharing technology had the potential to increase the effective scale of American industry and to recover market share.[5] Initial goals included industry infrastructure—especially the capabilities of specialized equipment and materials suppliers—manufacturing processes, and factory management. The founders agreed to contribute in proportion to their revenues for an initial period of five years, and the federal government matched the sum, leading to an overall budget of close to $1 billion. Work initially focused on reducing the feature size of transistors on chips, technology that all of the partners would benefit from and that each could employ to compete in downstream product markets. While SEMATECH has evolved considerably since its founding, the pre-competitive R&D phase cemented U.S. leadership at a crucial time.

A purely commercial example with no government support was the Common Platform Alliance, in which IBM, Siemens, and Toshiba focused on process technology for making advanced semiconductors. Others who were having trouble developing competitive CMOS process technology joined, including Advanced Micro Devices—whose technology operation was spun off and became the base for Global Foundries—Freescale Semiconductor, Infineon, Samsung, ST Microelectronics, and Chartered Semiconductor. The Alliance helped Samsung and Global Foundries develop their respective competitive positions in the industry—especially in the move to high-k metal gate designs around 32 nm. Though the Alliance has wound down and been superseded by collaborative efforts at SUNY Albany, it served the partners well for a number of years, giving them a far better level of process capability than they could have developed alone and at a significantly lower cost.

This type of pre-competitive collaboration is common in Europe. For example, the Interuniversity Microelectronics Centre (IMEC) in Belgium is a world-leading innovation hub in nanoelectronics that

An example of such a collaboration was SEMATECH, established in 1987 as a way for U.S.-based semiconductor manufacturers to respond to Japanese competitors.

Exhibit 1: GE Aviation Engine Roadmap: Key Technologies



counts organizations like DARPA, Intel, and TSMC as partners. The BioPro consortium in Denmark focuses on advanced fermentation-based manufacturing processes of biological compounds, adding to the strength of the fermentation cluster around Copenhagen. The partners' end-product markets include pharmaceuticals, food ingredients, industrial enzymes, energy production, and hydrocolloids—all distinctly different with minimal overlap. Many such European programs serve narrow market niches and help participants sustain global competitiveness.

NASA's Aircraft Energy Efficiency program of the late 1970s offers an outstanding example of the impact of government support for such collaborations.[6] It came out of a hearing before the Senate Aeronautical and Space Sciences Committee in the wake of the 1973 Arab Oil Embargo, which painted a dire picture of "immediate crisis condition," "long-range trouble," and "serious danger." The program's objective was to establish enabling technology that aircraft manufacturers could commercialize at their own expense. NASA contracted with Pratt & Whitney and GE to do early-stage research on advanced propulsion systems for subsonic aircraft, with involvement from Boeing, Lockheed, and McDonnell-Douglas. This learning platform proved to be immensely valuable to the companies and U.S. global leadership more broadly. The Experimental Clean Combustor program sponsored early development of the Dual Annular Combustor at GE, which went into the CFM-56 engine, the most commercially successful

turbofan engine in history. The Advanced Subsonic Technology (AST) and Ultra Efficient Engine Technology (UEET) Programs helped to advance the basic science and secure long-term global leadership for the U.S. in the large turbofan category. **Exhibit 1** shows government support for key parts of GE's product roadmap. The program was pre-competitive research at its best.

The National Science Foundation reports that R&D expenditures have grown more rapidly in several Asian economies, particularly China, than in the U.S.[7] While the U.S. continues to spend the most on R&D of any single country, the share funded by the federal government has declined since 2000. Because businesses are the largest funder of R&D, federal funding for pre-competitive collaborations in important new areas, as in the examples described above, could foster or accelerate the development of important manufacturing capabilities in industries that will be important in the future.

Policy Recommendations

As the COVID-19 pandemic recedes and the country considers infrastructure spending to provide an economic stimulus, federal policymakers should aggressively target some of this spending to generate stable domestic demand for key platform technologies and increase funding of pre-competitive R&D programs aligned with those areas. This will boost the growth of domestic manufacturing capabilities, contributing to longer-term economic sustainability.

As policymakers consider other sectors for investment, they should be forward-looking and identify "platform" technologies that will underpin innovations in a broad range of products and services.

Biomanufacturing. The U.S. lead in biotechnology is the product of extensive pre-competitive research sponsorship. Funding for the Human Genome program made possible something that was beyond the means of individual labs and companies, and the interdisciplinary effort mounted at NIH and places like MIT and Harvard, among others, secured this country's position in the field. Federal funding for places like MIT's Department of Chemical Engineering developed processes to manufacture biopharmaceuticals. Today, we do this better than any other nation on earth.

The U.S. should extend its position and invest in more precompetitive R&D in biomanufacturing. We could incent the use of a new generation of process-intensified bioreactors to make biopharmaceuticals, and traditional as well as recombinant vaccines. We could develop the demand side by building national strategic stockpiles for key medicines or purchasing vaccines as part of assistance packages to underdeveloped countries. We should look at fermentation-based technologies, engineered microbial cell factories, flexible approaches to purification, and plant-based production concepts. Continuous flow manufacturing, another innovation in chemical processing, might enable us to deploy new lower-cost process technology, not only rendering existing competitors' installed capacity obsolete but also making the U.S. small molecule generic drug supply chain far more resilient. DARPA has taken this approach with its Battlefield Medicine program by funding the development of flexible miniaturized manufacturing platforms and methods for producing multiple small-molecule APIs from shelf-stable precursors in order to meet specific medical needs as they arise.[8] Driving the domestic commercialization and adoption of such technologies with favorable tax treatments or incentives would be a great way to lessen future dependencies while building up strategic capabilities in the sector.

Grid Modernization. Another good target for federal spending is electrical grid modernization, a known strategic vulnerability. This is already part of a Department of Energy initiative, and funding to speed implementation would support the transition to a distributed generation architecture better suited to renewables technologies. It would drive domestic consumption of power semiconductors and the development of microgrids, sensing technologies, and high-voltage DC transmission systems, as well as new services.[9] Similarly, funding for interconnecting the three major U.S. grids[10] could drive the replacement of equipment that is more than 40 years old and encourage substantial energy- and operating-reserve sharing.[11] Domestic content rules for equipment or tax abatements would also drive domestic capability development.

As policymakers consider other sectors for investment, they should be forward-looking and identify "platform" technologies that will underpin innovations in a broad range of products and services. Examples might include secure communications (especially millimeter wave, 6G technology), high-performance materials (e.g., high-temperature superalloys and composite materials), next-generation semiconductor technology (e.g., chiplets, heterogeneous integration, advanced photonics, and new materials like Group III-V), energy storage technology, next-generation architectures to support artificial intelligence and new computational applications, and genomics-based medicine. Policymakers should also convene leaders in the scientific community to

advise government efforts and take a portfolio approach to public investments, recognizing that some failures are inevitable and that it will not be possible to predict everything.

Pre-Competitive Program Design Considerations

Pre-competitive R&D consortia need to include leading companies, universities, and government research labs that are working at the frontiers of technology. This is not to exclude some firms; the intent of such collaborations should be to advance the frontier on commercialization, not act as a training ground for developing base capabilities. That should be the work of other types of partnerships.

While some companies form alliances and joint ventures, many shy away from activities that are too close to commercialization due to risks associated with antitrust or competition laws.[12] The core question is the antitrust treatment of research joint ventures. The Senate Judiciary Committee noted in a 1984 investigation that antitrust challenges have "been frequently cited by industry to explain the reluctance to undertake such activity."[13] The National Cooperative Research Act of 1984 was designed to reduce this risk for research joint ventures and standards organizations. What about pre-competitive collaborations that target the shared development of a supply base? For example, the Institute for Advanced Composites Manufacturing Innovation (IACMI) is focused on energy-efficient manufacturing of polymer composites. Such initiatives could be looked at as a form of buying cooperative and thus could have been treated as a group boycott and subject to per se invalidity under the Sherman Antitrust Act (e.g., *United States v. Gen. Motors Corp.*, 384 U.S. 127, 145 (1966)). But U.S. courts have looked more broadly at effects on markets and whether a particular initiative seemed designed to increase economic efficiency and render markets more, not less competitive. IACMI, if successful, would foster substitution of advanced composites for traditional materials and easily meet that test.

Our Future Depends on Investments We Make Today

Restoring manufacturing capabilities in the United States will require many steps taken by the private- and public-sector in concert. Doing so will be critical not only for ensuring the nation's economic resilience, but also for securing its technological supremacy going forward. Policymakers and industry practitioners have been right to focus on supply-side solutions, but they should not ignore the demand-side factors necessary to motivate manufacturers and foster long-term sustainable competitive positions. A strategic effort to invest in pre-competitive R&D should be a top priority for the United States. Our future competitiveness may depend on it. ■

Endnotes

1 Gary Pisano and Willy Shih, "Restoring American Competitiveness," Harvard Business Review 87, nos. 7/8 (2009).

2 See: K.J. Arrow, "Economic Welfare and the Allocation of Resources for Invention," in *Readings in Industrial Economics* (London: Palgrave, 1972), 219-236; N. Rosenberg, "Why Do Firms Do Basic Research (With Their Own Money)?" in *Studies On Science And The Innovation Process: Selected Works of Nathan Rosenberg* (2010), 225-234; *National Innovation Systems: A Comparative Analysis*, ed. R.R. Nelson, (New York: Oxford University Press, 1993); R. R. Nelson, "Why Should Managers Be Thinking about Technology Policy?" *Strategic Management Journal* 16, no. 8 (1995); OECD Science, Technology and Industry Outlook 2008, Organisation for Economic Co-operation and Development (OECD); K. Pavitt, "What Makes Basic Research Economically Useful?" *Research Policy* 20, no. 2 (1991); K. Pavitt, "The Social Shaping of the National Science Base," *Research Policy* 27, no. 8 (1998); A.J. Salter and B.R. Martin, "The Economic Benefits of Publicly Funded Basic Research: A Critical Review," *Research Policy* 30, no. 3 (2001).

3 J.S. Altshuler et al., "Opening Up to Precompetitive Collaboration," *Science Translational Medicine* 2, no. 52 (2010).

4 P. Dasgupta and P.A. David, "Toward a New Economics of Science," *Research Policy* 23, no. 5 (1994); R.R.Nelson, "The Simple Economics of Basic Scientific Research," *The Journal of Political Economy* 67, no. 3 (1959).

5 L.D. Browning, "Building Cooperation in a Competitive Industry: SEMATECH and the Semiconductor Industry," *Academy of Management Journal* 38, no. 1 (1995).

6 M. Bowles, "The Apollo of Aeronautics: NASA's Aircraft Energy Efficiency Program, 1973-1987," NASA (2010).

7 B. Kahn et al., "The State of U.S. Science and Engineering 2020," National Science Foundation (2020).

8 K. Duggan, "Battlefield Medicine," Defense Advanced Research Projects Agency.

9 2018 Grid Modernization Initiative Peer Review, U.S. Department of Energy (2020).

10 The U.S. has three major grids, the Eastern Interconnect, Western Interconnect, and Texas with its own grid. Equipment at the connection points is nearing the end of its useful life. Because demand peaks occur later in the West, a national grid would offer better demand sharing and peak load management, and could make more effective use of wind and solar generation in the west.

11 D. Wagman, D, "It's Time to Tie the U.S. Electric Grid Together, Says NREL Study," *IEEE Spectrum* (2018).

12 R. Gulati, "Alliances and Networks," *Strategic Management Journal* 19, no. 4 (1998); T. Khanna et al., "The Dynamics of Learning Alliances: Competition, Cooperation, and Relative Scope," *Strategic Management Journal* 19, no. 3 (1998); D.C. Mowery, "Strategic Alliances and Interfirm Knowledge Transfer," *Strategic Management Journal* 17 (S2) (1996).

13 G.M. Grossman and C. Shapiro, "Research Joint Ventures: An Antitrust Analysis," *Journal of Law Economics, and Organization* 2, no. 2 (1986).

COMMENT

David P. Goldman

As an afterthought to Willy Shih's and Terrence Keeley's excellent essays on R&D and infrastructure, it may be helpful to consider the overlap of these two subjects.

One critical area of infrastructure where the U.S. lags dramatically is 5G mobile broadband. Adjusted for land mass and population, China is outspending us three to one. Part of the reason for our neglect of this game-changing technology lies in the fact that we view mobile broadband as mainly a consumer technology, whereas China views it as industrial infrastructure. 5G is superfluous for streaming video and other consumer applications, but it makes possible a range of other technologies, including autonomous robotic networks, autonomous vehicles, telemedicine (including remote surgery), and robotic mining. In that respect, 5G is comparable to 19th-century railroads which, in the main, were unprofitable as standalone businesses, but transformed every facet of economic life. Until the advent of the railroad, large-scale mechanized farming was not viable because animal-based transport limited the range of distribution to about 50 miles. Once the railroads arrived, farm machines invented a generation before went into mass production and transformed American agriculture.

5G is a leading (although surely not the only) example of a technology that should be viewed as public infrastructure and subsidized accordingly. We can only envision a few of the transformational new technologies that 5G will make possible. In that respect, it falls under both Shih's and Keeley's topics. Dr. Henry Kressel has proposed the creation of a national telecommunications authority to promote R&D and provide infrastructure subsidies in mobile broadband. A central authority of some sort is required to sort out numerous problems, such as the assignment of radio spectrum, the creation of standards (including the delicate problem of negotiating such standards with China, the market leader), and the promotion of funding for R&D and construction.

There are many ancillary issues in which government support will be required to employ such infrastructure optimally. The application of artificial intelligence to health care, now one of China's top prior-

5G is a leading example of a technology that should be viewed as public infrastructure and subsidized accordingly.

David P. Goldman comment, continued

ities, has been delayed in the United States due to privacy protections for medical records. Google, IBM, Microsoft, and other American companies are eager to develop this field but face regulatory obstacles.

I agree strongly with Shih's view that the Department of Defense has a central role to play in funding basic R&D. I would add that the fact that weapons innovation often challenges the frontier of physics is particularly conducive to fruitful basic research. Still, it is important that a national strategy for infrastructure should include high-tech infrastructure (of which 5G is the most important example) and that the funding of high-tech infrastructure should support R&D in the new technologies made possible by that infrastructure. ■

COMMENT

Rob Atkinson

Willy Shih's essay "On Research and Development" provides critical lessons and advice for U.S. policymakers seeking to ensure that the U.S. economy does not fall behind China's technologically. He is right that, absent a more active role for the federal government in R&D, it is likely that the United States will lose its lead in innovation – along with its military and economic advantages.

After all, a major reason for America's innovation lead was that, in the early 1960s, the U.S. government invested more in R&D than the rest of the world's governments and businesses did combined. That gave American companies a giant head start as much of this funding went to companies developing technologies for the Pentagon and NASA or to institutions that became world-class research universities pumping out groundbreaking discoveries and top talent.

But that is just a wonderful mirage in the rearview mirror. The U.S. now ranks a pitiful 28th among OECD nations in government funding of R&D at research universities as a share of GDP.

Federal funding for R&D is no better. Indeed, in 22 of the 28 years between 1990 and 2018, federal R&D spending has made up a smaller share of GDP than the year before. The federal government invested just 0.61% of GDP in 2018, the lowest level since before Sputnik.

And when it comes to tax incentives for R&D, the U.S. is hardly on the board. In 2000, the United States ranked 10th among OECD members. By 2008, its ranking had fallen to 18th, and by 2016 it was 25th. The 2018 rankings show the United States tied for 26th among OECD members and 32nd among all countries included in the report.

Despite America's spirit, our entrepreneurs cannot hope to compete effective-

Rob Atkinson comment, continued

ly with Chinese companies that are generously supported by Beijing. A recent study estimated that the Chinese government paid for 22.2% of business R&D in 2015, with 95% of Chinese firms in six industries receiving government cash—petrochemicals, electronics, metals and materials, machinery and equipment, pharmaceuticals and biotechnology, and information technology. In fact, nearly 25% of all R&D expenditures in China come in the form of government subsidies to firms. The U.S. should not copy the distortive Chinese model, but as Shih rightly proposes, it should invest more in pre-competitive, industry-led research partnerships. If Congress appropriated $85 billion per year to support these kinds of partnerships, the U.S. would match China's funding.

Shih's prescription of big federal procurement projects that would spur innovation, such as electric grid modernization, is also right on the mark. These initiatives, if done well and with prohibitions on bids from Chinese companies, would not only address key national needs, but spur domestic innovation and production.

If Congress can spend $3 trillion this year to address the COVID-19 pandemic, it can and should spend at least $100 billion per year through a more generous R&D tax credit, more direct funding of industrially relevant R&D, and demand-led investments in projects like a modernized electric grid. ■

If Congress appropriated $85 billion per year to support pre-competitive, industry-led research partnerships, the U.S. would match China's funding.

TAX INCENTIVES

Rob Atkinson
Information Technology & Innovation Foundation

A tax credit for domestic investment is the best way to reduce production costs.

Paul Krugman may insist that "the notion that nations compete is incorrect," but reality proves him wrong. Countries not only compete, but increasingly do so for high value-added, innovation-based industries, such as advanced machinery, aerospace, biopharmaceuticals, semiconductors and computing, software, and automobiles. For example, the Made in China 2025 plan identifies eight key industries in which Beijing intends to win—and these do not include plastic toys and soybeans. If the United States is not only to avoid losing this competition—and suffering the myriad economic, military, and social consequences of defeat—but also to win back offshored supply chains and boost exports, it must turn the tax code into a tool for technological competitiveness and reshoring.

Checking the Score

Nations use a number of strategies to gain global market share in advanced industries, including intellectual property theft and forced tech transfer. But a common approach is to lower advanced industry firms' costs through a panoply of tools. China is the master, deploying the equivalent of hundreds of billions of dollars in

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subsidies to its national champion firms. In 2019, for instance, the Chinese government established a second fund of $29 billion to subsidize domestic semiconductor companies.[1] Chinese subsidies go beyond cash injections. They include tax breaks, low-interest and forgivable loans, equity injections, cheap land and energy, and other incentives. In some industries the result is massive: government alone accounts for more than 30% of the revenues of China's largest two semiconductor firms.[2]

Any CEO will tell you that competing with a subsidized foreign competitor is difficult. The subsidized competitor can lower its prices and use this advantage to gain market share at the expense of rivals. Unless the disadvantaged firm decides to move its operation to the country providing the subsidies in hope that it qualifies, there are only three ways to retain its competitive position: scale, innovation, and management. The view among most economists and pundits is that U.S. firms have advantages in all three and that these outweigh any disadvantages from foreign subsidies.

