Manufacturing and Workforce

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The CHIPS and Science Act can provide the impetus to develop public-private partnerships and build regional innovation capacity to bolster manufacturing and innovation in the United States. But to succeed, these efforts must be matched by a long-term national commitment to invest in research, technology, and a qualified workforce.

Public-private partnerships will be critical

New chip plants can help power a broader resurgence in US manufacturing. Semiconductor fabrication plants, or "fabs," tend to become the focal points of manufacturing and innovation clusters: concentrations of technology-intensive companies, large numbers of skilled workers, and academic institutions and training centers offering curricula relevant to chip design and production. New fab construction itself also directly and indirectly generates well-paid jobs and contributes to economic activity across a region.

Public-private partnerships are key to growing these fab-centric ecosystems. For example, sustained state support of research infrastructure was critical to attracting semiconductor investments to New York's Capital Region. The College of Nanoscale Science and Engineering (then part of the State University of New York at Albany), working closely with IBM and other industrial partners, drew semiconductor companies from around the country to engage in collaborations relevant to their businesses. The college became a shared space where industrial competitors could address common technological challenges while sharing the costs, risks, and ultimately the knowledge gained.

Also essential to the revival of New York's Capital Region were efforts to educate and train a technical workforce. In cooperation with industry, state and local educational leaders established relevant curricula and research infrastructure at regional universities, community colleges, and K–12 schools. Importantly, this overall effort sought to train not just advanced scientists and engineers, but also the technicians, operators, and construction workers with the specialized skills needed to build and operate semiconductor manufacturing plants.

Need for a regional approach

The advent of the CHIPS Act has already encouraged the construction of new semiconductor wafer fabrication plants across the United States. Companies such as Intel, Taiwan Semiconductor Manufacturing Company, and Samsung are among those that have announced the construction of facilities in Ohio, Arizona, and Texas. However, as the New York experience suggests, supportive state and local initiatives will be essential to successfully leverage federal and private investments.

So far, the outlook is promising. Twelve colleges and research institutions have joined forces to create the Midwest Regional Network to Address National Needs in Semiconductor and Microelectronics. The partnering institutions—located in Ohio, Indiana, and Michigan—will collaborate on industry-focused research and talent development to meet the workforce needs of companies planning to build fabs in the region. Similar efforts are underway in other states to develop the research base, foster industry collaboration, and prepare a skilled technical workforce. For example, semiconductor processing clean rooms and industry-scale equipment at Arizona State University (ASU) engage students and faculty in semiconductor research and collaboration. At the same time, ASU's new School of Manufacturing Systems and Networks provides undergraduate and graduate students firsthand experience with semiconductor tools and technologies. In Texas, new laboratories and classrooms at Austin Community College will train the next generation of technicians needed by regional semiconductor companies. The school's program also offers dual-credit college classes for high school students interested in going into chip manufacturing.

As the CHIPS Act is implemented, it will be important to ensure that regional networks support broader national efforts to promote US leadership in semiconductors and microelectronics. To assist in this coordination, the act established a $2 billion public-private consortium, the National Semiconductor Technology Center, which will "conduct research, provide prototyping capabilities, establish an investment fund, and expand workforce development programs." Regions began jockeying to attract this center long before the bill was passed,

but it remains unclear whether the center should exist in one physical location or in a more geographically dispersed manner. Careful consideration will be required to successfully balance the center's many responsibilities.

The "science" part of the CHIPS and Science Act also advances policies to grow innovation ecosystems, and while the increasingly regional focus is to be applauded, coordination and partnership will be critical for the whole to be greater than the sum of its parts. Multiple agencies are set to receive significant increases in funding for a wide range of initiatives, from rural STEM education to diversifying the STEM workforce to manufacturing technology upgrades, as well as the creation of regional hubs tasked with spurring regional economic development and expanding access to the innovation economy. Ensuring that these efforts are appropriately integrated with those being driven by the CHIPS part of the legislation will avoid duplication and improve the chances of success.

