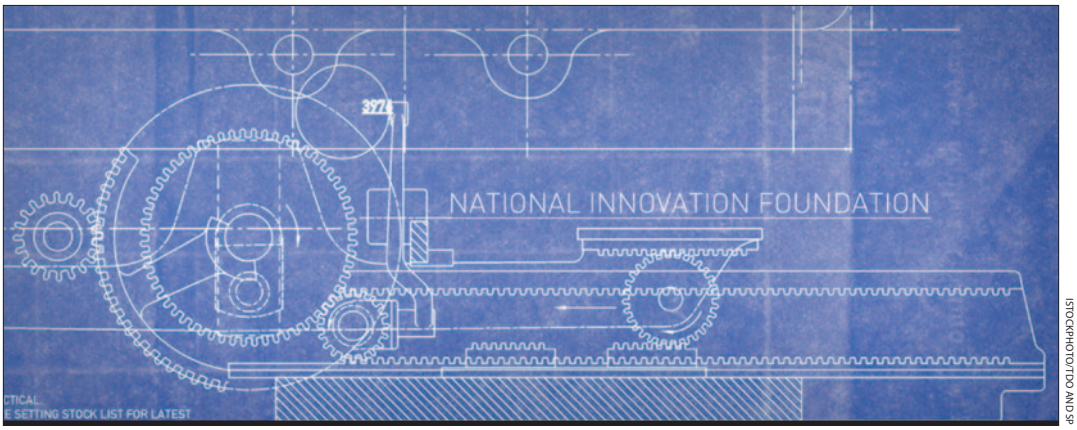
SCIENCE POLICY



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Creating a National Innovation Foundation

Economic Prosperity Rests on Diverse Technology Innovation

By Robert Atkinson and Howard Wial

THE PROBLEM OF ECONOMIC GROWTH was on the public agenda this past election season in a way it has not been for at least 15 years. Policymakers have been preoccupied with providing a short-term economic stimulus to counteract the economic downturn that has followed the collapse of the housing bubble and the meltdown of the financial services industry. Yet the problem of how to restart and sustain robust economic growth goes well beyond short-term stimulus and financial-market fixes.

Our nation needs a firm foundation for long-term economic growth. But to date there has been no serious public debate about how to create one. At best, we have seen a rehash of 1990s debates about whether tax cuts or lower federal budget deficits are the better way to increase savings and (it is often assumed) stimulate growth. A growing number of economists, however, have come to see that innovation—not more savings—is the key to sustained long-term economic growth. Some have found that research and development accounts for nearly half of U.S. economic growth and that its rate of return to the United States as a whole is as high as 30 percent.

But R&D is not all there is to innovation. If properly conceived, innovation encompasses: new products, new processes, and new ways of organizing production; both radical and incremental change; and the diffusion of new products, technologies, and organizational forms throughout the economy to companies and even entire industries that are not effectively using leading technologies or organizational practices. Innovation is fundamentally about applying new ideas in organizations (businesses, nonprofits, and governments), not just about creating those ideas.

Innovation has returned to the federal policy agenda, most recently in the form of the America COMPETES Act, which was signed into law last year. That law, unfortunately not yet fully funded, provides for a much-needed increase in federal support for research and science and engineering education—key inputs into the process of innovation. But it does not go far enough. It does little to promote the demand for those inputs or to organize them in ways that lead to the commercial application of new ideas. More engineers and more R&D funding do not automatically create more innovation, or particularly, more innovation here in the United States.

As a result, it is time for the federal government to make innovation a central component of its economic policy, not just a part of technology or education policy. To do so the new administration should create a National Innovation Foundation—a new, federally funded organization whose sole responsibility would be to promote innovation.

NIF would be a nimble, lean, and collaborative entity devoted to supporting organizations in their innovative activities. The goal of NIF would be straightforward: to help businesses in the nonfarm U.S. economy become more innovative and competitive. It would achieve this goal by assisting companies with such activities as: joint industry-university research partnerships; technology transfer from laboratories to businesses; technology-based entrepreneurship, industrial modernization through adoption of best-practice technologies and business behaviors; and worker training programs for employees of companies participating in NIF programs.