This is wishful thinking at best. First, China's captive market is huge, providing the same—if not greater—economies of scale than U.S. firms enjoy. The Chinese domestic market is already vast and growing, and the Belt and Road Initiative has only expanded its overseas markets. Second, China is not destined to remain a distant follower in innovation. U.S. policymakers have already made the mistake of taking America's lead in innovation for granted. From the 1970s to 1990s, they assumed that nations like Japan, South Korea, and Taiwan could not be global innovation leaders. But as they soon learned, fast followers can become leaders. China is already catching up. As the Information Technology and Innovation Foundation has shown in an analysis of 36 indicators of national innovation, China is catching up to the United States, and in some areas like 5G, mobile payments, and drones, it is already ahead.[3] Third, while the U.S. is ahead of China in management quality, the gap has closed over the last decade from 21% to 18%. That gap should continue to close as younger Chinese managers, many trained in world-class business schools, ascend China's corporate ranks over the next two decades.[4]

In other words, it is not—and was never—safe to assume that U.S. advanced industries will maintain global market share, absent some change in policy.

In other words, it is not—and was never—safe to assume that U.S. advanced industries will maintain global market share, absent some change in policy. If our traditional advantages of scale, innovation, and management no longer suffice, then Congress must find a way to lower the costs for leading American firms if they are to remain competitive in advanced industries. Otherwise, other nations, especially China, will force even the best U.S. firms into a dilemma: offshore even more production or else lose significant market share, potentially going out of business. Either way, the U.S. economy is hurt.

Reviewing the Cost-Reduction Playbook

So how to reduce costs? There are three potential approaches—each with its own unique drawbacks and advantages.

The first approach is lowering the value of the dollar. Given the United States' $617 billion trade deficit, the dollar is clearly overvalued, making U.S. exports more expensive and imports cheaper. There are multiple ways to bring down the value of the dollar. One is to place a market access charge on foreign purchases of U.S. stocks, bonds, and other assets, as Senators Baldwin (D-WI) and Hawley (R-MO) have proposed.[5] While a weaker dollar would help to bring back supply chains and boost exports, it would not be enough, particularly as China would likely ramp up subsidies and other unfair practices. Moreover, it would do little to spur productivity growth and innovation.

A second approach is direct subsidization. Subsidies, such as funding more pre-competitive R&D, would help, especially given that the federal government invests less in R&D as a share of GDP than it did prior to Sputnik. But these only help firms indirectly. Direct subsidies, such as Japanese Prime Minister Shinzo Abe's proposal to pay firms to reshore production, are effective, and Congress should establish such a program targeted to helping to bring back critical, advanced technology industries, such as semiconductors.[6] But there is insufficient political will to do this at the necessary scale.[7] And, like currency value reduction, reshoring subsidies do little to spur productivity growth and innovation.

The third tool is the tax code. Tax incentives, in particular, can directly help manufacturers and other export industries, primary targets of a reshoring strategy. Despite the difficulties of WTO compliance if targeting manufacturing, tax incentives have clear advantages. They not only reduce costs, expanding both reshoring and exporting, but also spur investment in key factors driving productivity growth and innovation. They are relatively easy to administer and avoid the chimera of picking particular firms as winners. If set at the right levels, they can also be a powerful incentive to change business behavior.

U.S. policymakers should pursue all three of these approaches: devalue the dollar, issue direct subsidies, and reform the tax code. But reforming the tax code—and designing tax incentives, in particular—presents the fewest drawbacks and greater advantages.

Tackling Tax Incentives

What kind of tax incentive should be used? America's ideological camps are divided over the question. Conservative supply-siders favor lowering taxes on capital gains, dividends, and high-income earners, which they imagine will boost savings and investment.[8] But America's problem is not a lack of capital—the Chinese will loan us as much as we want—it's a lack of demand by firms for investment capital. Because liberal populists view the world through a fairness lens, they see the answer to social injustice as raising taxes on big companies (after all, for them, small neighborhood firms are what really matter). That may or may not serve social justice, but it will not make American firms more competitive.

Meanwhile, most moderates embrace the "lower the rate, broaden the base" mantra which holds that the best tax code is one with low rates and few deductions. In their view, the pre-tax marketplace is efficient and any incentives distort the "invisible hand." As the Simpson-Bowles Commission asserted, "The [tax] code presents individuals and businesses with perverse economic incentives instead of a level playing field."[9] Congress followed this advice when it scaled back the R&D tax credit in 2017 with the Tax Cut and Jobs Act. But the claim that tax incentives are a form of wasteful, special interest-driven spending, or "corporate welfare," is ideological, not evidence-based.

The complaint that tax incentives distort firm behavior and reduce economic welfare misses the point: government should want the firms located in their jurisdiction to do certain things that maximize the national interest. And because firms cannot capture all of the value from investments in R&D, workforce training, as well as machinery, equipment, and software, they

underinvest in these activities relative to what would otherwise maximize economic welfare. For example, companies investing in research, on average, capture less than half of the returns from that research, even with robust intellectual property protection,[10] and the same is true for investments in skills and equipment.[11] As Canadian government economist Aleb ab Iorwerth writes, "there is no presumption that distortions are necessarily welfare-reducing. Distortions that favor the contributors to long-run growth will be welfare-enhancing."[12]

The tax code should be focused on company demand for capital. It should reduce the effective tax rate for companies, including large corporations, when they invest in research and development, capital equipment, and workforce training. In other words, the tax code should incent American companies to support the three main building blocks of productivity growth, innovation and competitiveness.

While the lower corporate tax rate Congress established in 2017 helped, it is not enough. An across-the-board rate reduction is not a particularly strong incentive to make the kinds of critical investments needed in the United States to ensure competitiveness and boost reshoring and exports. Direct tax incentives tied to actual investment are better.

When it comes to using the tax code to spur competitiveness, the United States is a laggard. Many nations have adopted investment tax credits. But the United States eliminated its credit in 1986, after neoclassical economists like Larry Summers argued they were distortionary—though Summers did admit that an investment tax credit boosted overall growth.[13] And while the United States has long had an R&D tax credit, it is anemic, with 25 OECD nations providing a more generous incentive.[14]

The United States can no longer afford to fall behind. It must create a new, more generous tax incentive.

The American Innovation and Competitiveness Tax Credit

To limit further deterioration of U.S. advanced industry competitiveness, Congress should enact an American Innovation and Competitiveness Tax Credit for expenditures made in the United States on R&D, machinery and equipment (including software), and workforce training. Any such incentive should be modeled on the current Alternative Simplified Credit for R&D which provides a credit of 14% of expenditures on R&D in excess of 50% of base period expenditures.

It is not clear what the optimal credit level should be. One consideration might be that the effective U.S. tax subsidy for R&D is just 42% of the median of nations with an R&D tax subsidy.[15] On the other hand, any incentive would have to address fiscal realities of lost tax revenues—at least in

> ***Many nations have adopted investment tax credits. But the United States eliminated its credit in 1986, after neoclassical economists like Larry Summers argued they were distortionary.***

the short run. As such, it seems reasonable to set the rate of this new credit at 30% (of expenditures in excess of 50% in the base period). Thus, if a firm invested an average of $10 million in R&D, workforce training, and new machinery over the last 3 years (the base period) and in year 4 invested $12 million, it would receive a credit of $2.1 million (30% of 7 million).

This rate would bring firm discount rates more into line with the *actual* cost of capital, rather than the higher rates most firms in the U.S. appear to use.[16] As a result, the tax incentive would encourage investments that would otherwise fail to meet corporate financial hurdle rates. For example, assume a company has an opportunity to invest $1 million in a machine that reduces annual labor and other costs by approximately $200,000. The investment would break even after 4 years and 10 months, longer than most companies' investment time horizons. But with the tax credit, the breakeven point would be 3 years and 5 months. In other words, a tax credit would make significantly more investments attractive to American businesses.

In the long run, the tax credit would lower the cost of returning production stateside and attract foreign direct investment, while also spurring innovation and productivity growth. It would have the added benefit of encouraging more firms to become high-performance work organizations, where investments in new process technologies and worker skills go hand in hand.

The American Investment and Innovation Tax Credit is not a silver bullet for reversing America's competitiveness slide. Other steps, including better workforce training, trade policies, government funding of R&D, and regulatory reform, are all needed. But without such a tax credit to help level the playing field, these other measures will not be enough. ■

Endnotes

1 Yoko Kubota, "China Sets Up New $29 Billion Semiconductor Fund," *The Wall Street Journal* (October 25, 2019).

2 "Measuring distortions in international markets: The semiconductor value chain," OECD Trade Policy Papers No. 234.

3 Robert D. Atkinson and Caleb Foote, "Is China Catching Up to the United States in Innovation," Information Technology & Innovation Foundation (ITIF) (April 2019).

4 Authors calculations from: Nicholas Bloom and John Van Reenen, "Why Do Management Practices Differ across Firms and Countries?" *Journal of Economic Perspectives* 24, no. 1 (2010); and Nicholas Bloom et al., "Management as a Technology?" Harvard Business School Working Paper 16-133 (October 8, 2017).

5 "U.S. Senators Tammy Baldwin and Josh Hawley Lead Bipartisan Effort to Restore Competitiveness to U.S. Exports, Boost American Manufacturers and Farmers," Baldwin.senate.gov.

6 Asa Fitch et al., "Trump and Chip Makers Including Intel Seek Semiconductor Self-Sufficiency," *The Wall Street Journal* (May 11, 2020).

7 Robert D. Atkinson, "The Case for a National Industrial Strategy to Counter China's Technological Rise," Information Technology & Innovation Foundation (ITIF) (April 2020).

8 Robert D. Atkinson, *Supply-Side Follies: Why Conservative Economics Fails, Liberal Economics Falters, and Innovation Economics is the Answer* (New York: Rowman & Littlefield, 2006).

9 Moment of Truth: Report of the National Commission on Fiscal Responsibility and Reform, The National Commission on Fiscal Responsibility and Reform (2010).

10 Charles Jones and John Williams, "Measuring the Social Return to R&D," Quarterly Journal of Economics 113, no. 4 (1998).

11 Luke A. Stewart and Robert D. Atkinson, "The Greater Stagnation: The Decline in Capital Investment is the Real Threat to Economic Growth," Information Technology & Innovation Foundation (ITIF) (October 2013).

12 Aleb ab Iorwerth, "Canada's Low Business R&D Intensity: the Role of Industry Composition," Department of Finance Canada Working Paper 2005-03 (2003).

13 Rob Atkinson, "Could a Fed Under Larry Summers Worsen America's Investment Drought?" (September 9, 2013).

14 Joe Kennedy, "U.S. Continues to Lag Its Competitors on Tax Credits for Research and Development," Information Technology & Innovation Foundation (ITIF) (September 13, 2019); Rob Atkinson, "Hearing on Tax Reform Options: Incentives for Capital Investment and Manufacturing," Information Technology & Innovation Foundation (ITIF) (March 6, 2012).

15 John Lester and Jacek Warda, "Assessing the U.S. R&D Credit in the International Context," Information Technology & Innovation Foundation (ITIF), forthcoming.

16 Rachelle C. Sampson and Yuan Shi, "Are US Firms Becoming More Short-Term Oriented? Evidence of Shifting Firm Time Horizons from Implied Discount Rates, 1980-2013," SSRN (October 2, 2019).

COMMENT

Matt Stoller

Reshoring supply chains is a critical task, and there is an endless number of policy levers at our disposal to do so. But the key philosophical change that policymakers must make is to rethink our relationship between the state and the corporation. For too long, the American state has been the junior partner, seeking to find non-coercive ways to encourage corporate actors to act on behalf of the national interest. The result is decay, ineptitude, and historically low productivity growth. Meanwhile, the Chinese state, run by strategists with no such naive views about corporations, governs aggressively on behalf of its national interests.

With that in mind, I'd like to comment on Rob Atkinson's essay on the need for tax incentives for innovation. In it, he suggests that the American government match the Chinese government in its large-scale subsidization of research activity. We can debate the right way to design a tax code to help innovation, and there is critical work to be done on tax incentives to end offshoring. We would also be wise to remember that the American technology industry grew because the U.S. government was a large and important customer in the 1950s and 1960s. That said, the historic reason American firms innovated is not because the government provided them with resources, but because they were forced to do so by antitrust enforcement.

As scholars have recently observed, the large research labs of the 20th century were a function of aggressive anti-merger rules. Historically, many large labs were set up partly because antitrust pressures constrained large firms' ability to grow through mergers and acquisitions. In the 1930s, if a leading firm wanted to grow, it needed to develop new markets. With growth through mergers and acquisitions constrained by antitrust pressures, and with little on offer from universities and independent inventors, it often had no choice but to invest in internal R&D. The more relaxed antitrust environment of the 1980s, however, changed this status quo. Growth through acquisitions became a more viable alternative to internal research, and hence the need to invest in internal R&D was reduced.

American firms innovated not because the government provided them with resources, but because they were forced to do so by antitrust enforcement.

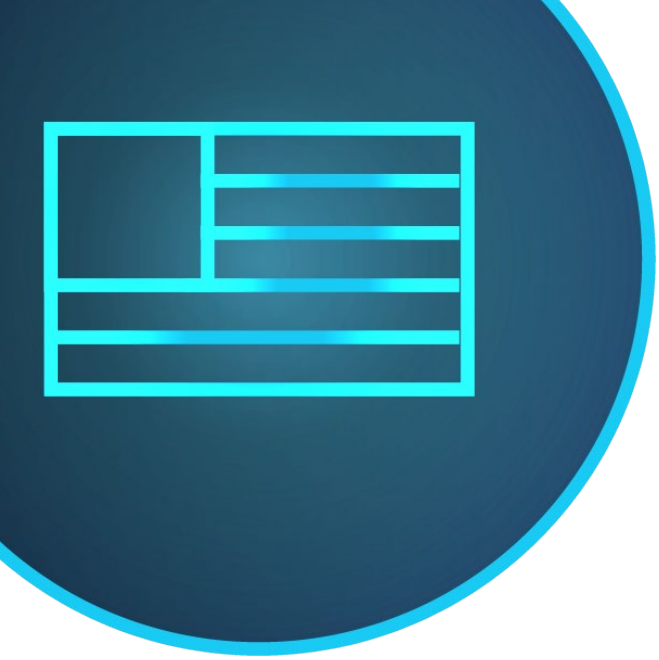
Matt Stoller comment, continued

Today, corporations do not have to innovate because the public policy framework we've developed lets them avoid doing so. Scholars also note that more aggressive intellectual property protection laws also led to a decline in R&D; why invent if you can invest in lawyers to block your competitors from doing so?

Nearly every time that a pharmaceutical corporation buys a competitor, it lays off the scientists and focuses on generating cash from existing patents. Such non-productive financial engineering was originally pioneered by Jack Welch, who slashed General Electric's research capacity because he understood that the post-1981 antitrust framework meant that market power, not quality products, was what mattered. This is not to say that mergers are never useful; there is some utility from scaling production. But we have gone way too far. It is increasingly evident at this point that American brilliance focuses on financial engineering rather than actual engineering.

Fundamentally, Atkinson and I agree that the way to change corporate behavior is to change the way that corporations make money. But puncturing new loopholes in the tax code is not going to lead to anything except more tax lawyers, unless we change our market structure to force innovation in the first place. Changes to tax laws may help, depending on the details, but what we really need are market rules, such as assertive antitrust and laxer intellectual property laws, that force corporations to compete by inventing things. ■

American brilliance focuses on financial engineering rather than actual engineering.



DOMESTIC SOURCING

Michael Lind
University of Texas

Local content requirements offer a simple intervention with benefits that its prohibitionist detractors ignore.

There is growing recognition across the American political spectrum that neoliberal globalization has been a disaster for the economy and people of the United States. During the COVID-19 pandemic, Americans discovered the extent to which the U.S. is dependent on the industry of China, a hostile great power, for basic medicines and medical equipment, among many other manufactured goods.[1] For reasons of public health and national security, the reshoring of essential supply chains to American soil is imperative. Combined with other tools of national industrial policy, local content requirements (LCRs) provide a direct, market-friendly, and effective method to achieve the goal of national independence in strategic industries.

LCRs are among the numerous tools in the toolkit of industrial policy that can be used in the service of strategies of economic development. LCRs require designated final goods to use a specified percentage of domestic value-added or domestically sourced intermediate products. LCRs can apply to all firms or be limited to government suppliers. The term "localization measures" has been used as a broader category that includes, in addition

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to classic LCRs, other measures such as requiring that data be stored and analyzed locally, conditioning bailouts, government contracts, export financing, as well as tax, tariff, and price concessions on local sourcing, and mandating that products be tested locally.[2]

LCRs have been widely used by developing and developed countries alike, including Brazil (the oil and gas industry), Russia (automobiles), South Africa (wind energy), India (solar power) and Taiwan (refrigerators and televisions). They have been deployed both by nation-states and multinational trade blocs. In addition to state and local laws, the U.S. has a number of federal laws mandating local content for defense procurement and other purposes, often with waivers at the discretion of officials.[3] The U.S.-Mexico-Canada Agreement (USMCA) negotiated by the Trump administration to replace the North American Free Trade Agreement (NAFTA) raises the North American local content of automobiles eligible for special treatment under the treaty from 62.5% under NAFTA to 75%.[4]

The Prohibitionist Campaign against LCRs

As one student of the subject has noted, "Despite their importance, economic evaluations of these policy measures are surprisingly limited."[5] Many of the studies of LCRs are polemical in nature, employing the tone of temperance movement pamphlets denouncing the evils of alcohol. For instance, a 2016 paper from the Peterson Institute for International Economics (PIIE) speaks of "the United States' notorious Buy American statutes."[6] A 2009 PIIE analysis is entitled "Buy America: Bad for Jobs, Worse for Reputation."[7] *Notorious… reputation…* The sinners must be shamed into sobriety.

Typical of this mentality was an announcement from the Obama administration's office of the U.S. Trade Representative in 2013: "Last week's CTI meeting marked the first time the economies of APEC collectively addressed LCRs to gain a better understanding of how *they distort trade and investment flows* [emphasis added]." The claim that LCRs distort "natural" markets is also found in a 2015 OECD study of LCRs, which claims: "Overall, LCRs *distort input markets* and potentially inhibit innovation by removing access to technologically advanced inputs, undermining efficiency gains from lower value chains [emphasis added]."[8] The underlying assumption is that the normal and sound condition of the world economy is a single market, with no "distortions" in the flows of goods, services, workers, or money across borders. But of course, such an economy never has existed and never will.