Maintaining strategic advantage through sustained commitment

While the CHIPS Act breaks new ground in supporting US-based semiconductor manufacturing, its passage constitutes merely the opening volley in an intense strategic global competition to dominate emerging information technologies. To thrive in this environment will take sustained attention and investment in research, technologies, and people. As Chinese President Xi Jinping has declared, technological innovation has become the main battlefield in the global competition for economic supremacy and strategic advantage. The cost to the United States of not engaging in this competition will be very high.

This strategic imperative is reinforced by Moore's law, which continues to set the competitive pace in the semiconductor industry by anticipating the exponential growth rate of computing power. Nations whose semiconductor industry can sustain the technical and financial exertion needed to keep up with this competitive pace can dominate markets and gain strategic advantage. Those who fail to keep this pace are unlikely to remain in the front ranks. The CHIPS and Science Act is but one step forward in an arduous race, but it's a race that the United States must compete in. Most immediately, this means that Congress should reliably appropriate funds authorized in the act over the coming years. More significantly, this means that the United States will need to change its mindset about the sheer scale and length of effort it will take to maintain the hard-won US lead in science, technology, and innovation in the coming strategic environment. What has worked in the past will be insufficient for the future. The passage and implementation of the CHIPS and Science Act is the start, not the end, of the effort.

Semiconductors are the platform on which the world now works, communicates, transacts, and consumes, and dedicated attention to policy and investment in this fast-evolving technology is essential to secure the nation's future. The United States needs a sustained effort at the national level, partnered with initiatives at the state and local level, to maintain and enhance its position as a major research and manufacturing node in semiconductors and other emerging technologies.

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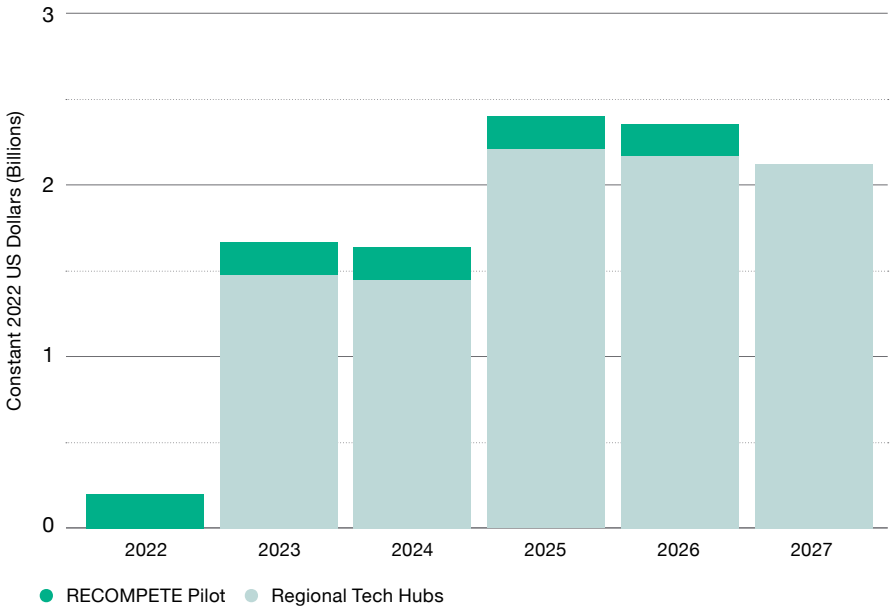
DEPARTMENT OF COMMERCE: AUTHORIZATIONS FOR NEW INNOVATION PROGRAMS



Two new programs under the Department of Commerce

The CHIPS and Science Act authorizes two new programs under the Department of Commerce: the Regional Tech Hubs program and the RECOMPETE pilot, which respectively seek to expand innovation capacity across the country and support economic development in distressed communities.

Note: Authorizations for both programs were given as a lump sum to be distributed across a range of years. Each sum has been evenly distributed across the range of eligible years.

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