By making innovation NIF's mission, funding it adequately, and focusing on the full range of companies' innovation needs, the new foundation would be a natural next step in advancing the innovation agenda that Congress put in place when it passed the America COMPETES Act.

Because flexibility should be one of NIF's key characteristics, we do not wish to over-specify NIF's operational details. NIF would determine how best to organize its activities; it would not be locked into a particular programmatic structure. Nonetheless, we believe that there are some core functions that NIF should undertake. The first is to catalyze industry-university research partnerships through national sector research grants. The second is to promote more regional innovation through state-level grants to fund activities such as technology commercialization and entrepreneurial support. And the third is to encourage technology adoption by assisting small and mid-sized companies in implementing best-practice processes and organizational forms that they do not currently use. We'll now examine each of these functions in turn.

CATALYZE INDUSTRY-UNIVERSITY RESEARCH PARTNERSHIPS

NIF would offer competitive grants to national industry consortia to conduct research at universities—something the government does too little of now. These grants would enable federal R&D policy to break free of the dominant but unproductive debate over science and technology policy, which has tended to pit those who argue that the federal government should fund industry to conduct generic pre-competitive R&D against those who maintain money should be spent on curiosity-directed basic research at universities.

This is a false dichotomy. There is no reason why some share of university basic research cannot be oriented toward problems and technical areas that are more likely to have economic or social payoffs to the nation. One way to improve the link between economic goals and scientific research is to encourage the formation of industry research alliances that fund collaborative research, often at universities.

Currently, the federal government supports a few sector-based research programs, but they are the exception rather than the rule. As a result, a key activity of NIF would be to fund sector-based research initiatives. NIF would offer competitive

Industry Research Alliance Challenge Grants to match funding from consortia of businesses, businesses and universities, or businesses and national labs. These grants would resemble the National Institute of Standards and Technology's Technology Innovation Partnership programs and the National Science Foundation's innovation programs, such as Partnerships for Innovation, Industry-University Cooperative Research Centers, and Engineering Research Centers. These programs would be folded into NIF.

NIF grants, however, would have an even greater focus on broad sectoral consortia and would allow large companies as well as small and mid-sized ones to participate. Moreover, like TIP and the NSF innovation programs, NIF's work in this area would be led by industry, with industry coming to NIF with proposals. To be eligible for NIF matching funding, companies would have to

- Form an industry-led research consortium of at least five companies
- Agree to develop a mid-term (three-to-10-year) technology roadmap that charts generic science and technology needs that the firms share
- Provide at least a dollar-for-dollar match of federal funds.

NIF would also support a productivity-enhancement research fund to support research into automation, technology-enabled remote service delivery, quality improvement, and other methods of improving productivity. Automation, including robotics, machine vision, expert systems, and voice recognition, is a key to boosting productivity in both manufacturing and services. Technology-enabled remote service delivery—home health monitoring, remote diagnosis, perhaps even remote surgery—has considerable potential to improve productivity in health care and other personal service industries.

A key function of NIF would be to fund university research or joint business-university projects focused on increasing the efficiency of automated manufacturing or service processes. NIF would support early research into processes with broad applications to a range of industries, not later research focused on particular companies. NIF would also fund a service-sector science initiative to research productivity and innovation in the nearly 80 percent of the economy that is made up of service industries.

EXPAND REGIONAL INNOVATION-PROMOTION THROUGH STATE-LEVEL GRANTS

The design of a more robust federal innovation policy must consider, respect, and complement the plethora of energetic state and local initiatives underway. While the federal government has taken only very limited steps to promote innovation, state governments and state and metropolitan organizations have done much more. They engage in a variety of technology-based economic development activities to help spur economic growth by supporting the development of cutting-edge, science-based industries through targeted research funding.

Moreover, states and regional organizations try to ensure that research is commercialized and that good jobs are created in both cutting-edge, science-based industries and industries engaging in related diversification. They have established initiatives to help companies commercialize research into new business opportunities. They also promote upgrade- and project-based innovation by helping existing companies become more competitive.