This dogmatic assumption vitiates most studies of the alleged harmful effects of LCRs. If LCRs raise any costs to consumers or producers previously reliant on imports as inputs, this is taken to prove the

If targeted policies to promote the localization of specific industries within a country are 'distortions' of the global market, then broad policies to encourage localization of industry in general must be 'distortions' as well.

existence of a harmful "distortion." But the very purpose of LCRs, along with other import substitution measures, is to "distort" trade and production by replacing an existing pattern with a new pattern. Whether the price of localizing a particular industry in the interest of national security, economic diversification, or economic growth is worth paying is a values-based policy judgment which economists *qua* economists are not qualified to make.

Some critics of LCRs will argue that, even if it were legitimate for governments to promote particular industries, they should do so by means of "horizontal" measures, such as creating a business-friendly environment, encouraging corporate social responsibility, expanding training, and investing in infrastructure.[9] But if targeted policies to promote the localization of specific industries within a country are "distortions" of the global market, then broad policies to encourage localization of industry in general must be "distortions" as well.

It is true that protectionist policies can be promoted by self-interested firms and industries. But it is also true that policies that encourage offshoring of industry or indifference to foreign mercantilism are promoted by selfish interests that benefit from them. Special interests and national interests are aligned in the case of policies that improve and diversify the domestic industrial base, but they are divergent in the case of policies that allow multinationals to profit by dismantling the nation's manufacturing ecosystem or allow foreign mercantilist regimes to rob national producers of domestic and global market share. In the words of Alexander Hamilton: "To preserve the balance of trade in favor of a nation ought to be a leading aim of its policy. The avarice of individuals may frequently find its account in pursuing channels of traffic prejudicial to that balance, to which the government may be able to oppose effectual impediments."[10]

Debating Alternatives

Because neoliberals and libertarians are opposed on principle to national industrial policy, they have as little to say about the

appropriate mix of LCRs, tariffs, or subsidies as crusading prohibitionists have to say about the relative merits of beer, wine, and vodka. But there is already an interesting debate underway among adherents of the school of political economy that Robert D. Atkinson and I have dubbed "national developmentalism."[11] Members of this school would agree that countries, as well as firms and individuals, are actors with their own particular interests in the global economy, and that national industrial policies are therefore legitimate. This debate—a pragmatic one, over the strengths and weaknesses of LCRS in particular cases and circumstances compared to the merits and disadvantages of other industrial policy measures—is the debate in which policymakers ought to be engaged: not over whether to have a policy at all, but what the policy ought to be.

Tariffs and quotas are one possible alternative to LCRs. They come in two kinds: temporary measures, used as bargaining chips to pressure trading partners into opening up their own markets, and permanent measures, intended to localize certain kinds of industrial production in the national interest, regardless of the behavior of trading partners. If the goal is to retaliate against particular instances of foreign mercantilism or to pressure trading partners into reciprocal trade liberalization, then temporary tariffs or quotas may be more effective than LCRs, which tend to be permanent.

If, however, the goal is to nurture vital infant industries, to preserve mature industries that might otherwise be lost to import competition, or to repatriate supply chains lost to private firms' offshoring strategies, then LCRs are arguably superior to tariffs and quotas. In this case, the goal of tariffs, quotas, and LCRs are the same—the permanent localization of certain industries or supply chains. But the tariffs and quotas are indirect measures that merely incentivize localization without guaranteeing it. It is simpler to mandate localization directly by means of LCRs.

If LCRs are justified by a long-term national or regional bloc development strategy—not short-term tit-for-tat trade diplomacy—they should apply equally to all trading partners, including military allies, neutrals, and rivals alike. In the absence of national security concerns, the national identity of the owners and managers of multinational firms compelled by LCRs to produce in national or bloc markets would be a matter of indifference, and foreign firms would be free to repatriate their profits from in-market production.

Compared to tariffs and quotas, then, as a policy to create or preserve permanent domestic supply chains, LCRs are more direct, simpler to administer, and potentially less diplomatically contentious.

Subsidies are another alternative approach worth considering. But they should be used with caution. Government

subsidies to favored industries—like tax breaks for domestic production of certain goods—might achieve the same goal as LCRs, but at the price of greater misallocation of investment and labor. (For the purposes of this discussion, I will define government procurement policies as a kind of LCR, rather than a subsidy).

If countries are allowed to subsidize their national champion firms to compete in global markets, but forbidden to encourage or require in-market production for goods sold in their domestic markets, the result may be escalating subsidy wars that end in global gluts in the subsidized sectors. Farm subsidies have produced "mountains of butter" and "lakes of milk" in the U.S. and EU, which are then sometimes dumped on world markets. Because of subsidization, domestic production of targeted goods would be ensured, but at the cost of oversupply, overinvestment, and wasteful misallocation of resources and labor.

Compared to tariffs and quotas, LCRs are more direct, simpler to administer, and potentially less diplomatically contentious.

In contrast, widespread reliance by countries and blocs on LCRs, rather than subsidies, to promote strategic industries would not encourage gluts. If most major countries or blocs were to use LCRs, no country could hope to use a dumping strategy to drive foreign firms out of their home markets, and in-market production, undistorted by subsidies, would not exceed in-market demand.

Another problem with subsidies is that conventional approaches—tax breaks for targeted industries, for example—reduce tax revenue, which may need to be made up by other taxes, a price that may be worth paying in the interest of national security, job creation, or productivity growth. Of greater concern should be subsidies in the form of preferential credit policies by public or private banks nudged by national governments. If used in excess, as in Japan and China, these can result in nonperforming loans in zombie financial institutions. Here, too, compared to subsidies to favored industries, LCRs may be a superior tool of industrial policy.

It is not enough for policies to be effective; they must also be politically sustainable. It is much easier for opponents to denounce tariffs as taxes than to campaign against "Buy American" policies—

although consumers and firms reliant on imported inputs may suffer similar adverse effects. Unlike subsidies, LCRs require no legislative appropriations of funds, alterations of the tax code, or special credit policies. Once they are enacted, LCRs are relatively invisible to consumers and taxpayers, but they are likely to be defended against repeal by the industries they benefit. This is a feature, not a bug, if the goal is to permanently localize part or all of those industries within national borders.

Consistency requires that any policies that incentivize firms to invest in one country rather than another—including the provision of law and order, public education, and infrastructure—should be defined as "distortionary" and prohibited by international trade treaties. As members of the national developmental school will point out, "distortionary" policy is unavoidable in policymaking. Rather than neglect some policies for being "distortionary," we should assess them on the merits of their "distortion."

Selective, strategic reshoring, not complete national autarky, should be the goal of LCRs. As noted above, local content requirements can be imposed by trading blocs like NAFTA/USMCA as well as by nation-states like the U.S. The most critical supply chains, however, should be located within national borders, where they are safe from interdiction or disruption. Replacing American dependence on Chinese producers with dependence on producers in India, Vietnam, or other Asian countries might reinforce an anti-Chinese diplomatic coalition led by the U.S., but it would do nothing to increase America's own economic independence and resilience. It is also a mistake to allow U.S. industry to become too dependent on factories in nearby Mexico, an unstable, crime-ridden country with a corrupt and unreliable government.

Of the potential tools that American policymakers can use to reshore strategic supply chains, LCRs have fewer drawbacks than other policies—including tariffs, quotas, and subsidies. Their virtue lies in their simplicity. They do not require exercises of vast discretionary authority by the executive branch. They do not require targeted allocations of public money. Nor do they require technocrats to craft detailed policies to offset specific alleged "distortions" or "externalities." The federal government simply formulates a list of which goods must be manufactured in the U.S. and allows private firms and private investors, both American and foreign, to figure out how to meet the requirements.

The LCR is a policy tool that should not be neglected. Beginning with pharmaceuticals, personal protective equipment, and critical inputs used in defense manufacturing, Congress should authorize the executive branch to designate and enforce U.S. local content requirements and to withdraw from any existing international treaties that prevent the U.S. from exercising this essential right of economic self-defense. ■

Endnotes

1 For U.S. medical imports from China, see Karen M. Sutter, Andres B. Schwarzenberg and Michael D. Sutherland, "COVID-19: Chinese Medical Supply Chains and Broader Trade Issues," CRS Report, Congressional Research Service, April 6, 2020.

2 Karan Bhatia et al., "Why General Electric is localizing production," Vox CEPR Policy Portal (June 21, 2016).

3 Kate M. Manuel et al., "Domestic Content Restrictions: The Buy American Act and Complementary Provisions of Federal Law," Congressional Research Service (September 12, 2016).

4 David Lawder and David Shepardson, "Automakers to pay $3 billion in new U.S. tariffs under USMCA: budget estimate," Reuters (December 18, 2019).

5 Francisco M. Veloso, "Understanding local content decisions: economic analysis and an application to the automotive industry," *Journal of Regional Science* 46, no. 4 (2006), 747. The most influential early study was G.M. Grossman, "The Theory of Domestic Content Protection and Content Preference," *The Quarterly Journal of Economics* 96, no. 4 (1981).

6 Cathleen Cimino-Isaacs and John Zilinsky, "Local Content Requirements: Backdoor Protectionism Spreading Under the Radar," Peterson Institute for International Economics (PIIE) (July 22, 2016).

7 Gary Clyde Hufbauer and Jeffrey J. Schott, "Buy America: Bad for Jobs, Worse for Reputation," Peterson Institute for International Economics (PIIE) Policy Brief Number PB09-2 (2009).

8 Susan Stone et al., "Emerging Policy Issues: Localisation Barriers to Trade," Organisation for Economic Co-operation and Development (OECD) Trade Policy Paper 180 (January 5, 2015).

9 Gary Hufbauer et al., "Local Content Requirements: Report on a Global Problem," Peterson Institute for International Economics (PIIE) (October 7, 2013). See also Gary Clyde Hufbauer and Jeffrey J. Schott, Local Content Requirements: A Global Problem (Washington, D.C.: Peterson Institute for International Economics (PIIE), 2012).

10 Alexander Hamilton, The Continentalist No. V, in Henry Cabot Lodge, ed., *The Works of Alexander Hamilton, Federal Edition No. 1* (New York: G.P. Putnam & Sons, 1904), 267-9.

11 Robert D. Atkinson and Michael Lind, "National Developmentalism: From Forgotten Tradition to New Consensus," *American Affairs* (Summer 2019).

COMMENT

Willy Shih

As Michael Lind points out, local content requirements (LCRs) have often been used to achieve employment, industrial development, and technology policy goals. LCRs primarily target input demand, and China has arguably been quite successful using them. One might question how much of this success was temporal because it came at a time of rapid growth of China's domestic market and thus powerful incentives for foreign manufacturers to invest and build local supply infrastructure. Chinese LCRs also translated into gains in production efficiency because they had the effect of shortening the supply chains of inputs for product assemblers while reducing input costs and improving manufacturing flexibility. Foreign input suppliers in turn could also reduce their costs and increase their sales by localizing in China. Those aspects will probably not work for the U.S. because many of the intermediate inputs will cost substantially more as part of a switch to domestic suppliers, or if foreign suppliers are forced to localize. More broadly the risk is that LCRs generate indirect costs and make American firms less globally competitive.

Some argue that tariffs or subsidies are a lesser evil, and I think Lind points to the direct relationship between subsidies and gluts. The oversupply of world markets by Chinese steel and aluminum producers is a good example supporting his arguments. Therefore, a narrower strategic approach focusing on sectors with clear national security implications might be more sustainable. ■

COMMENT

Thomas Duesterberg

Michael Lind's essay on local content requirements (LCRs) has an Occam's Razor-like elegance and plausibility, proposing LCRs as the most effective tool to achieve a broad return of supply chains to the United States. His critique of using subsidies to this end is also compelling. He rightly argues that the use of tariff measures cannot "guarantee" a revival of domestic production, but only incentivize this result. However, his assertions that LCRs are "less diplomatically sensitive" than subsidies or tariffs, that a country invoking them should apply the rule to both allies and adversaries, and that the U.S. should withdraw from any international agreements that limit their use, could engender counterproductive results. As with other measures supporting the goal of reinvigorating domestic production, prudence must be used with LCRs, especially with regard to those that impact allies in an era of weakened, long-standing alliances.

There is scope for narrowly tailored LCRs in national defense, medical security, and some crucial enabling technologies of

Thomas Duesterberg comment, continued

the future such as quantum computing and telecommunications. But even these sectors ought to be open to some participation by trusted allies. Some products, like steel or medical protective, gear might fall under security imperatives, but a shared priority of close allies, such as those in the "Five Eyes" group, to meet these requirements surely would not endanger the overall goal. The "Five Eyes" have long fostered close collaboration in defense-related technologies and established a track record of reliability. It is possible, too, that close allies like Japan could be added to a circle of trusted allies.

The European Union is a slightly different matter. As an economic superpower, it is not easily convinced by the seemingly obvious choice to work with the U.S. on common problems like addressing the existential economic threat from China or even crafting a common approach to the COVID-19 outbreak. These issues, along with the frequent disdain of the Trump administration for cooperation, has instead led the European Commission, spurred by France and Germany, to propose subsidizing its own national champions in both traditional manufacturing and high technology sectors of the future and using LCRs to promote local producers. The European Union also seems intent on the localization of data storage to protect privacy. If U.S. businesses are not allowed to easily access the huge caches of data gathered in their European operations (and China is already employing data localization), Europe is at a major disadvantage to its longer-term development of artificial intelligence and the Internet of Things. Broad deployment of LCRs in the U.S. will spur Europe to expand further its own industrial policies.

If the U.S. were to expand the scope of LCRs beyond those allowed in negotiated agreements (e.g., WTO, regional agreements, and bilateral free-trade agreements) or by compelling security considerations it would also limit the ability of U.S. firms to access many markets as countries match the U.S. efforts. It would also undermine most U.S. attempts to build coalitions to take on the Chinese economic juggernaut. The evidence to date on the Trump administration's confrontation with China is that this mercantilist power will not yield to bilateral pressure to modify the structure of its economy in a permanent way. I believe that only a broader coalition of non-mercantilist powers is likely to achieve this goal. Access to what is soon to become the world's largest single economy is already eroding, and China has been able to gain market share in places like Europe, in part due to unease about unilateral U.S. actions.

Lind is right to argue that "selective strategic reshoring, not complete autarchy, should be the goal of LCRs." But without limiting their use and working toward more cooperation with like-minded allies, however difficult that cooperation is to achieve, I fear the world will tilt in the direction of economic autarchy. ■

WORKFORCE INVESTMENT

Samuel Hammond
Niskanen Center

Reshoring strategies can only go so far without investment in America's skilled workforce.

The crisis sparked by the COVID-19 pandemic has brought the hidden costs of offshoring into sharp relief. Our reliance on China for all manner of medical supplies, from antibiotics to personal protective equipment, makes the literal health of American families dependent on the whims of an authoritarian regime.

Drugs and medical devices are just the tip of the iceberg. China is the single largest offshoring destination for U.S.-based multinationals. In manufacturing, U.S. companies employ more workers in China than in Mexico, and own more valuable property, plants, and equipment in China than in any other foreign country besides Canada.[1] This has led China-U.S. trade to be a global outlier relative to the expectations of the standard "gravity model," which reliably predicts larger export flows between geographical neighbors. China's exports to the U.S., in contrast, "are perennially twice as large as predicted."[2] What's going on?

Companies that move operations to China save money through reduced labor costs, but lower wages can only explain so much. The hard truth is that Chinese

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workers have skills that American workers on the whole lack. This includes an enormous pool of engineering talent with ground-level knowledge of industrial processes, making China a growing hub for research and development, as well. As Apple CEO Tim Cook once put it, "In the U.S. you could have a meeting of tooling engineers, and I'm not sure we could fill the room. In China you could fill multiple football fields."[3]

China's skilled workforce represents a durable competitive advantage that can't be easily offset through financial incentives to reshore. Some kinds of knowledge can be written down and easily shared, like a recipe book. Process knowledge, or "know-how," is much harder to transfer between individuals, let alone whole nations, given its embeddedness in what Brad Delong has called "communities of engineering practice and excellence." For example, Brazil's attempt to create a domestic computer industry in the 1970s was a disaster because import-substitution policies prevented Brazilian engineers from learning from engineers in America, while blocking the importation of IBM's far superior hardware.[4]

Building — or rebuilding — communities of engineering excellence takes time. Acquiring process knowledge requires being a part of the community, whether by recruiting world-class talent from abroad or through trade missions to learn from successful industrial ecosystems. By giving nascent ecosystems enough of a push, the learning-by-doing process can take off in a virtuous cycle that culminates into mastery.[5] Reshoring strategies based on tax incentives, local content requirements, or R&D investments will only go so far if, at the end of the day, our shiny new factories have "help wanted" signs on the door.

Labor Market Policy *Is* Industrial Policy

The relationship between labor market policy and industrial policy has wide-ranging implications.[6] Whom and how a nation educates will shape its comparative advantage. Whether labor markets are tight or loose affects investment in labor-saving technology. Whether a company or industry is unionized influences management and production decisions. The ease with which workers can move between jobs affects the diffusion of knowledge between firms. And whether dislocated workers are quickly re-employed after an economic shock determines whether their talents are preserved, enhanced, or allowed to atrophy.

When it comes to an industry's risk of offshoring, the strength of labor relations matters enormously. As the economist Dani Rodrik has long argued, offshoring (and globalization more generally) increases the *own-wage elasticity of labor demand*, particularly within the manufacturing sector.[7] Stripped of jargon, this simply means that globalization makes employment and wag-

es more responsive to economic shocks, contributing to job insecurity.

Conversely, empirical research suggests that stronger employment protections make it more difficult to offshore an industry and therefore *decrease* the elasticity of labor demand.[8] This can have positive knock-on effects at the industry level. Trade organizations and professional societies can form more easily, helping to preserve process knowledge in a way that transcends any particular firm. Inelastic labor demand can even expand the scope for risk-sharing arrangements, whether through insurance pools or in the form of wages that are stable across time despite fluctuating external conditions.

Indeed, labor relations are key to understanding "why the 'China Shock' was so shocking" in the first place, as MIT economist David Autor put it in a 2019 presentation.[9] Contrary to popular belief, the job losses from Chinese import competition were concentrated not in the so-called Rust Belt, but in the South Atlantic states. The deindustrialization of the Northeast and Midwest began years prior, when manufacturers relocated to the South in droves to take advantage of lower taxes and "Right-to-Work" laws. Weaker labor protections encouraged moving *down* the value-chain into more labor-intensive forms of production, creating a perfect storm of worker and supply-chain vulnerability.

Weaker labor protections encouraged moving down the value-chain into more labor-intensive forms of production, creating a perfect storm of worker and supply-chain vulnerability.

Why "Active Labor Market Policy"?

