MANUFACTURING POLICY INITIATIVE AT O'NEILL
INSIGHT INTO MANUFACTURING POLICY

Tending the Industrial Commons

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Manufacturing is integral to the process of innovation. For example, in the United States, the manufacturing sector, which contributes just 12% of GDP, sponsors 45% of all research and development, employs 60% of all scientists and engineers, and is responsible for 90% of all patents. Being a catalyst for innovation, manufacturing provides benefits well beyond those of its customers, such as higher productivity and economic growth.

To create this value, manufacturers in a given region rely on shared resources, including the pool of skilled labor and specialized supply chain capabilities (e.g., R&D, tacit knowledge, and infrastructure). These shared resources, referred to as the "Industrial Commons," create an ecosystem of sorts. If this ecosystem is weakened, the entire region suffers. And just as a natural ecosystem requires collective management to ensure long-term sustainability, so does the Industrial Commons. Identifying opportunities for, and risks to, the Industrial Commons provides a foundation for collective management—a foundation currently lacking in the United States.

Growth and Erosion of the Commons

It was Franklin Roosevelt who coined the term, "the arsenal of democracy," referring to the collective efforts of American industry to support the allied nations during World War II. Organized by the government and implemented by the private sector, these efforts ultimately produced two-thirds of the material needed to win the war. This rapid expansion of US manufacturing and innovative capacity, coupled with the destruction of manufacturing operations in the theatre of war, allowed the US to dominate global manufacturing in the latter half of the 20th century.

Eventually, other nations grew their industrial capacity and the US share of global manufacturing output gradually declined. In 2010, China surpassed the US as the leading manufacturing nation in the world. Although currently world number 2, the US has seen long-term erosion in some of its core competencies due to outsourcing. According to researchers Gary Pisano and Willy Shih, certain types of applied R&D (e.g., where the production process is immature) tend to gravitate to factories:

if the factories are in China, R&D (and innovation) will follow.

For example, the US was once the world leader in the making of consumer electronics. World-class manufacturing capabilities have shifted to Asia, where next-generation technologies—including smart phones, flat screen displays, and packaged semiconductors—are now made. Ironically, many of the technologies upon which the smart phone is based (the internet, GPS, the touch-screen display, etc.) were developed from research sponsored by the US government. The US has lost the capacity to translate invention into innovation.

Another example is machine tools—machines for shaping steel and other rigid materials. Machine tools are critical to the health of a nation's manufacturing sector. In 1975, the US was the global leader in the manufacture of machine tools. Today, the US holds a 7% share, well behind that of China (22%), Germany (17%), and Japan (17%). Between 1990 and 2009, US shipments of all metalworking machine exports fell by nearly 50%. The number of skilled tool and die makers has dropped by half since 1998. The US now relies on imports for more than half of its machine tool needs.

These examples underscore a key point: *once it is eroded or lost, the Industrial Commons is difficult to restore*.

And these examples are not isolated. The US is losing ground on an array of advanced manufacturing technologies. According to the US Census Bureau, the United States had a persistent and growing negative trade balance (imports exceed exports) across all high-technology manufacturing sectors from 1998 to 2010. Examples include fiber optics, liquid crystal displays, light-emitting diodes (LEDs), rare earth elements, and ultra-heavy forgings.

Policy Matters

On a more optimistic note: *the right public policies (including fiscal and regulatory decisions), established at the right time, can sustain the Industrial Commons*. Table 1 provides examples of successful US government interventions that have maintained or nurtured its manufacturing capacity across important sectors of the economy.

Automobiles. During the Great Recession of 2008-2009, the federal government stepped in to rescue, during its managed bankruptcy, Chrysler and General Motors, two of the Big Three US automakers. The decision was not without controversy. Why reward mismanagement, critics asked? However, the Bush and Obama Administrations were moved by a powerful argument: the failure of a major automaker would erode the common supply chain shared by all US automakers. This was the reason Ford Motor Company supported the bailout of its competitors. As it turned out, government intervention helped turn around the two firms, which paid off their federal loans within a few short years without damage to their shared supply chain.