Fortunately, capturing the stability benefits of worker protections does not require making it impossible to hire and fire workers. That comes with its own costs. Instead, labor standards can be raised through demand-side policies that keep labor markets tight. While a *particular* firm may no longer demand a *particular* worker, a tight labor market ensures the demand for lesser-skilled labor is kept consistently high.

By definition, a tight labor market is one in which job vacancies outnumber jobseekers. Under such conditions, businesses in need of workers must either raise wages, invest in the labor productivity of the workers they already have, or recruit disadvantaged

workers from off the sidelines. In the twelve months before COVID-19 wrecked the economy, all three of these effects could be observed in the U.S. thanks to the historically low unemployment rate: Wage growth for the bottom quarter of workers was the fastest in decades, employers were launching training programs for entry-level jobs, and disability rolls were shrinking.

The tight labor market we enjoyed as recently as February was ultimately driven by the business cycle. Eleven years into a recovery, we finally approached full employment. But with quarantines spurring tens of millions of layoffs in the span of a few months, the strong economy turned out to be incredibly fragile.

It didn't have to be this way. While U.S. unemployment shot up from 3.5% in February to 14.7% in April, Germany's only rose from 4.7% to 5.5% over the same period.[10] Their secret? Germany's *Kurzarbeit* system of "short-time work" allowed employers to reduce worker hours while the government covered most of their lost wages. In theory, 26 U.S. states have similar work-sharing programs in place, yet uptake is pitiful due to lack of employer outreach, administrative complexity, and employer taxes that discourage its use.[11]

Work-sharing programs are just one example of an "active labor market policy" (ALMP). Wage subsidies, job search assistance, or retraining programs are all "active" in the dual sense of *activating* workers and *actively* shaping market outcomes, such as the quality of a match between an employer and employee. Work-sharing does this by helping to maintain the employer-employee relationship during a temporary downturn. Unemployment Insurance (UI), in contrast, is considered a "passive" labor market policy because it ostensibly exists to insure individuals against job loss and little more. These distinctions are blurry in practice, as most governments combine active and passive labor market policies in ways that are hard to disentangle.

The United States has incredibly weak labor market policies of either type. According to the OECD, the U.S. spends about 0.10% of GDP on programs that

actively encourage labor force participation, the lowest of any OECD country after Mexico.[12] As the Council of Economic Advisors noted in a 2015 report, our low rate of ALMP spending is the result of a steady erosion that began in the 1980s — an erosion that doesn't appear to have been a part of any deliberate policy choice, but which correlates well with steady declines in prime-age labor force participation.[13]

For comparison, Denmark spends over 1.9% of GDP on ALMPs and has perhaps the most dynamic labor market in the world. One in five Danes switch jobs in any given year, aided by insurance with generous wage replacement that transitions into vocational education and other job support programs if workers fail to find a new job quickly.[14] This combination of labor market flexibility, income security, and continuous education is known as "flexicurity" and is the flipside of Denmark's diversified, export-oriented economy. Roughly 55% of Danish GDP is produced in export industries, of which about a fifth is in manufacturing. International exposure helps to keep the workforce highly productive, but also vulnerable to foreign trade shocks. Robust active labor market programs are thus not simply a nice thing to have, but an integral part of how Denmark stays globally competitive.

Anglophone countries like Canada and Australia expend much less on ALMPs than Scandinavian social democracies, but still double what the U.S. does. In fact, the U.S. would need to increase spending on ALMPs by nearly $100 billion per year just to match the average OECD expenditure of 0.55% of GDP.

The Case for Comprehensive Employment Supports

Well-designed ALMPs can be both protective of the industries we have and attractive to the industries we might hope to reshore. Their effectiveness, however, depends on ensuring that underlying workforce development programs are both comprehensive and administered in coordination with private industry.

America's largest employment and training program, Trade Adjustment Assistance (TAA), is far from comprehensive.

This combination of labor market flexibility, income security, and continuous education is known as "flexicurity" and is the flipside of Denmark's diversified, export-oriented economy.

Yet despite its bad reputation, TAA provides valuable resources for workers lucky enough to be admitted, including funding for retraining and income support payments while they are enrolled. According to a quasi-experimental study of 300,000 displaced workers, TAA-trained workers cumulatively earn $50,000 more than their non-TAA trained counterparts over ten years, representing an up to 9% internal rate of return.[15] One third of this effect is driven by higher wages, with the remainder from greater labor force participation, suggesting that workers gain real human capital from retraining.

Unfortunately, TAA eligibility is restricted to workers who can demonstrate that they lost their job due to international competition or outsourcing. Establishing that kind of causation is a challenge for the world's top econometricians, much less your typical blue-collar worker. Supervisors in the Office of Trade Adjustment Assistance are then tasked with adjudicating the petitions, including through subpoenas of the employer's internal records. A process this scrupulous doesn't begin to make sense, as the policy rationale for retraining applies equally to job losses from non-trade shocks like technological change or shifting consumer demand. Nonetheless, administrative data reveal that every trade-displaced worker in TAA is associated with two lost jobs overall, suggesting that America's single largest retraining program is not even covering its own relatively narrow remit.[16]

A comprehensive system of ALMPs would integrate these otherwise effective training and wage insurance programs directly into the federal-state UI system, liberalizing eligibility to the universe of dislocated workers. Under this proposal, any worker who exhausted their unemployment compensation would be eligible for federally funded retraining and subsidized employment programs, regardless of why their job disappeared.[17]

State workforce agencies, in turn, would be given the flexibility to test different retraining models, provided the majority of federal funds went toward direct training and wage costs. States could choose to prioritize apprenticeships and on-the-job training models over classroom education, for example, by partnering with employers, professional associations, and local workforce development boards. The same systems used to help quickly re-employ dislocated workers could then be aligned with broader economic development strategies, including the sort of sector-specific training and recruitment necessary for reshoring.

The Great Reset

While "creative destruction" may be an inevitable feature of capitalism, the disposability of our skilled workforce is not. Had the U.S. properly invested in ALMPs in the early 2000s, many of the two million manufacturing workers who lost their jobs to Chinese import competition would

Rather than take the low road on worker wages and productivity, we can prioritize access to apprenticeships and trades programs, bridge workers into transitional jobs, and boost labor demand.

have stayed attached to the labor force and moved into higher valued-added parts of the manufacturing supply chain. Instead, as the economist David Autor and his colleagues found, disability insurance was *30 times* more responsive to job destruction than TAA and UI combined. That is, rather than re-activate our skilled workforce, we pummeled it into passivity.[18]

With Great Depression-levels of joblessness, the United States needs a comprehensive approach to re-employment and retraining now more than ever. Absent a vaccine, demand for labor in sectors like retail, hospitality, and food services will likely remain depressed for the foreseeable future, forcing millions of workers to retrain or relocate. And while a boost to our UI system is replacing lost wages at levels that would make the Danish prime minister blush, emergency relief cannot go on forever.[19]

Behind all this human tragedy lies a once-in-a-generation opportunity to reset our labor market around a new equilibrium. Rather than take the low road on worker wages and productivity, we can prioritize access to apprenticeships and trades programs, bridge workers into transitional jobs, and boost labor demand through hiring subsidies conditioned on job quality, training, and retention.[20]

For many, simply having someone help to write a resume or navigate a job board will make a world of difference. But over the longer run, active labor market policies can aim much higher. Through strategic partnerships with the private sector, we can retrain workers for the jobs we — and they — want, not merely for the jobs we already have. In doing so, we can plant the seeds for new communities of engineering, scientific, and vocational excellence to grow in our own backyard. All roads to an American manufacturing renaissance lead through a skilled workforce. If we train for them, good jobs will come. ■

Endnotes

1 Alexander Hammer, "The Size & Composition of U.S. Manufacturing Offshoring in China," United States International Trade Commission (USITC) Executive Briefings on Trade (2017).

2 Willem Thorbecke, "China-U.S. Trade: A global outlier," The Research Institute of Economy, Trade and Industry (RIETI) Discussion Paper Series 14-E-039 (2015).

3 As quoted in Samuel Hammond, "The China Shock Doctrine," *National Affairs* (Fall 2019).

4 "Alphachatterbox: Brad DeLong on Hamiltonian Economics," *Financial* Times (May 2016).

5 See also Dan Wang, "How Technology Grows (a restatement of definite optimism)" (July 24, 2018).

6 For my personal definition of industrial policy, see "The Struggling Regions Newsletter" (July 9, 2019).

7 Dani Rodrik, *Has Globalization Gone Too Far?* (Washington, D.C.: Institute for International Economics, 1997).

8 Alexander Hijzen and Paul Swaim, "Offshoring, Labour Market Institutions and the Elasticity of Labour Demand," University of Nottingham Research Paper No. 2008/05 (2008).

9 David Autor, "Why Was the 'China Shock' so Shocking? – And What Does that Mean for Policy?," Peterson Institute for International Economics (PIIE) (October 17, 2019).

10 John Detrixhe, "Why the US unemployment rate is so much higher than Germany's," *Quartz* (May 28, 2020).

11 George Wentworth et al., "Lessons Learned: Maximizing the Potential of Work-Sharing in the United States," National Employment Law Project (NELP) (2014).

12 "Active Labour Market Policies: Connecting People with Jobs," Organisation for Economic Co-operation and Development (OECD).

13 "Active Labor Market Policies: Theory and Evidence for What Works," Council of Economic Advisers Issue Brief (2016).

14 As discussed in Samuel Hammond, "The Free-Market Welfare State: Preserving dynamism in a volatile world," Niskanen Center (May 1, 2018).

15 Benjamin Hyman, "Can Displaced Labor Be Retrained? Evidence from Quasi-Random Assignment to Trade Adjustment Assistance," SSRN (April 20, 2018).

16 Illenin O. Kondo, "Trade Displacement Multipliers: Theory and Evidence Using the U.S. Trade Adjustment Assistance," National Bureau of Economic Research (NBER) (2017).

17 For a related proposal, see Samuel Hammond, "The ELEVATE Act Explained: A 'Job Guarantee' That Can Actually Work," Niskanen Center (January 24, 2019).

18 David Autor et al., "The China Shock: Learning from Labor Market Adjustment to Large Changes in Trade," National Bureau of Economic Research (NBER) Working Paper No. 21906 (2016).

19 Samuel Hammond, "Will Pandemic Jobless Benefits Make Recovery Harder?" *National Review* (April 2, 2020).

20 For a detailed subsidized employment proposal, see Samuel Hammond, "The ELEVATE Act Explained: A 'Job Guarantee' That Can Actually Work," Niskanen Center (January 24, 2019).

COMMENT

Oren Cass

Hammond is right to emphasize the importance of active labor-market policies, and training in particular, to firms and industries as well as workers themselves. But his emphasis on expanding Trade Adjustment Assistance is far too kind to a program—and policy model—that tends to fail even those it does cover. Data consistently show that government-led training programs fail to impart relevant skills or yield long-term gains for workers.

Rather than funnel money through government programs, America should invest in workforce training by establishing an open-ended grant for employer-based training comparable to the generous support offered to students on college campuses. An American designated with the status of "student" and spending time at an institution accredited as a "college" can expect to receive approximately $10,000 in annual taxpayer support to study—well, just about anything. Yet that same American, if trying to learn how to do a new job in a workplace, gets nothing. This despite, for a wide range of jobs, the workplace offering a far more effective learning environment.

Instead, we should establish a "trainee" status for any worker employed full-time by a firm that provides a balanced mix of on-the-job experience and substantive training, whether in the workplace or through a firm-sponsored community-college program. Just as college administrators can expect about $10,000 for each "student" enrolled, employers should receive a comparable amount for each "trainee" on staff. The prospect of hiring and internally training inexperienced workers would instantly become an attractive opportunity rather than a risky burden. Firms doing this at scale would find themselves with a cost advantage.

With such a program in place, the prospect of reshoring a factory absent a well-prepared workforce would be less daunting. And rather than the government attempting to discern what skills might be useful and how to teach them, the end "customer"—the employer—would be in the driver's seat. In many cases, employers would work with community colleges

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Oren Cass comment, continued

to develop programs rather than attempt to run them in-house. But whereas today's community college has as its mission the attraction and enrollment of individual students, most of whom will not graduate, under the new system the community college's focus would have to be delivering what employers actually need.

Such a system would also be far more responsive than the existing higher-education framework to the needs of workers. The "campus" model of education presumes predominantly young people with few other attachments or commitments dedicating their time to classroom learning. Certainly, there is a need and a place for that in our society. But the far more pressing need is to help the person trying to connect or reconnect to the labor market. A campus might in some cases be an attractive option, or a necessity. But in most, it is the workplace that is both wanted and needed.

Both the anti-business contingent on the Left and the anti-government contingent on the Right will surely object to the idea that public funds should be given to corporations. But firms will not sufficiently invest of their own accord in the training of their workers for the simple reason that it is the workers who ultimately capture the value of their skills in the form of higher productivity and wages (which we should want!), so public funds are needed. Government agencies have neither the capacity nor the incentives to train as well as employers will, so corporations are needed too. Active labor market policy should bring those forces together. ■

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REGULATORY REFORM

Oren Cass
American Compass

Outdated environmental regulation poses an irrational barrier to reshoring efforts.

One reason that firms have chosen to establish supply chains abroad is that attempting to expand domestically could get them sued, stalled, and saddled with extraordinary burdens—all in the name of an approach to "environmental protection" that is decades out of date. Since 1970, when the Environmental Protection Agency (EPA) was created and the National Environmental Policy Act (NEPA) and Clean Air Act were both enacted, the United States has inadvertently erected a byzantine system of permitting processes for infrastructure and industry that seems designed to frustrate investment. Proposals are subject to years-long reviews from multiple agencies, after which the litigation begins. Final approval is contingent on adherence to costly requirements of unparalleled stringency. Alternatively, you can go elsewhere, comply with far laxer rules, and sell back to American businesses and consumers just the same.

The domestic obstacles are salient and the costs measurable. A Department of Commerce survey of manufacturers in 2017 found that EPA regulations occupied the top nine spots on a list of the twenty "most frequently cited regulatory and per-

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mitting issues that impact manufacturing."[1] Already in the 1990s, the stricter standards imposed on regions with air quality below the EPA's standard were depressing new plant construction by 26–45%, with the greatest impacts on the largest plants and firms.[2] Compliance with air-quality regulations were costing the industry 9% of profits,[3] comparable to the median state tax burden on a manufacturer.[4]

Matters have only gotten worse. A 2018 study in the *American Economic Review* reports that "the implicit pollution tax that manufacturers face doubled between 1990 and 2008."[5] The Obama administration pushed the envelope further, tightening ozone standards in a way that some national parks could not meet,[6] let alone cities like Atlanta, Baltimore, Cincinnati, Columbus, and Cleveland.[7] Environmentalists were outraged that the Obama EPA did not go further[8]; "the goal for policymakers worldwide," reports *Science*, "should be to push down levels as far as possible."[9]

This is irrational. Of course, environmental quality is important, and clean air and water have real value that policymakers should pursue. But industrial activity offers enormous benefits to the nation alongside the environmental costs that it might impose. The more important that activity becomes, the greater the environmental tradeoffs we should be prepared to accept. Otherwise, the claimed commitment to reshoring is mere lip service. Major reforms responsive to present conditions and priorities could ensure that America maintains its environmental achievements to date while also unleashing a wave of domestic investment.

Outdated Environmentalism

At the time of their passage, the Clean Air Act and NEPA corrected an imbalanced regime that had granted industry carte blanche and left the nation's air, water, and ecosystems in woeful condition. Fifty years later, the pendulum has swung to the opposite extreme, as restrictions ratchet ever-tighter with little regard for the tradeoffs involved. In the 1970s, the average "Environmental Impact Statement" (EIS) mandated by NEPA for a federal highway project was 22 pages long and the process took two years to complete; by 2011 the typical highway EIS could run more than 1,000 pages and the process required more than 8 years.[10] Over that same period, air-quality standards were tightened repeatedly, to the point where Brussels—the capital of the purportedly enviro-friendly European Union—would be the single dirtiest city in America.[11]

The Clean Air Act, sometimes called "the most powerful environmental law in the world,"[12] provides a particularly compelling case study and the best opportunity for immediate reform.[13] The Act establishes the types of pollution-control technology that emitters must employ, based on two factors. First, it directs the EPA to set National Ambient Air Quality Standards

(NAAQS) that define the thresholds for acceptable pollution concentrations in the air. A region whose air quality fails to meet this standard is declared a nonattainment zone (NAZ). Second, it creates a "new source review" process for any new facility that will emit pollutants. Existing facilities must also install pollution controls if their region becomes designated a NAZ, but the most demanding standards are reserved for newly built sources of emissions.

To build in a nonattainment zone, a new facility must install the best possible pollution controls, while also finding other facilities in the region that can make offsetting pollution reductions to compensate for any new emissions. Even if built in a region that already met all air quality standards, a new facility must install state-of-the-art pollution controls, a requirement more stringent than what preexisting facilities have to meet. As new source standards tighten, existing facilities are "grandfathered"—asked only to meet the existing-source standards. But, significantly, major modifications to existing facilities cause them to be treated as "new" sources of pollution. The idea is that over time, as new facilities get built and old ones are renovated, all will be constantly required to use better controls than before.

The Act's structure is understandable given the goals at the time of its passage to improve environmental quality rapidly and regardless of cost, without overburdening already-operating facilities. On those terms, it has been quite effective. Between 1980 and 2018, lead levels in the air fell 99%, carbon monoxide fell 83%, sulfur dioxide fell 91%, nitrogen dioxide fell 61%, and ozone fell 31%.[14] These are significant achievements, and environmentalists are justifiably proud of the enormous public health benefits that have followed.

But no matter how clean the air gets, the rules demand ever more. Consider a hypothetical manufacturer seeking to return production capacity to the United States. The firm cannot build a plant comparable to one already in operation, because as a "new source" it must do better. If seeking to build in an area already meeting air quality standards, it must install pollution controls although existing operators need not. If it is located in a nonattainment zone, it must install the best possible pollution controls and pay to offset its pollution. If it hopes to expand at some point in the future, it will have to go through this whole process again. An otherwise-attractive investment might not go forward at all.

The discrimination against new facilities amplifies other economic costs as well, and, over time, it has even interfered with environmental goals. Large businesses benefit from barriers to entry that keep newer and smaller firms out, giving them an incentive to advocate regulation that hurts them but hurts potential competitors more. Older, dirtier facilities continue to operate as they have rather than investing in upgrades that might improve their productivity while reducing their environmental impact. In some cases, shutting out new construction has led to pollution levels that are higher than they would have been if there had been no regulation at all. "This approach," writes Robert Stavins, director of Harvard University's Environmental Economics Program, "has been both excessively costly and environmentally counterproductive."[15]

Removing the Dam

Although the EPA earns well-deserved criticism for its implementation, it is merely the messenger of a long-ago Congress's broader choices. The ever-tightening ratchet is exactly what the Act—duly passed by overwhelming bipartisan majorities in 1970 and further strengthened by overwhelming bipartisan majorities in 1990—calls for. Showing disregard for massive costs is exactly how the U.S. Supreme Court, in a unanimous opinion authored in 2001 by none other than conservative justice Antonin Scalia, has held that the Act requires the EPA to proceed.[16]

A federal statute is not a pendulum that will swing back of its own accord; it requires substantive reform. A new balance, appropriate to America's current challenges, would secure the widespread gains in environmental quality to date while pri-

Removing heightened new source requirements would allow industrial and energy-producing facilities to expand and would also allow new facilities to be built under the same rules that older plants must follow.

oritizing efforts to establish and restore domestic production capacity over further environmental improvement. It would accept the additional pollution that naturally follows from the return of domestic production that both political parties say is their explicit policy objective.

The key reform to shift the Act's fulcrum and strike a new balance would be to eliminate new source review, ending the discriminatory treatment of new facilities. Removing heightened new source requirements would allow industrial and energy-producing facilities to expand and would also allow new facilities to be built under the same rules that older plants must follow. The EPA would continue to set air-quality targets as it saw fit, but progress toward those targets would proceed more slowly. If a hypothetical factory wanted to double its size, it would be able to do so without inviting new burdens. If another firm wanted to build a competing factory with similar technology, it also would be able to do that. States would retain the authority they have today to impose tighter regulations if their circumstances or policy preferences warranted such a course.

This reform would be the economic equivalent of removing a dam. The current discrimination against new investments holds back a reservoir of capital that would surge forward were it not for the costs and restrictions now imposed. American industry sits downstream, happy to expand employment but restricted in its ability to do so. Under current law, every time environmentalists succeed in tightening an air-quality standard yet further, the dam wall gets that much higher.

Eliminate the impositions on new investments and, as quickly as analysts could revise their models, a host of construction projects previously considered infeasible would become attractive. Upgrades to existing plants, shelved for fear of triggering new requirements for the plant, would go back on the drawing board. New plants, rejected because they could not operate profitably, would suddenly find willing investors. Entirely new businesses, deemed

unlikely to succeed while established businesses and foreign competitors enjoyed a sizable cost advantage, would begin hiring. The return of supply chains would begin to seem more sensible, and its encouragement would require fewer costly inducements like tax incentives or subsidies.

Entirely new businesses, deemed unlikely to succeed while established businesses and foreign competitors enjoyed a sizable cost advantage, would begin hiring. The return of supply chains would begin to seem more sensible, and its encouragement would require fewer costly inducements like tax incentives or subsidies.

The effects on air quality would follow directly from the objectives of the reform. There would be no change from the existing facilities that are the vast majority of pollution sources. New and modified facilities would not operate free of all regulation; they would simply be subject to the standards that now apply to existing facilities. Thus, although one would expect improvements in air quality to slow, overall quality could degrade only as the result of a much-needed expansion in output. Meanwhile, the competitive pressure to cut costs through improved energy efficiency would continue to usher in technological improvements that tend to reduce pollution.

Permitting Progress

A second target for reform should be NEPA, which is infamous for imposing red tape on energy and infrastructure projects but can also trigger environmental review processes for other projects that require federal permitting or use federal funds. These reviews can take years and, rather than concluding the matter, a completed one then provides an invitation for environmental groups to launch lawsuits over the quality of the process, occupying years more, even if no legal basis exists for objecting to the project itself.

The extent of these obstacles became obvious during implementation of the 2009 American Recovery and Reinvestment Act, for which Congress appropriated $800 billion with the goal of rapidly boosting employment and—purportedly—upgrading American infrastructure in the process.[17] Notwithstanding the typical argument from environmentalists that NEPA "improves governance, increases transparency, and makes infrastructure projects better,"[18] President Obama be-

gan granting waivers from its requirements when it was deemed economically vital and politically expedient.[19]

In fact, NEPA's lengthy, unpredictable process is entirely unnecessary and should be replaced. Countries like Canada and Germany, with exemplary environmental bona fides, have streamlined review processes that guarantee short, fixed timelines for review and preclude further litigation once a decision has been made. In Germany, legal challenges to quickly made permitting decisions are tightly cabined and subject to a one-month statute of limitations. Canada's federal government defers to province-level approvals for most projects.[20] Done right, such approaches could make major industrial investments far more attractive without sacrificing environmental quality. Even if the change entails some environmental risk, that is a trade-off worth making.

The Trump administration has focused intensively on this issue and taken substantial action, proposing new rules that would narrow the categories of projects subject to review and set firm deadlines for completion.[21] But administrative action on this front is inherently limited by the reality that it will itself invite years more of litigation, precisely the outcome that reform seeks to short-circuit. Ultimately, NEPA itself must be scrapped in favor of a structure that provides the protection the environment needs rather than the endless stalling tactics that activists crave.

NEPA itself must be scrapped in favor of a structure that provides the protection the environment needs rather than the endless stalling tactics that activists crave.

The environmental laws that raise costs, increase risks, and lengthen timelines for investments in domestic industry no longer serve the purposes for which they were created. A genuine commitment to environmental quality requires setting reasonable expectations for progress and pursuing it with the least possible economic burden. Today, the system does the reverse, setting standards without reference to cost and providing opportunities for opponents of investment to create arbitrary burdens without reference to any cognizable environmental goal. Whether policymakers are willing to revisit this arrangement and strike a balance appropriate to the imperative for reshoring supply chains provides a useful litmus test for whether they are serious about supporting domestic production at all. ■

Endnotes

1 "Streamlining Permitting and Reducing Regulatory Burdens for Domestic Manufacturing," U.S. Department of Commerce (October 6, 2017).

2 Randy Becker and Vernon Henderson, "Effects of Air Quality Regulations on Polluting Industries," *Journal of Political Economy* 108, no. 2 (2000).

3 Michael Greenstone et al., "The Effects of Environmental Regulation on the Competitiveness of U.S. Manufacturing," MIT Center for Energy and Environmental Policy Research (CEPR) (2012).

4 Jared Walczak, "Location Matters: Effective Tax Rates on Manufacturers by State," Tax Foundation (September 1, 2015).

5 Joseph S. Shapiro and Reed Walker, "Why Is Pollution from US Manufacturing Declining? The Roles of Environmental Regulation, Productivity, and Trade," *American Economic Review* 108, no. 12 (2018).

6 "Ozone Standard Exceedances in National Parks," National Park Service (November 28, 2017).

7 "8-Hour Ozone (2008) Designated Area/State Information with Design Values," U.S. Environmental Protection Agency (as of May 31, 2020).

8 Coral Davenport, "New Limit for Smog-Causing Emissions Isn't as Strict as Many Had Expected," *New York Times* (October 1, 2015).

9 Emily Underwood, "The Polluted Brain: Evidence Builds That Dirty Air Causes Alzheimer's, Dementia," *Science* (January 26, 2017).

10 "Getting Infrastructure Going: Expediting the Environmental Review Process," Regional Plan Association (2012).

11 Oren Cass, "Will EPA Cuts Harm America's Air Quality?" Manhattan Institute for Policy Research (2017).

12 Coral Davenport, "Obama Build Environmental Legacy With 1970 Law," *New York Times* (November 26, 2014).

13 This discussion is adapted from Oren Cass, *The Once and Future Worker: A Vision for the Renewal of Work in America* (Encounter Books, 2018).

14 "Air Quality – National Summary," U.S. Environmental Protection Agency.

15 Robert Stavins, "Moving beyond Vintage-Differentiated Regulation," *Huffington Post* (May 25, 2011).

16 *Whitman v. American Trucking Assns., Inc.*, 531 U.S. 457 (2001), Justia.

17 Joe Biden, "What You Might Not Know about the Recovery," *New York Times* (July 26, 2009); Michael Grabell, "How Not to Revive an Economy," *New York Times* (February 12, 2012).

18 Kevin DeGood, "The Importance of NEPA Review for Infrastructure Projects," Center for American Progress (August 16, 2018).

19 Kristen Lombardi and John Solomon, "Obama Administration Gives Billions in Stimulus Money without Environmental Safeguards," *Washington Post* (November 28, 2010).

20 Philip K. Howard, "Two Years Not Ten Years: Redesigning Infrastructure Approvals," Common Good (2015).

21 Lisa Friedman, "Trump's Move Against Landmark Environmental Law Caps a Relentless Agenda," *New York Times* (January 9, 2020).

AGENCY STRUCTURE

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A new task for government demands a new structure for its agencies.

Prominent leaders across the political spectrum have argued in recent years that the United States needs an industrial strategy. These advocates recognize that some kind of industrial policy is inescapable. When government adopts tax incentives or regulations that differ by economic sector, for example, it is engaged in a kind of ad hoc industrial policymaking.

Advocates also recognize that a variety of contemporary challenges – from geo-economic competition with China to pandemics to climate change – could be better addressed if America had an industrial policy that fits within a broader strategy for economic resilience. Such a strategy would consider vulnerability in our supply chains, address economic inequality and ensure good paying jobs, guarantee economic security from foreign technological theft, and invest in research that will keep the United States on the frontiers of science.

But even if advocates succeed in persuading the White House to convene a blue-ribbon commission, organize an inter-agency task force, or deputize some trusted advisor to develop a strategy for economic resilience and a plan for indus-

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trial policy that includes rebuilding domestic supply chains, we will still need a government that can execute that strategy – and right now, we don't have it.

Institutional Capacity and Industrial Policy

Many people think reorganizing government is futile and unproductive – and proposals to do so are unhelpful. But the reality is that structure shapes substance. If we want government to pursue a specific mission with gusto, there must be an institution within government equipped for that mission. Right now, there is no single department or agency within the federal government whose core mission is to develop a comprehensive industrial policy and facilitate its execution across government. Offices that are relevant to a coherent strategy are split across multiple departments and agencies. Commerce houses the Economic Development Agency and Minority Business Development Agency, but the Small Business Administration (SBA) sits alone as a cabinet-level agency. The U.S. Trade Representative (USTR) does too – but Treasury handles economic sanctions, and Commerce houses the International Trade Commission. Labor, meanwhile, administers Trade Adjustment Assistance (TAA). Importantly, none of these agencies see themselves as doing industrial policy or quarterbacking the economic resilience strategy of which it should be a part.

If we want government to pursue a specific mission with gusto, there must be an institution within government equipped for that mission.

In addition to being split across the government, the work of industrial policy needs to change. Current programs cover a dizzying range of topics – from loan programs for small businesses to export controls. But one of the core aspects of industrial policy – supply chain resilience and domestic production capacity – is not a systematic feature of U.S. economic policy outside of the Pentagon. Understanding supply chains is difficult, resource-intensive work. It requires investigating sectors of the economy to identify the links in the chains that could be relevant in different crises. A pandemic might lead to one set of supply chain needs; a drought which led to the 1930s Dust Bowl a different set; a massive earthquake in the Bay Area a third set; and a hurricane tearing up the Eastern Seaboard yet an-

other. And that is before evaluating possible global disruptions. Moreover, serious supply chain analyses are not a one-and-done proposition. As both the economy and its risks evolve, analyses will need to be revisited in order to maintain preparedness. In other words, this is not work that can be done on an occasional basis by politically appointed advisors who serve for a couple of years before their next gig. It is the work of civil servants.

If we are going to take industrial policy seriously, we will need a government that understands where the risks and vulnerabilities lie, can develop a strategy to address them, and can execute on that strategy. That is why we need a new Department of Economic Resilience. The Department should subsume the Department of Commerce, take on USTR, SBA, TAA, export promotion agencies, economic sanctions, and a smattering of other agencies and offices, and organize them into five cones: international trade, export promotion, economic security, industrial policy and economic development, and statistics. The Department should also have an office of policy planning, akin to the State Department's Policy Planning Staff, that would report directly to the Secretary and be tasked with developing a quadrennial national economic resilience strategy, akin to the national security strategy or national defense strategy.

Five Cones:

International Trade

Export Promotion

Economic Security

Industrial Policy

Statistics

A single department would have a variety of benefits. First, the Department would be able to develop a strategy that integrates international trade, the dislocations and shocks to domestic industry that accompany trade, and economic security- and supply chain-related issues that emerge from global interconnectedness (including with great power competitors like China and Russia). It would both have capacity to gather information to inform a strategy and have the bureaucratic capacity to execute on the strategy.

Second, the Department would gain heightened status within the federal government, elevating the importance of these issues and creating a series of cascade effects. With the Department articulating a strategy every four years, think-tank experts will spend more time working on industrial policy-related issues; academics will have much fodder for research, creating a pipeline of scholars who study industrial policy and a body of literature on what works and what doesn't; and civil servants

who develop expertise in these currently sleepy areas will have a path to greater influence and prominence.

While some might rightly point out that interagency coordination will still be necessary, there are significant benefits to reducing interagency frictions and having a single Department with a single leader who can coordinate agencies to align with the strategy. Rather than having to elevate issues to the White House, the Secretary will be able to coordinate a wide range of economic resilience-related issues within the Department. This should alleviate, not exacerbate, interagency coordination challenges.

Industrial Policy without Industry Capture

Perhaps the strongest objection to industrial policy, and therefore to organizing government to be better at it, is that industrial policy invariably attracts interest-group capture. If government is setting policies to protect some industries from foreign competition, to prevent some industries from foreign operations, to invest domestically in some industries, or to regulate any aspect of some industries, those industries will do whatever they can to influence decision-making.

Preventing capture must be a primary focus for anyone interested in industrial policy because capture threatens the entire enterprise. A captured government wastes taxpayer money and reduces faith in the government's integrity on economic issues. It could also backfire and make the United States more vulnerable, not less. For example, if companies at essential points in the supply chain are able to lobby government to avoid resiliency policies, the U.S. might find itself without critical supplies in the next pandemic or during a geo-economic crisis with China. Or imagine if companies influence government to prevent export controls on certain technologies: they might actually help great power competitors innovate faster than they would have otherwise.

It is difficult, perhaps even impossible, to block every single avenue for influence. But lawmakers must try to close as many as possible in order to maintain the integrity of industrial policymaking. Campaign

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contributions, congressional lobbying, and meetings to influence regulators are one set of problems. The revolving door in and out of government – for both political appointees and civil servants – poses another set of challenges. And a third issue is the cognitive capture that comes from cozy friendships and relationships, even down to regulators and the regulated hobnobbing at dinner parties and sending kids to the same schools.

Industrial policy advocates need to focus greater attention on how to combat these problems, even if they cannot stop all of them. For starters, policymakers should try to set industrial policy using structural rules, rather than technocratic market incentives or monitoring. Structural rules shape the structure of the market itself, while technocratic rules require bureaucrats to make case-by-case distinctions or monitor market activity on an ongoing basis. For example, the 1906 Hepburn Act created a structural rule in railroad regulation: railroads were not allowed to own companies that had goods that moved across the rails. If railroads could vertically integrate between their platform and commerce that trafficked across it, they could preference their own goods over other companies' competing goods. This would make it difficult for competitors to get their goods around the country. A technocratic rule would not have prohibited all ownership and mandated a clean separation; it would have allowed for some ownership or investment, tried to figure out what amount would be risky from the perspective of conflicts of interest, and required regulators to monitor that practice or lawyers to sue the railroad after an alleged violation of the technical rules. The structural rule is simpler and clearer, and while it might be a little over- or under-inclusive, its virtue is that it does not rely as much on regulators or judges to make fine-grained distinctions.

In the supply chain and industrial policy category, competition laws are perhaps the best example of a structural approach. Rather than mandate particular production by particular firms, strong antitrust enforcement can ensure competition in entire sectors – leading to many competitors across a wide geography and, therefore, to more resilient supply chains. In the context of the COVID-19 pandemic, for example, medical device mergers contributed to a shortage of ventilators. This is not to say that there cannot be benefits to scale, but simply that even if there are efficiency gains at the extremes of consolidation (though, of course, there may not be), resilience requires making a trade-off –and we should be willing to make it.

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Second, policymakers should adopt a new principle: the separation of information gathering and industrial policymaking. Industrial policymaking choices will require knowing about market structures and practices, and civil servants will have to work closely with companies to get information on suppliers, production levels, capacity, and fragility. Such close cooperation with corporations could make these information gatherers sympathetic to those with whom they work and skew their perspective on which policies serve the national interest. As a result, information gatherers should be akin to intelligence collectors and analysts—offering information, but not setting or implementing policies. In essence, the separation of information gathering and industrial policymaking is a structural rule within government, akin to a structural rule within the market.

Even with structural rules in the market and government, the likelihood of capture is still extraordinarily high. Political appointees might come from or exit to firms that benefit from industrial policy choices. Appointees might be influenced by aggressive informational campaigns. Congress might place undue pressure on administrators, driven more by campaign contributions or independent expenditures than by the public interest. As a result, organizing government for industrial policy will require a variety of stringent anti-capture provisions targeted at specific practices. These include adopting strict ethics rules to eliminate financial conflicts

of interest, restricting lobbyists' practices like contingency fees and foreign lobbying, closing the revolving door through bans on lobbying and employment in related sectors, and boosting transparency in the rulemaking process. There have been rigorous, effective proposals in each of these areas in recent years – and they are essential to making industrial policy work and retaining public confidence in it.

A Time for Big Changes

We are used to hearing objections to proactive, institutionally focused government reforms from the Right, but it is worth noting that similar objections come from the Left as well. People on both sides argue that structural change is not worth pursuing, and that it is an especially bad idea in the midst of – or even in wake of – a pandemic and economic crisis. Their arguments often presume that there are too many other urgent priorities and that a massive government reorganization and the passage of new anti-capture laws are too hefty a lift for Congress.

But these anxieties misjudge the moment. Big changes in how government is structured almost always happen during or immediately after a significant crisis for a simple reason: the American people recognize the need to act and to act decisively. Lincoln thus overhauled the entire banking system in the middle of Civil War. The SEC was created during the Great Depression. The National Security Act restructured the entire defense establishment immediately after World War II. The Department of Homeland Security came into being only a year after the September 11 attacks. There are always challenges to creating, moving, merging, and eliminating government offices. But that is no excuse not to act – in fact, a crisis is precisely the time to act because everyone understands what is at stake.