Industrial Chemicals. The US shale gas revolution has led to significant competitive advantage for energy-

intensive manufacturers. Shale gas often contains natural gas liquids, such as ethane, that are used as feedstock materials for the chemical industry. Innovation by the oil and gas industry—in hydraulic fracturing and seismology—led to cost-effective extraction of natural gas from shale formations across the US. Favorable regulations and timely permitting of new pipelines and gas processing plants have created supply chain capabilities unmatched anywhere in the world. As a result of the US "shale gale," chemical companies greatly expanded capacity and the US increased its global market share.

Government-sponsored R&D helps to advance innovation that would not otherwise occur.

Smart Manufacturing. The next Industrial Revolution is likely to be the digitalization of manufacturing at the production unit, factory, and value chain levels. Known as smart manufacturing, this movement depends on associated technologies (such as 5G and AI), but also rules to facilitate and manage the flow of information within and across national borders. With the recently enacted United States, Mexico, and Canada Agreement (USMCA), the US is establishing rules for digital trade that will benefit all manufacturing in North America and go a long way toward setting international standards for smart manufacturing.

Table 1. US Policies to Nurture its Industrial Commons

Sector	*Government Action*	*Timeframe*
automobiles	rescue of GM and Chrysler	2008-2014
industrial chemicals	regulation and permitting of shale gas	2007-present
pharmaceuticals	R&D	1960s-present
smart manufacturing	USMCA	2020

Pharmaceuticals. Research by Mariana Mazzucato shows that 75% of new, breakthrough drugs in the United States arise from US government-sponsored R&D. Why? Because the private sector tends to focus its research dollars on drugs that offer incremental improvement over established drugs; breakthrough drugs are riskier and less attractive to pharmaceutical companies.

In each of these examples, timely governmental action at the local, state, and/or federal levels has improved the health of the Industrial Commons and benefitted the public.

Need for Early Warning System

These two points—that erosion of the Industrial Commons is a long-term detriment, and that timely public policy can improve competitiveness —suggest the need for an early warning system as one component of a larger national strategy to address existential threats (e.g., China's industrial policy). Simply put, the United States needs to identify opportunities for, and risks to, its Industrial Commons to allow for timely policy action.

The US military has long recognized this need. The Department of Defense routinely monitors the nation's industrial defense base, and Congress has enacted laws to allow the President to take actions necessary to maintain its defense base capabilities. However, no similar system exists for the private sector.

Policy makers should consider two approaches for establishing such a private-sector monitoring system. The first is for Congress to create a bipartisan commission with a small cadre of expert staff to watch over the Commons, set priorities, and make recommendations to Congress and the President. It would also monitor the policies and practices of other nations. This approach could be modeled after the long-standing and successful US-China Economic and Security Review Commission.

The second approach is for the executive branch to contract out this activity to a nonprofit organization tied to an academic institution, and subject to renewal every few years. The absence of political appointees and the inclusion of an academic nexus would ensure objectivity and insulate the organization's findings from political pressures.

Under either approach, the US would establish a capability that until now has been at worst nonexistent or at best haphazard. Given the loss of innovative capacity over decades associated with erosion of the Commons, investment in an early warning system accountable to policy makers would be a prudent investment.

For Further Reading:

Arthur Herman, 2019. "America Needs an Industrial Policy," *American Affairs*, *3* (4): 3-28.

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Mariana Mazzucato, 2014. *The Entrepreneurial State*, Anthem Press: New York.

Gary P. Pisano and Willy C. Shih, 2012. *Producing Prosperity: Why America Needs a Manufacturing Renaissance*, Harvard Business Review Press: Boston.

Peer Reviewers: Gurminder Bedi, President, Bedi & Associates and former automotive industry executive, and Patrick A. Mulloy, trade attorney and Former Commissioner, US-China Economic and Security Review Commission