Still other skeptics worry that reorganizing government isn't possible because Congress will object to anything that changes its committee structures or oversight powers. This concern can be easily dealt with. Existing committees can retain oversight of the parts of the new Department over which they hold power, but Congress should agree to phase out this structure in favor of a more sensible one after twelve years. That would give members more than enough time to make choices about their committee preferences.

More than anything, however, we must reorganize the government because we cannot afford not to. If our government cannot create an economic resilience strategy and execute on it, our country will not be able to weather the challenges of the future successfully. Whether it is great power economic competition with China, climate shocks, or the next pandemic, Americans will suffer and America will be weaker if we do not prepare for the next crisis and have plans in place to endure and bounce back. That is a fate worth avoiding. ■

COMMENT

Samuel Hammond

Before being supplanted by the narrower discipline of economics, "political economists" from Adam Smith to Karl Marx understood markets as inherently embedded in laws, customs, and cultures. It simply didn't make sense to study "the economy" absent other social or political structures, as those social and political structures were understood as constitutive of "the economy."

Today, it is far more common to draw a categorical distinction between politics and the economy, and thus to see their interaction in terms of contamination or capture. If you're on the Left, it's the ultra-wealthy and big corporations that capture an otherwise public-spirited government. If you're on the Right, it's the government that captures, contaminates, and distorts an otherwise free market. Or maybe it's a two-way street, and both can capture each other simultaneously. Either way, the universal tendency is to treat the public and private sectors as separable, with their independence mediated by the relative throughput of various "revolving doors."

The universal tendency is to treat the public and private sectors as separable, with their independence mediated by the relative throughput of various 'revolving doors.'

Ganesh Sitaraman's essay in this series, On Agency Structure, is no exception. In it, Sitaraman tackles the question of how to implement industrial policy at the level of federal organizational structure. As he writes, "Preventing capture must be a primary focus for anyone interested in industrial policy because capture threatens the entire enterprise. A captured government wastes taxpayer money and reduces faith in the government's integrity on economic issues. It could also backfire and make the United States more vulnerable, not less."

For better or worse, industrial policy has a strong association with "picking winners and losers," including by agencies like the Export-Import Bank that libertarian groups have gone to lengths to make the poster-child of "crony capitalism." The onus is therefore on industrial policy proponents to make the case that regulatory capture is not a fait accompli, but instead depends on the specifics of an agency's structure and institutional capacity. One job of political economy is to explicate which institutional designs work best, given the filter of democratic politics. All

Samuel Hammond comment, continued

else equal, for example, independent and mission-oriented agencies with dedicated funding, competitive salaries, and clear lines of accountability are harder to "capture" than, say, politicized agencies that are shielded from oversight.

Sitaraman is also right that American national economic policy is unusually fragmented, spread across multiple agencies that rarely coordinate on ad hoc issues, much less around a coherent national development strategy. This likely increases an agency's vulnerability to regulatory capture, as programs designed for narrow interests tend to serve narrow interests. Sitaraman therefore proposes consolidating agencies like USTR, SBA, TAA, and various Commerce Department functions under a new "Department of Economic Resilience." The Department would have a unified policy planning staff, allowing its Secretary to coordinate a national development strategy in much the same way the President coordinates the National Security Strategy. As someone who has proposed a similar "Office of Struggling Regions," this idea clearly speaks to me.

At the same time, industrial policy proponents should resist limiting themselves to the vocabulary of regulatory capture. To understand which governance models work best ultimately means reviving the dormant discipline of political economy. And by its very nature, that means rejecting the neoclassical premise that economics can be separated from the political and social system within which it is embedded.

> ***In a second-best world, our choice may not be between whether our government is captured but by whom. Indeed, today's America has a robust industrial policy for Wall Street, soybean farmers, Hollywood, drug companies, and trial lawyers.***

Western observers often struggle to understand developmental states like China or Japan precisely because the lines between civil society, private enterprise, and the state can be so blurry. Corporatist social democracies are a bit easier to describe, but still require a thoroughly institutionalist approach. Rather than impose a stark divide between the state and the market, for instance, regulations, social policies, and strategic coordination often emerge dynamically from the negotiations between trade unions and employers' associations, with the government serving as mediator. In such systems, the conventional notion of regulatory capture breaks down.

Samuel Hammond comment, continued

Developmental and corporatist states tend to be our main, contemporary source for case studies of successful industrial policy. They should also be a source of information, if not inspiration, for which governance models are likely to work. And in both types of systems, regulatory capture is not so much eliminated as something that is continuously and dynamically managed, whether through tripartite negotiations, or (as in the export-oriented growth model) through the ruthless discipline of international competition and a hyper-meritocratic civil service.

Charlie Wilson may not have actually said "What's good for General Motors is good for the country." Nonetheless, in a second-best world, our choice may not be between whether our government is captured but by whom. Indeed, today's America has a robust industrial policy for Wall Street, soybean farmers, Hollywood, drug companies, and trial lawyers. Is it any coincidence that the systems governing these sectors are also some of the most captured?

Reorienting American industrial policy toward productivity growth, upward mobility, and breakthrough innovation will require strengthening our coordinating institutions to resist certain forms of capture. But in many cases, it will also require identifying superior captors, for whom the "special interest" and "general interest" roughly align. ■

COMMENT

Michael Lind

In his thoughtful contribution to the American Compass symposium, "On Agency Structure," Ganesh Sitaraman addresses two problems: fragmentation of authority over industrial policy and regulatory capture. The problems are real, but I am not sure that his proposed solutions—a single, centralized department of industrial policy and more powerful career civil servants—are politically realistic or necessary.

His proposed new Department of Economic Resilience "should subsume the Department of Commerce, take on USTR, SBA, TAA, export promotion agencies, economic sanctions, and a smattering of other agencies and offices…" In essence, this is the model that Congress followed when it created the Department of Homeland Security, cobbled together by putting the Coast Guard, the Secret Service, the Federal Emergency Management Agency (FEMA), the Immigration and Naturalization Service, and the Environmental Measurements Laboratory, among others, into a single cabinet-level department. It is not clear that any synergies resulted.

What is more, the danger of politicization can only increase when a single political appointee sets the agenda for many formerly independent entities. Jeane Kirkpatrick taught me a rule she learned from

Michael Lind comment, continued

one of her professors, the political scientist Harold Lasswell: when designing a constitution, imagine that your worst enemies are in power.

We tend to think of the U.S. as a bigger version of Japan or Germany, when it is really a more coherent version of the European Union—a group of states and regions bigger than most countries. In designing an industrial policy for a continental society with a third of a billion people, we would do well to follow the examples of 20th-century reformers who created regional institutions for economic regulation and development—the Progressive-Era Federal Reserve System, with its twelve regional banks, and the Farm Credit System, with its half-dozen territories, created during the New Deal. Even if most regional institutions are corrupt or incompetent, a few country-sized American regions might get it right.

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Then there is the question of personnel. Sitaraman writes that "organizing government for industrial policy" will require "adopting strict ethics rules to eliminate financial conflicts of interest, restricting lobbyists' practices like contingency fees and foreign lobbying, closing the revolving door through bans on lobbying and employment in related sectors, and boosting transparency in the rulemaking process."

These are all sensible reforms. But you go to war with the army you have, not the army you want. If industrial policy in the U.S. can only be carried out by the equivalent of Japanese Ministry of Finance technocrats or powerful French enarques, instead of our existing cadres of revolving-door in-and-outers and career civil servants, then we are in for a long wait.

I am more optimistic. In the 20th century, Congress repeatedly rejected proposals to create a powerful American high civil service. Nevertheless, the U.S. managed to mobilize industry to win two world wars and a cold war and to launch the nuclear, space and computer revolutions. Even with our flawed political and personnel systems, we might be able to get much of the industrial policy we want. ■

TERMS OF TRADE

Thomas Duesterberg
Hudson Institute

The international trading system must recover the core principles of reciprocity, security, and democracy.

After the fall of the Soviet Empire and the entry of China into the global trading system, a new idea was added to the canon of neoliberalism: that formerly communist economic systems could be transformed into liberal democracies by the attraction of rising living standards. Soon thereafter, however, the growing industrial dominance of mercantilist China disrupted the political and economic calculus that a liberal, rule-based trading regime would produce balanced growth among faithful practitioners and that the U.S. would prosper by dominating cutting edge technologies in the modern economy. China's export-oriented economic model decisively undermined Western industrial sectors starting with metals and electronics and later proceeding into higher-technology industries such as telecommunications, high-speed railroads, and automobiles. Meanwhile, the World Trade Organization (WTO), the centerpiece of this liberal, rules-based trading regime, proved ineffective in combatting the blatant disregard of its rules by its founders in transatlantic economies, and even less so by mercantilist regimes.

International trade growth fostered an unprecedented rise in global prosperity in

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the post-1945 period. But in recent years it has encouraged the prolonged atrophy of American industrial capacity and an erosion of domestic supply chains. The United States has only just begun to wake up to the consequences of this historic trend. Over 8 million American manufacturing jobs were lost after 1979 as supply chains moved overseas and U.S. manufacturers replaced workers with capital to meet low-cost foreign competition. The social impact of deindustrialization in the U.S. was perhaps the final blow as pathologies linked to the loss of blue-collar jobs engendered a political backlash against the postwar trading system. In 2020, the COVID-19 pandemic and attendant interruptions of key supply chains have underscored the problems of interdependence and the political reality of nationalist responses to them.

Trade policy alone will not solve the problems caused by vulnerable supply chains and the loss of industrial jobs, but it will be essential to any effective agenda addressing them. A different set of fundamental principles will help reverse these trends and bolster incentives to produce goods—especially high-technology goods and related services—in the United States.

Three Principles of Trade

The principles proposed here are not new, but they require a new emphasis if trade policy is to be effective in a world economy much different than those in which the General Agreement on Tariffs and Trade (GATT, 1948) and the WTO (1995) were conceived. They are: reciprocity, national security, and democratic oversight.

The principle of reciprocity is simple in theory but complex in practice. Adam Smith has too easily been pigeonholed as a proponent of the unrestricted flow of goods, knowledge, and people across borders to maximize efficiency. But he also admitted to its limits: "…it may be a matter of deliberation how far it is proper to continue the free importation of certain foreign goods…when some foreign nation restricts by high duties or prohibitions the importation of some of our manufactures into their country."[1] It is not only China that violates this principle systematically, but many proponents of open trade as well. Agricultural goods are largely exempted from trade liberalization. India restricts imports of most high-technology goods and services, and maintains bound tariffs averaging 49%. All nations protect their telecommunications and airline sectors.

The way to think about reciprocity is straightforward: a real balance of rights and protections between trading partners that is mutually beneficial. A simple metric of trade flows does not convey the real impact of reciprocity. At a minimum, reciprocity implies equal access to market opportunities. When China systematically subsidizes exporters and appropriates intellectual property while restricting access to its markets, or Europe applies higher

tariffs on autos and blocks imports of genetically modified products while offering no offsetting measures, or India refuses to honor pharmaceutical patents, reciprocity is undermined. But redress is difficult to achieve under existing WTO rules and procedures.

The second principle is that national security imperatives are crucial to any trade and related investment policy. This idea has long been recognized, including by Adam Smith,[2] but it is especially important in an age in which commercial technologies are increasingly hard to separate from those important to national defense products and systems. The security of telecommunications and electric power infrastructure are part and parcel of national security. Many also argue that medical products and services should be considered vital to national security, a concern obviously brought into sharp relief by the present pandemic.[3] Purist supporters of a rules-based trade order would argue that the WTO can adjudicate differences of interpretation of what constitutes a legitimate security sector (famously steel, for instance). U.S. Trade Representative Robert Lighthizer, however, is right to insist that each nation has an absolute right to determine its own security imperatives and meet them with domestic resources.[4]

Related to the second principle is the third: democratic oversight of trade policy by sovereign states must be restored. There are two strands to this concept: The abstract rules of economic efficiency should not be the only consideration for setting economic policy, and the role of technical experts must be balanced by democratic oversight.[5] In practical terms, what this implies is that democratic (or republican) institutions such as the Congress can surely decide whether considerations, such as the resilience of medical or certain high-technology supply chains, should override the imperatives of lower-cost production. In an era of unprecedented prosperity, a nation could choose to pay more for domestically produced medicines or supercomputers than those imported from an adversary or an unreliable supplier.

The tension between technocratic management and democratic oversight that is ubiquitous in the 21st century has roots that extend back to the Bretton Woods trade order.

Yet the tension between technocratic management and democratic oversight that is ubiquitous in the 21st century has roots that extend back to the Bretton Woods trade order and a deep mistrust of populist

rule and ill-informed politicians emerging from the chaos of the 1919-1945 period.[6] The GATT and especially its successor, the WTO, were always conceived as supra-national in character, with rules that take precedence over domestic law. Its quasi-judicial procedures often bypass member negotiations to make new law or to overturn the laws of sovereign nations. But over time, the WTO has proved incapable of enforcing existing rules and addressing problems such as forced technology transfer and state subsidization of industry.[7]

Reforming the WTO to Rebalance Production Incentives

There are multiple paths by which the principles outlined above could induce firms to return supply chains to the U.S., largely by weakening the opportunities for mercantilist foreign competitors and strengthening the calculus in favor of domestic production. For instance, the U.S. has already leveled tariffs against China for violation of existing WTO rules as well as national security concerns associated with the dual use of certain products or their acquisition by the People's Liberation Army (PLA). Because the U.S. does not enjoy reciprocal access to the Chinese market and faces systematic dumping of subsidized products by Chinese firms, the Trump administration has imposed broad restrictions on Chinese exports. It has also increased scrutiny of Chinese purchases of firms in the U.S., a strategy also used by allies in Europe and Japan, thus diminishing Chinese access to the technologies it needs to compete with firms in advanced economies.

Such actions damage the Chinese economic model as well as the balance of incentives to produce and move supply chains to the Middle Kingdom. They also weaken the economies of scale and ease of access to advanced technologies for China. In 2016 more than 75% of Chinese exports of advanced-technology goods to the U.S. were made by wholly foreign-owned or joint-venture companies. During the same year, the domestic content of all advanced-technology exports from China was less than 50%.[8] Many analysts have shown that China's ability to innovate still depends on access to American firms and research institutions.[9]

Unfortunately, the WTO has shown itself ill-equipped to maintain an effective system of international trade, with much of the action now confined to unaccountable WTO judges arbitrating disputes and interpreting existing rules.[10] Reform of the WTO itself now requires unanimity of its more than 160 members, which effectively blocks any attempt to create new rules for the modern economy, vigorously enforce its existing rules, effectively sanction mercantilist actors, reverse long-standing asymmetries in its rules, or overrule its techno-bureaucratic decisions. These are underlying structural challenges of an organization that was designed for a global economy that no longer exists.

The United States should address these problems by working with allies to reform the WTO, not abandon it. The recent proposal by Senator Josh Hawley (R-MO) to abolish the WTO is not a good idea for several simple reasons.[11] The U.S. alone cannot abolish the institution. Withdrawing would only further alienate allies such as Japan, the United Kingdom, and other European nations, who could be helpful in achieving better rules to combat the China challenge. The U.S. has had some success in convincing allies to join its WTO complaint against Chinese intellectual property theft and also won a landmark case in the WTO to curb state subsidies to Airbus Industries. If the United States is to reverse the damage to domestic supply chains built up over the last 70 years, it should pair reform of the institution with vigorous use of U.S. trade law and regional trade pacts.

Modernizing the WTO to meet the challenges of China and others to a market-based and reciprocally balanced trade system can only be achieved if the organization's unanimity rule gives way to majoritarian decision-making reflective of member-party priorities.[12] So long as a unanimity rule governs, the institutional paralysis that has reigned since 1995 will continue empowering technical experts to make the relevant policy choices in the interstices of existing rules. Reform of the reform process itself must be the top priority.

In a WTO prepared to make substantive changes, the reform agenda should focus first on establishing better rules to limit the role of state subsidies and the power of state-owned enterprises. Subsidies underpin the Chinese march to technical parity and trade advantage encapsulated in the Made in China 2025 program.[13]

Updating WTO rules is also important in seeking reciprocal access to more open economies that enjoy advantages relative to the United States. Long-embedded rules often favor European nations at the United States' expense. For instance, the WTO tolerates higher auto tariffs for U.S. exports as well as rebates of high European value-added taxes for its exports while refusing to accept U.S. efforts to adopt reciprocal border adjustable taxes.[14] Curbing the overreach of the WTO's Dispute Settlement Body and allowing more scope in

the WTO for "plurilateral" agreements negotiated by coalitions representing a supermajority of trade in a given sector would help to overcome longstanding problems dating to the early years of the GATT as well as new problems associated with the rise of modern mercantilist states.

Finding a solution in the WTO would be ideal, but absent this, the United States should pursue other policies to combat China's strategy—either with a coalition of the willing or, if necessary, by leading on its own. Coordination with longstanding allies in the "Five Eyes" group would be a good place to start.[15] Given the increased tensions with, and intransigence of, China, the United States should also reconsider its decision to pull out of the Trans-Pacific Partnership Agreement. Stronger rules of origin, however, must be incorporated into that agreement.

The example of Huawei is instructive to crafting an overall approach to reform of U.S. and WTO policies. In Huawei, China has employed state support of as much as $70 billion and technology theft to build a low-priced and competent national champion that undermines the ability of other firms to achieve profitability in global markets.[16] The United States no longer has an integrated equipment maker, and the two European competitors, Nokia and Ericsson, struggle to remain financially sound enough to compete and invest in fresh technology. A U.S. policy toward Huawei, based on the three principles outlined above, would deprive the Chinese national champion of multiple advantages and give domestic and allied firms more time to find economically viable alternatives.[17]

Placing trade restrictions, including export restrictions, on China and other nations certainly has costs. The American semiconductor industry, for instance, relies on China for 23% of its exports and controls almost half of all global production of this key enabling technology. The profitability of world-leading American firms allows them to devote 20% or more of their sales to research and to keep ahead of their subsidized Chinese competitors. Jeopardizing this model by risking access to the world's largest semiconductor market, if China were to retaliate against U.S. sanctions, could endanger a vital area of American technological leadership.[18] On the other hand, U.S. restrictions have incentivized Taiwan Semiconductor Manufacturing Company (TSMC), the world's largest fabricator of semiconductor chips, to locate a $12 billion plant in the United States, where the leading creators of new designs are already domiciled. The extensive supply chains for large fabrication plants could follow in TSMC's steps.[19]

One can be more confident that the appropriate tradeoffs for trade actions will be balanced when they are made by some democratic process rather than the impersonal logic of economic efficiency narrowly defined as that which produces the lowest cost to consumers, or by technical experts interpreting rules adopted fifty years ago. ■

Endnotes

1 Quoted in Jeffrey Peters, "Father of Capitalism Embraced the Use of Tariffs," *The News and Times* (March 2, 2018).

2 Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations*, Vl II (London: W. Strahan and Company, 1778).

3 Scott Atlas and H. R. McMaster, "Relying on Foreign Drugs Is Dangerous," *Wall Street Journal* (April 28, 2020).

4 See "Hearing on 'Approaching 25: The Road Ahead for the WTO; Questions for the Record for Ambassador Robert Lighthizer, USTR," U.S. Senate Committee on Finance (March 12, 2019).

5 Oren Cass, "Putting Dynamism in Its Place," *National Affairs* (Spring 2020).

6 Even the stalwarts of the London School of Economics preferred rules-based order enforced by technocrats. As one historian argues:" Hayek, for instance, feared … 'unlimited' (or what Von Mises called 'omnipotent') democracy as always leading to totalitarianism out of a logic of capture." See Quinn Slobodian: *Globalists: The End of Empire and the Birth of Neoliberalism* (Boston, Harvard University Press, 2018).

7 Thomas J. Duesterberg, "Now is a Good Time to Reform the WTO," *Wall Street Journal* (December 1, 2019).

8 Mary E. Lovely and Yang Liang, "Trump Tariffs Primarily Hit Multinational Supply Chains, Harm US Technology Competitiveness," in *US–China Economic Relations: From Conflict to Solutions*, eds. Ha Jiming and Adam Posen, Peterson Institute for International Economics (PIIE) (2018).

9 John Lee, "Decoupling the US Economy from China after Covid-19," Hudson Institute (2020)

10 Thomas J. Duesterberg, "The Importance of WTO Reform from a Transatlantic Perspective," Hudson Institute (2020).

11 Josh Hawley, "The W.T.O. should be Abolished," *New York Times* (May 5, 2020).

12 Thomas J. Duesterberg, "The Importance of WTO Reform from a Transatlantic Perspective," Hudson Institute (2020).

13 John Lee, "Ambition and Overreach: Countering One Belt and One Road and Beijing's plans to dominate Global Innovation," Hudson Institute (2020).

14 Ike Brannon and Thomas J. Duesterberg, "Tax Reform and the Republican Manufacturing and Growth Agendas," *Tax Notes* (July 10, 2017); Gary Hufbauer and Lucy Lu, "Border Tax Adjustments: Assessing Risks and Rewards," Peterson Institute for International Economics (PIIE) Policy Brief 17 (2017).

15 J. Rogers, A. Foxall, M. Henderson, and S. ArQuinn Slobodian, *Globalists: The End of Empire and the Birth of Neoliberalism* (Boston, Harvard University Press, 2018); James Rogers et al., "Breaking the China Supply Chain: How the 'Five Eyes' Can Decouple from the China Supply Chain," Henry Jackson Society (May 14, 2020).

16 See Robert Spalding, "Data Security in a 5G World," National Bureau of Economic Research (NBER) (March 16, 2020).

17 Thomas J. Duesterberg, "There is a Better Alternative than Huawei," *Wall Street Journal* (February 5, 2020).

18 Antonio Vara and Raj Varadarajon, "How Restrictions to Trade with China Could End US Leadership in Semiconductors," Boston Consulting Group (March 9, 2020).

19 Bob Davis et al., "Taiwan Firm to Build Chip Factory in U.S.," *Wall Street Journal* (May 15, 2020).

INFRASTRUCTURE FINANCING

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A national development bank could attract the private capital that America's infrastructure needs.

As America launches an era of industrial and economic resurgence, it must simultaneously address our ailing, and in many cases failing, physical infrastructure. Improving the security of our supply chains and strengthening our economy through reshoring of manufacturing and technological capacity is an urgent, national priority. Success will depend upon our comparative tax and regulatory frameworks, worker retraining efforts, and trade and antitrust regimes. But the quality of our energy, transport, broadband and other public works are equal concerns for business leaders – and, at present, a major weakness for the nation. Left unattended, infrastructure underinvestment may delay or even disqualify many industry relocations.

Building the infrastructure America needs to power and transport a new century of growth has proven problematic in the best of times. The COVID-19 pandemic has made an already challenged environment for state, local, and federal public infrastructure finance worse. The U.S. sorely needed a new approach to planning, permitting, and financing infrastructure across all 50 states before the latest health and economic crisis. Now, reluctance to

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adopt a new approach—one that is comprehensive, resilient, flexible, and sustainable—invites economic peril.

Any meaningful solution requires that private capital step up. Experiences with public-private partnerships (PPPs) outside of the U.S. reveal promising and plausible paths that could mobilize 20% or more of our total infrastructure funding needs, or trillions of dollars. Political stars also seem to be aligning for such a solution. Pending legislation, supported by Democrats and Republicans alike, envisages a much larger role for private capital. The most compelling elements of four bills now pending in Congress could be aggregated and augmented to create a best-in-class, uniquely American development bank.

The right PPP model would serve multiple goals. It would make America a more attractive supply-chain site and bring industry home, eliminating foreign supply risks and boosting the domestic economy. It would create enormous latent demand for industrial output and millions of new, high-quality jobs. Finally, it would efficiently upgrade our public works at minimal taxpayer expense.

Broke ... and Broken

The state of our roads, bridges, broadband, airports, sea-ports, energy transmission, levees, and mass transit systems bear directly upon our economic competitiveness—and currently retard growth. The U.S. spends some 2–3% of GDP annually on infrastructure—half of what the EU spends, and only a quarter as much as Australia and China. Years of neglect have caught up with us.

A widely cited 2017 report by the American Society of Civil Engineers (ASCE) graded our systems a D+ before assigning a hefty "$4.5 trillion by 2025" price tag for their prioritized remediation.[1] This report has gone largely unheeded, however; since its release, America has lagged an additional $1.5 trillion behind.

Our infrastructure vulnerabilities are not academic. In rail transport alone, 15% of maintenance facilities, 17% of systems (e.g., power, signal, communications, and fare collecting), 35% of tracks, and 37% of stations are not in a state of "good repair."[2] By another estimate, proper expansion of and upgrades to our energy grid requires at least $600 billion in investment through 2050.[3] In fact, without $180 billion for transmission and distribution enhancements in the next four years, Americans across the South and Midwest will likely experience longer and more frequent power interruptions.[4]

These shortcomings are a top issue for manufacturers and a comparative vulnerability for the nation. They are also a direct obstacle to reshoring industrial production. Infrastructure quality is one of the vital factors that firms evaluate when deciding where to site their facilities: one of

the top six "key location drivers" for Deloitte in 2015;[5] one of five crucial dimensions for McKinsey in 2017;[6] and one of six for PwC in 2019.[7] The World Economic Forum (WEF) rated the United States second overall in its 2019 Global Competitiveness Index—but this was despite our infrastructure shortcomings. Against top-five rankings for our labor market, financial system, business dynamism, and innovation capability, the WEF ranked the U.S. *thirteenth* for infrastructure—well behind Germany, France, Korea, the Netherlands, Japan, the UK, and Spain, among others.[8] Our industrial leaders have repeatedly decried these disadvantages. A 2017 survey by *IndustryWeek*, conducted before passage of the Tax Cuts and Jobs Act, found that 47% of 1,500 manufacturing and supply-chain professionals preferred "investment in U.S. infrastructure" as their top policy priority for the Trump administration, versus just 26% who chose "tax reform."[9]

47% of 1,500 manufacturing and supply-chain professionals preferred investment in U.S. infrastructure as their top policy priority for the Trump administration, versus just 26% who chose tax reform.

Even the recent decade-long economic expansion failed to close our infrastructure funding gap. States and localities historically provide two-thirds of the nation's total infrastructure spending, the rest coming from the federal government.[10] The COVID-19 crisis has now crippled the finances of many states and localities, gutting revenues while spending has soared. Many hard-hit states need federal assistance to shore up their healthcare and first-responder services; their urgent physical infrastructure needs will again fall down the priority list. In times of local funding distress, Washington has often stepped up counter-cyclically, either increasing direct spending, or supporting new local debt instruments with guarantees. Following the Global Financial Crisis, Build America Bonds mobilized an incremental $180 billion in capital that would not otherwise have been available.[11] But the federal government today has more limited latitude to assist. Many congressional leaders are already fatigued with trillion-dollar, deficit-funded spending plans. It appears much of the country shares that fatigue as well.

Private Capital to the Rescue?

But now comes some good news. Trillions of dollars of private capital are both ready and willing to be deployed for

high-quality infrastructure projects that generate revenue streams. The premise is simple: private capital is used in a project's green- or brownfield build-out phase in exchange for some component of revenue sharing following the project's completion. The provision of credit and/or completion risk guarantees from the government makes the investment viable while lowering the project's total cost of capital.

Properly constructed guarantees crowd private financing in, rather than fencing it out. For example, the recent experience of the European Investment Bank (EIB) and the so-called "Juncker Plan" achieved a 15:1 ratio of private to public capital deployed.[12] The EIB's remarkable PPP successes are simultaneously credited with creating more than 1.7 million jobs and raising EU GDP by 1.8%.[13] Today, Europe has proven more adept than America at mobilizing private capital for public infrastructure.

In Hamiltonian fashion, developing public infrastructure in the U.S. as a new asset class may even solve one problem with another: better infrastructure for the country could well beget better and much-needed returns for those projects' owners. U.S. government and corporate bond yields have fallen to all-time lows. They could well fall into negative territory. Our public and private pension plans as well as our insurance companies urgently need to replace all this lost income. Today, on average, the top 100 pension plans in the U.S. are only 82% funded. Absent new sources of attractive, sustainable, long-term, real returns—such as that infrastructure could provide—taxpayers may need to bail out dozens of public and private pension plans and the millions of retirees they were created to serve.

The untapped opportunity for PPP is enormous. A recent Congressional Budget Office (CBO) report estimates that less than 3% of U.S. funding sources for public water and transport assets since 1990 have private origins[14]—infinitesimal relative to other countries. Roughly half of Australia's annual infrastructure spend has historically come from private sources,

equivalent to more than 4% of Australian GDP. U.S. emulation of Australia's PPP experience would amount to $900 billion of private infrastructure investment per year—enough to meet the ASCE's goals. That same CBO report further highlights why diversified financial sources aren't the only reason to foster more private involvement: *public works built in part with private capital and know-how are more likely to be completed on time and under budget*. Market discipline and the profit motive create powerful incentives for projects to get done faster and at lower cost.

In analyzing Australia's broadly positive experiences with PPP, Geoffrey Garrett, dean of the Wharton School of the University of Pennsylvania, cites three crucial lessons that the U.S. could learn:

1. Building first-rate infrastructure—roads, bridges, ports, high-speed rail, airports, power grids, cellphone networks, and fiber optic cables—is essential to realizing the full potential of all economies.

2. The sheer scale of the global infrastructure challenge is so enormous that the only possible way to meet it is to find a much bigger role for the private sector.

3. Smart governments can ensure that increasing the role of the private sector in infrastructure furthers their mission of serving the broad needs of society.[15]

Garrett further notes the "profound irony that America—arguably the world's most developed and perhaps most market-friendly economy—has persevered with a government-led, if not government-only, financial mindset to taking on its infrastructure challenge."

Proposed Congressional Solutions

The 116th Congress has four pending infrastructure bills, each intended to fill at least part of our yawning infrastructure funding gaps through a new era of public-private partnerships—three in the House and one in the Senate. The proposals differ in scope, function, and the amount of federal capital at risk (i.e., "recourse"). They also differ in reporting accountability, agency consolidation, and prospects for rapid expansion.

The House bills—H.R. 658, H.R 4780, and H.R. 6422—are sponsored by Representatives Rosa DeLauro (D-CT), Salud Carbajal (D-CA) and Adriano Espaillat (D-NY), and Danny Davis (D-IL) and Seth Moulton (D-MA), respectively. Each bill would effectively establish a national bank with the singular remit of infrastructure finance. Activities in scope at launch would be limited to debt- and project completion-guarantees. All governing board members would be appointed by the President with the Senate's advice and consent. Of these, the Davis-Moulton bill is by far the most ambitious, authorizing subscribed

equity capital of up to $500 billion, with no more than $100 billion coming from the federal government. Presuming a capital adequacy ratio of 12.5%, the implied lending capacity of the Davis-Moulton bill would be $4 trillion—i.e., genuinely proportionate to the tasks ASCE insists need to be undertaken. H.R. 6422 also includes an advisory function known as "regional economic accelerator planning groups"—an administrative capability that could encourage reshoring initiatives by creating ready site and execution plans.

Senator Mark Warner (D-VA) is sponsoring the Senate bill, S.1535, joined by bipartisan cosponsors including Senators Roy Blunt (R-MO), Amy Klobuchar (D-MN), John Cornyn (R-TX) and Chris Coons (D-DE), among others. Also known as the Reinventing Economic Partnerships and Infrastructure Redevelopment (REPAIR) Act, S.1535 relies upon an "infrastructure finance authority" structure that is directly accountable to the Secretary of the Treasury, rather than a bank with an independent board. S.1535's new authority would begin with paid-in public capital of $10 billion and be restricted from issuing debt in its own name. This means REPAIR's lending and guarantee capacity would have relatively modest beginnings until "proof-of-concept" is achieved, with lending authority specifically capped at $20 billion in its first two years. The bill would simultaneously establish a "Project Delivery Task Force" and an "Office of Technical and Rural Assistance." The former could tackle a problem that has often proven as vexing as financial resources: the expedition of local and cross-border permits. The latter would provide much the same advisory assistance as H.R. 6422's "regional economic accelerator" function, with detailed project analysis and execution advisory capacities. Both could underscore and deepen the symbiotic relationship between effective infrastructure financing and the reshoring of supply chains.

An alternate approach that might incorporate all of these positive elements, and perhaps augment them further, would be to establish a new *development* bank. Development banks differ from the national banks outlined in the House bills primarily through their larger scope of capabilities, including direct debt issuance, credit and completion guarantees, equity lending, syndication authority, and levels of technical assistance. The United States is unique in the world for not having some multi-lateral or national development bank providing these capabilities. This is a remarkable disadvantage. There are more than a dozen multilateral institutions and

The United States is unique in the world for not having some multi-lateral or national development bank,

nearly three dozen national development banks supplementing trillions of dollars of investments, supporting industry and infrastructure all over the globe—yet none in America. Such organizations—like KfW in Germany—have proven adept at attracting, supporting, and retaining businesses, enabling local industries to flourish.[16] Their ambit extends from infrastructure to worker training to advisory services for large-scale production facilities and beyond.

Relative to the infrastructure agency and national bank instrumentalities now before Congress, stand-alone development banks present another potential benefit, especially in an era of fiscal constraint: most operate with a "callable capital" model, funding their own activities and balance sheets through tax-advantaged debt and, most often, implicit rather than explicit federal guarantees. Their debt often trades at, or even through, U.S. Treasury rates, depending upon the currencies in which they are issued. Such cheap funding provides considerable leverage opportunities with limited systemic risk: no major national or multi-lateral development bank has ever sustained stultifying losses. Loss recourse for, say, the World Bank or Asian Development Bank is effectively limited to the equity capital and their other senior and secured assets. Given this, it is reasonable to assume an American development bank with $100 billion in callable capital (i.e., the same as H.R. 6422) may be able to mobilize $1.5 trillion in private funds within two years, nearly three times more than the Juncker Plan. Callable capital also represents the *most* taxpayers could ever owe—though if history is any guide, public cost would most likely be zero.

Built to Last

America has a golden opportunity to regain its position as a preeminent manufacturing power, reshoring industrial capacity, fortifying supply chains, and repatriating high-quality jobs. To succeed, we must create the right tax, trade, and regulatory incentives, in addition to a properly trained workforce. But we must simultaneously bring our antiquated infrastructure up to globally competitive standards—or perhaps even dare to surpass our competitors and establish next-generation infrastructure as a genuine strength.

Absent ubiquitous, scalable, innovative partnerships between public and private capital, it is hard to see where much-needed financial resources and know-how will come from. For this reason, chartering the right institution or institutions to turbocharge a new PPP era should rank among our top national priorities. Without an infrastructure authority or development bank providing proper technical assistance, fast-track permitting, and customized financing solutions, we may well be unable to bring desired manufacturing back to our underemployed communities. And without a new era of American industrial leadership, the vibrant promise of the next American century will be lost. ■

Endnotes

1 "Infrastructure Report Card," American Society of Civil Engineers (ASCE).

2 Ibid.

3 "Increased Electrification and Renewable Energy May Require Massive Transmission Investment," Institute for Energy Research (IER) (March 20, 2019).

4 "Energy – Infrastructure Report Cards," American Society of Civil Engineers (ASCE).

5 "Footprint 2020: Expansion and optimization approaches for US manufacturing," Deloitte (2015).

6 "Making It in America: Revitalizing US Manufacturing," McKinsey Global Institute (2017).

7 "Reconfiguring your manufacturing footprint for growth," PricewaterhouseCoopers (PWC) (2019).

8 Klaus Schwab, "The Global Competitiveness Report 2019," World Economic Forum (WEF) (2019).

9 Karen Field, "Manufacturing Professionals to Trump: Focus on Infrastructure," *IndustryWeek* (June 29, 2017).

10 Hunter Blair, "What is the ideal mix of federal, state, and local government investment in infrastructure?" Economic Policy Institute (EPI) (September 11, 2017).

11 "Treasury Analysis of Build America Bonds Issuance and Savings," U.S. Treasury Department (May 16, 2011).

12 "European Fund for Strategic Investments: Action needed to make EFSI a full success," European Court of Auditors (ECA) (2019).

13 "Juncker Plan has made major impact on EU jobs and growth," European Investment Bank (EIB) (October 22, 2019).

14 "Public-Private Partnerships for Transportation and Water Infrastructure," Congressional Budget Office (CBO) (January 21, 2020).

15 Geoffrey Garrett, "What the U.S. Could Learn from Australia about Financing Infrastructure," Knowledge@Wharton (June 8, 2018).

16 "KfW Group at a Glance," KfW.

COMMENT

David P. Goldman

As an afterthought to Willy Shih's and Terrence Keeley's excellent essays on R&D and infrastructure, it may be helpful to consider the overlap of these two subjects.

One critical area of infrastructure where the U.S. lags dramatically is 5G mobile broadband. Adjusted for land mass and population, China is outspending us three to one. Part of the reason for our neglect of this game-changing technology lies in the fact that we view mobile broadband as mainly a consumer technology, whereas China views it as industrial infrastructure. 5G is superfluous for streaming video and other consumer applications, but it makes possible a range of other technologies, including autonomous robotic networks, autonomous vehicles, telemedicine (including remote surgery), and robotic mining. In that respect, 5G is comparable to 19th-century railroads which, in the main, were unprofitable as standalone businesses, but transformed every facet of economic life. Until the advent of the railroad, large-scale mechanized farming was not viable because animal-based transport limited the range of distribution to about 50 miles. Once the railroads arrived, farm machines invented a generation before went into mass production and transformed American agriculture.

5G is a leading (although surely not the only) example of a technology that should be viewed as public infrastructure and subsidized accordingly. We can only envision a few of the transformational new technologies that 5G will make possible. In that respect, it falls under both Shih's and Keeley's topics. Dr. Henry Kressel has proposed the creation of a national telecommunications authority to promote R&D and provide infrastructure subsidies in mobile broadband. A central authority of some sort is required to sort out numerous problems, such as the assignment of radio spectrum, the creation of standards (including the delicate problem of negotiating such standards with China, the market leader), and the promotion of funding for R&D and construction.

There are many ancillary issues in which government support will be required to employ such infrastructure optimally. The application of artificial intelligence to health care, now one of China's top priorities, has been delayed in the United States due to privacy protections for medical records. Google, IBM, Microsoft, and other American companies are eager to develop this field but face regulatory obstacles.

I agree strongly with Shih's view that the Department of Defense has a central role to play in funding basic R&D. I would add that the fact that weapons innovation often challenges the frontier of physics is particularly conducive to fruitful basic research. Still, it is important that a national strategy for infrastructure should include high-tech infrastructure (of which 5G is the most important example) and that the funding of high-tech infrastructure should support R&D in the new technologies made possible by that infrastructure. ■

ANTITRUST ENFORCEMENT

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The American medical industry offers a case study of how market concentration undermines economic resilience.

According to virtually every major figure in Washington, it's time to bring back critical supply chains—including those for medical supplies and medicine—to the United States. Republican Senators Marco Rubio (R-FL) and Josh Hawley (R-MO) have bills, as do Democratic Congressmen Marc Pocan (D-WI) and John Garamendi (D-CA). President Trump has called for reshoring medical production in the wake of the pandemic. "These stupid supply chains that are all over the world," he said in May, "one little piece of the world goes bad, and the whole thing is messed up."[1]

Rubio emphasizes the threat from China, pointing to a threat in Chinese state-run news media to cut off pharmaceutical exports to the United States if America did not show more gratitude for China's help during the pandemic. "If China banned exports," said the article, "the United States will fall into the hell of a new coronavirus pneumonia epidemic."[2] This is not an empty threat; the vast majority of our imports of penicillin, tetraycline, surgical masks, rubber gloves, first aid kits, and liquid-filled thermometers come from China. Beijing does have the ability to induce shortages in America.

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What policymakers ignore is that shortages in American hospitals are not new, and have not, until recently, been related to China. These shortages started in the late 1990s and accelerated in the mid-2000s. We've had shortages of hundreds of standard generic medicines for so long that the Food and Drug Administration (FDA) warned that young doctors increasingly do not know how to practice medicine with high standards of care; they just aren't used to having the right medicines available.[3]

Focusing on the foreign threat ignores the real problem, of which Chinese dependence is merely a symptom. The United States' underlying markets for medicine are broken. Shortages should produce higher prices, which should draw in more production. Yet as the FDA noted in a report last year, "Drug shortages persist because they do not appear to resolve according to the 'textbook' pattern of market response."[4] Shortages don't really result in higher prices, and so they don't draw in more producers.

Markets are broken in medicine for the same reason that they are broken in much of the rest of the economy: the rise of monopolies has distorted price signals that used to match supply and demand. This market-rigging has a number of different symptoms, such as high prices for some generic pharmaceuticals, poor quality standards, dependence on foreign imports, and most significantly, shortages. Over the last 25 years, policymakers have allowed the monopolization of drug and medical supply purchasing, which makes it unprofitable to have a diverse and high-quality pharmaceutical production industry. In other words, China is threatening medical shortages that, ironically, we have already inflicted on ourselves.

This essay presents developments in the generic pharmaceutical and medical supply industries as a case study of a broader problem in the American economy: the relationship between consolidation and lost production capacity. Approaching reshoring in other strategic industries, from advanced materials to semiconductors to telecommunications, will require similar approaches to reform. The industry-specific analysis below can serve as a blueprint for analyzing other industries as well.

The Side Effects of Consolidation

Long before the Chinese entered our market, Americans began to see troubling signs of a fragile drug supply chain. In 1993, the FDA noticed that doctors were running out of off-patent drugs for three unrelated conditions: angina (nitroglycerin), HIV (sulfadiazine), and tuberculous (streptomycin).[5]

Americans had complained about the medical industry for decades. But while politicians like Senator Estes Kefauver (D-TN) had complained about high pharmaceutical costs in the 1960s, they complained

about excessive prices to consumers, not about the underlying productive machinery.[6] Supply chains were well-resourced and deep, with a thicket of different producers and distributors making and innovating around chemicals and medicines. Even into the 1980s, the only stories about drug shortages in American newspapers were stories observing problems in the Soviet Union as that system broke down.

By 2001, shortages had become a routine feature of our medical system; one hospital executive observed, 'Something strange is going on.'

But during the Clinton administration, shortages soon became a regular occurrence. These problems were concentrated among generic pharmaceuticals, ones for which patents had expired, not the more profitable on-patent medicine. Almost inevitably the story was the same. The sole factory that produced the medication would be taken offline by the FDA for some health infraction, and then not restored to production because it was no longer profitable. Such was the case in 1999, when there was a nationwide shortage of penicillin after Marsam Pharmaceuticals shut down production.[7]

By 2001, shortages had become a routine feature of our medical system; one hospital executive observed, "Something strange is going on."[8] What was bizarre about the problem was that they seemed to defy the laws of economics. Unmet demand didn't result in higher prices, but shortages.

What had shifted was the market structure by which hospitals buy supplies, including pharmaceuticals, medical devices, and generic products like cotton balls. Traditionally, hospitals bought supplies through large purchasing co-ops known as Group Purchasing Organizations (GPOs), a bit like Costco for medicine. GPOs used to be membership organizations, with hospitals paying dues. But in 1987, Congress exempted GPOs from anti-kickback rules, allowing GPOs to take money from suppliers.[9]

This change, finalized in regulations in 1991, shifted competition in the marketplace for devices and drugs.[10] Prior to this shift, suppliers and buyers matched through open competitive bidding, facilitated by a GPO. Afterwards, suppliers competed with each other to pay off the GPO and get an exclusive or near-exclusive contract to supply hospitals. The price that mattered was what vendors were will-

ing to pay to the GPO. Moreover, GPOs now had an incentive to inflate prices, because they were paid fees by vendors based on the total amount sold.

GPOs maintained control of the hospital market through a number of mechanisms. For one thing, several large GPOs were owned by hospitals. In addition, GPOs offered rebates to hospitals who purchased from them, or penalized hospitals who bought elsewhere by removing discounts. The industry also began consolidating; in 1995, Premier Health Alliance, American Healthcare Systems, and SunHealth Alliance merged into the nation's largest GPO, Premier.[11] By 1998, six GPOs controlled 80% of medical supply buying for acute care hospitals. Today, four GPOs manage 90% of hospital purchasing.[12] According to experts, four of these corporations – Vizient, Premier, HealthTrust, and Intaler — control purchasing of more than $300 billion annually of drugs, devices, and supplies for 5,000 health systems."[13]

GPOs gradually evolved into the business of selling access to the hospital buying market. Pharmaceutical manufacturers who weren't closely tied to GPOs could no longer make money; fees charged by GPOs could exceed 50% of the cost of the drug.[14] It was impossible to stay in the market for commodity products unless you were connected to a GPO. In 2002, the *New York Times* did a groundbreaking series of stories on GPOs, finding that Premier had, in the late 1990s, helped set up a pharmaceutical company called American Pharmaceuticals, which then had a successful IPO on Wall Street.[15] American Pharmaceuticals sourced from China, and its drugs were routinely recalled for poor quality. Yet Premier sold its drugs to hospitals because Premier had taken an undisclosed stake in the drug company.

Such self-dealing has eliminated the price signals that make markets work. Last year, the FDA noted that large GPOs do not really care about shortages of low-priced generic pharmaceuticals. A high-volume buyer "bears only a small portion of the costs of a shortage while other parties (health care providers, third-party payers, and patients) bear larger portions."[16] Since GPOs often contract with just one or two drug makers for any particular generic pharmaceutical, and any particular product is a small part of their business, it's just not particularly important to the people who control the market if there is a shortage of low-cost, but highly important drugs or devices.

Merger Mania

GPOs are the most obvious culprit in terms of breaking our medical markets, but consolidation was happening across multiple healthcare sectors, from hospitals to drugs to distribution. As pharmacy specialist Erin Fox put it, "drug shortages exploded in 2001," pointing to mergers as the culprit.[17] In a frenzy of mergers in the late 1990s and early 2000s, Pfizer had

bought Warner-Lambert in 1999, in the biggest pharmaceutical merger of all time, and in 2000, Glaxo bought Smithkline in the second biggest.[18]

Size in production led to a relentless focus on the most profitable drugs. For instance, in 2001, at the same time as GlaxoSmithKline's medicine Beclovent, an inhaled corticosteroid for asthma patients, lost its patent protection, there were production problems in the rest of the inhaled corticosteroid market. The corporation stopped production of Beclovent and shifted to making a more expensive treatment, Flovent.[19]

This consolidation happened largely because policymakers had changed their philosophy around monopoly power. Prior to the 1980s, policymakers followed the thinking of Louis Brandeis, who saw the control of markets through size as a threat to social stability. Enforcers were generally skeptical of attempts to roll up industries and tried to protect small and mid-sized businesses as resilient and responsive to public needs.

In the early 1980s, the Reagan administration and Congress adopted a new philosophical underpinning for industrial organization. Encouraged by law and economics scholars at the University of Chicago, as well as the consumer rights movement on the Left, lawmakers focused on efficiency, not resiliency, as the lodestar of commercial politics. They radically relaxed merger law and antitrust enforcement in the early 1980s. Big was no longer bad, and corporate consolidation no longer mattered.

Drug distributors, GPOs, hospitals, pharmaceutical makers, and pharmacy benefits managers consolidated throughout the 1980s and 1990s. "Shortages are now a fact of life," said an FDA official in 2001.[20] "We have to find ways to deal with them." Yet few connected consolidation to the shortages. Even as the drug supply chain fell into crisis, business school case studies celebrated the growth of consolidated healthcare distributors and GPOs as earnings-per-share bonanzas.[21]

A Dose of Reality

The problem is far worse today. Wave after wave of consolidation in purchasing and distribution has created massive fragility in the supply chain. Along with concentration among the pharmaceutical benefit managers, drug distributors, hospitals, and pharmaceutical corporations, there is now a complex thicket of oligopolies, joint ventures, and resulting coercive contractual arrangements that make it extremely hard to sell things into healthcare markets unless you are an incumbent player.

Selling to what is known as a "power buyer" is much like selling to Walmart or Amazon in retail; you have to be able to supply large amounts at extremely low prices, putting relentless pressure on suppliers to cut corners.[22] There's virtually no

profit margin for a small player because the ability to compete is solely based on bargaining power among middlemen and not on patients' needs.

And that's where China comes in. In the 1990s, foreign suppliers in India began exporting active pharmaceutical ingredients into the U.S., but without dominating the still-fragmented market. China followed and used its state power to build up an increasingly sophisticated pharmaceutical industry and to become a manufacturing powerhouse in other medical supplies.

Some of China's pricing advantage was due to state subsidies and lighter regulation of pollution. But these sources of supply also plugged directly into an increasingly concentrated American production and distribution system. By the 2000s, Chinese pharmaceutical companies were buying American players; Wuhan-based Humanwell purchased Risedose, PuraCap Pharma, and Epic Pharma, bragging in an investor presentation about how it had become a monopoly provider of five separate products.[23]

For the same reason that it was not sufficiently profitable to make penicillin in 1999, it isn't worth it for today's domestic players to challenge Chinese dominance in supply. After all, even if you are able to level the cost advantage, you're still up against power buyers.

That's why putting up tariffs hasn't really brought production back to the U.S.; the price signals have broken down. Without open and flexible markets, it's hard to get into the business of making medicine. By and large, this dynamic is true across much of the medical supply industry, not just pharmaceuticals.

In fact, the more you take a step back, the more this story of consolidation represents the American economy writ large. Everything from outdoor grills to construction cranes to consumer electronics is sold through a consolidated retail and distribution apparatus and made in China. Even our own ability to make weapons is increasingly controlled by a few giant defense contractors who thwart new entrants, leaving our military dependent on production in China.

Without open and flexible markets, it's hard to get into the business of making medicine. By and large, this dynamic is true across much of the medical supply industry, not just pharmaceuticals.

Policymakers largely missed this massive consolidation for the same reason they missed the elevated power of China. As monopolization was occurring in the early 2000s, the philosophy of the law and economics movement posited market structure as an innate force of nature rather than a political choice. In 2001, Mark J. Goldberger, the FDA official responsible for monitoring drug shortages, adopted the learned helplessness of this philosophy, telling *The New York Times* why there was little he could do about shortages: "We can't control who is making drugs." After all, "that," he continued, "is determined by the marketplace."[24]

We must ensure that American producers are no longer at a disadvantage versus their Chinese competitors. To do this, there are various levers, like raising tariffs and providing financial incentives for domestic producers. But failing to recognize the underlying market dynamics leads to the wrong—or at best, to an incomplete—policy response. The Trump administration's tariffs haven't helped.[25] It's had tariffs up for years, but they haven't restructured the market because its price signals no longer work. More recently, the Trump administration has tried direct financing. The Biomedical Advanced Research and Development Authority offered nearly a billion-dollar contract to a new corporation, Phlow, to create active pharmaceutical ingredient chemicals and finished medicines for federal stockpiles.[26] But Phlow is backed by the hospital consortium CivicRX,[27] which is heavily tied into the existing concentrated GPO system.[28] We aren't going to create a resilient and flexible pharmaceutical supply chain with an industrial policy focused entirely on financing appendages of existing monopolies.

The solution here is conceptually simple. Congress should remove the safe harbor to anti-kickback statutes it granted to GPOs in 1987 and then break up GPOs into smaller companies. These actions would force GPOs to return to their roots, as co-ops helping hospitals buy supplies through open and competitive bidding and thus restoring the market's price signals. Tariffs could then work because pricing would bring in new domestic producers. There are a host of other policy choices to restore price signals, all of which involve removing conflicts of interest among middlemen and breaking them up so that there is competition within the market—instead of over the market.

There is an emerging consensus that we must stand up to the Chinese threat. The question is whether we can muster the capacity to stand up to the American domestic corporate monopolies that serve as China's unwitting allies. We once had a vibrant and diverse supply chain in the United States. Reshoring the production of generic pharmaceuticals and medical supplies will require not only changing the relative cost of production, but ensuring that American entrants can actually sell into functional markets. ■

Endnotes

1 "Trump Says He'll Replenish Stockpile for Future Pandemics," *U.S. News & World Report* (May 14, 2020).

2 "Straightforward, the world should thank China," Xinhua (March 4, 2020).

3 "Drug Shortages: Root Causes and Potential Solutions," U.S. Food & Drug Administration (FDA) (2019).

4 Ibid.

5 Lawrence K. Altman, "Medical Science: THE DOCTOR'S WORLD; When Important Drug Is Scarce," *New York Times* (January 12, 1993).

6 Jeremy A. Greene and Scott H. Podolsky "Reform, Regulation, and Pharmaceuticals – The Kefauver-Harris Amendments at 50," *The New England Journal of Medicine* (October 18, 2012).

7 Abigail Zuger, "Type of Penicillin Is in Critical Supply," *New York Times* (October 29, 1999).

8 Melody Petersen, "Drug Shortages Become a Worry At Hospitals Around the Country," *New York Times* (January 3, 2001).

9 Social Security Act, 42 U.S.C. § 1128B.

10 "Medicare and State Health Care Programs: Fraud and Abuse; OIG Anti-Kickback Provisions," U.S. Department of Health and Human Services (July 29, 1991).

11 Marianne Taylor, "Hospital Alliances Unite Buying Clout," *Chicago Tribune* (November 28, 1995).

12 Letter from Senator John McCain to Assistant Attorney General Andrew Fois, U.S. Senate (August 17, 1998).

13 William Barnett and Phil Zweig, "Letter: Congress should repeal 'safe harbor' provision," *The Bulletin* (March 12, 2017).

14 William Barnett and Phil Zweig, "Letter: Congress should repeal 'safe harbor' provision," *The Bulletin* (March 12, 2017).

15 Walt Bogdanich, "When a Buyer for Hospitals Has a Stake in Drugs It Buys," *New York Times* (March 26, 2002).

16 "Drug Shortages: Root Causes and Potential Solutions," U.S. Food & Drug Administration (FDA) (2019).

17 Susan Jenks, "Drug Supply Dwindles," *Florida Today* (December 6, 2005).

18 Matthias Back, "The Top 10 Largest Pharmaceutical Mergers in History," *Process Worldwide* (May 17, 2019).

19 Melody Petersen, "Drug Shortages Become a Worry At Hospitals Around the Country," *New York Times* (January 3, 2001).

20 Melody Petersen, "Drug Shortages Become a Worry At Hospitals Around the Country," *New York Times* (January 3, 2001).

21 Mary B. Teagarden, "Case Study: Cardinal Health, Inc. (A)," *Harvard Business Review* (March 11, 2009).

22 "Drug Shortages: Root Causes and Potential Solutions," U.S. Food & Drug Administration (FDA) (2019).

23 Matt Stoller, "Shut Down Congress!!! (Physically at Least)," BIG by Matt Stoler (March 12, 2020).

24 Melody Petersen, "Drug Shortages Become a Worry At Hospitals Around the Country," *New York Times* (January 3, 2001).

25 Melody Petersen, "Drug Shortages Become a Worry At Hospitals Around the Country," *New York Times* (January 3, 2001).

26 "Phlow Corporation Awarded $354 Million HHS/ASPR/BARDA Contract to Manufacture Essential Medicines in Shortage," *PR Newswire* (May 19, 2020).

27 Arlene Weintraub, "How Civica helped under-the-radar Phlow nab a $354M COVID-19 Manufacturing Deal," *Fierce Pharma* (May 21, 2020).

28 David Dayen, "Behind the Coronavirus Threat, a Middleman Destroying Prescription Drug Markets," *The American Prospect* (February 25, 2020).

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