While impressive, these state and regional efforts have only partially filled the gap left by federal inaction. These entities could do even more, and their current efforts could be made more effective. Because the benefits of innovation often cross state borders and take at least a few years to result in direct economic benefits, state elected officials have less incentive to invest in technology-based economic development activities than in other types of activities, such as industrial recruitment that leads to more immediate benefits to state or regional economies.

In contrast, an effective national innovation initiative would find a way to assist the tens of thousands of innovation-focused small and mid-sized companies as well as larger ones that have specific, regional innovation needs that they cannot meet on their own. Unlike small nations, the United States is too big for the federal government to play an effective direct role in helping these businesses. State and local governments and regional economic development organizations are best positioned do this. But without assistance from the federal government, states will invest less in these kinds of activities than is in the national interest.

NIF would compensate for this political failure by offering state-based Innovation-Based Economic Development Partnership Grants to help states expand their innovation-promotion activities. The state IBED grants would replace part of the grant making that TIP and the NSF innovation programs currently perform but would operate exclusively through the states. To be eligible for NIF funding, states would need to provide at least two dollars in actual funding for every NIF dollar they receive. Rotating panels of IBED experts would review proposals. NIF staff would also work closely with states to help ensure that their efforts were effective and in the national as well as state interest.

ENCOURAGE SMALL AND MID-SIZED COMPANIES TO ADOPT TECHNOLOGIES

A third activity of NIF would be to boost technology diffusion primarily to assist small and mid-sized companies. While NIF's national sector grants and state IBED grants would largely support new, sometimes radical, products and processes, its technology-diffusion work would help spread existing processes and organizational forms to businesses that do not currently use them. This effort would incorporate and build on the existing Manufacturing Extension Partnership run by the Department of Commerce—the only federal program whose primary purpose is to promote technology diffusion among such companies.

The NIF effort would follow the MEP model of a federal-state partnership. One or more technology-diffusion centers would be located in each state. Like existing MEP centers, the centers could be operated by state or private organizations. States would submit proposals to NIF for the operation of these centers, and NIF would evaluate the centers periodically. Some specific changes to the current MEP program, however, would enable NIF more comprehensively and more effectively to promote technology diffusion for both manufacturing and services.

NIF, for instance, would expand MEP beyond its current emphasis on applying waste-reducing, quality-improving lean-production techniques to also include the direct production of manufactured goods. It would do so by helping improve productivity in some service activities where lean production could be applied.

In addition to supporting efforts that assist companies directly, NIF would more broadly analyze opportunities and challenges regarding technological, service delivery, and organizational innovation in service industries, such as health care, construction, residential real estate, finance, and transportation. It would recommend steps—among them revising procurement practices, modifying regulations, and helping spur standards development—that federal and state governments could take to incite innovation. This action could include the digital transformation of entire sectors through the widespread use of information technology and e-business processes.

FUNDING AND ORGANIZING A NATIONAL INNOVATION FOUNDATION

In the current fiscal climate, it will be difficult for the federal government to launch major new investment initiatives, especially since strong political forces on either side of the aisle oppose raising taxes or cutting other spending. Nevertheless, the

compelling need to boost innovation and productivity merits a substantial investment in NIF. We propose that the federal government fund NIF at an initial level of $1 billion per year, but approximately 40 percent of this funding would come from consolidating several existing programs and their budget authority into NIF.

These programs include NIST's TIP and MEP programs; NSF's Partnerships for Innovation, Industry-University Cooperative Research Center, and Engineering Research Center programs; and the Department of Labor's Workforce Innovation in Regional Economic Development, or WIRED program. Federal expenditures on all the programs that NIF would replace or incorporate total $344 million. In addition, the America COMPETES Act provides a total of about $88 million more in 2010 for MEP and the new TIP than MEP and the Advanced Technology Program received in 2006.

Therefore, current and already-planned expenditures on the programs whose work would be included in NIF total $432 million. We believe that after several years, NIF could easily be ramped up to a budget of $2 billion. At $2 billion, NIF's budget would be approximately one-third of NSF's. In addition, because of its strong leveraging requirements from the private sector and state governments, NIF would indirectly be responsible for ensuring that states and companies spent at least one dollar on innovation for every dollar NIF spent.

NIF could be organized in several different ways. NIF could be organized as part of the Commerce Department, as a government-related non-profit organization, as an independent federal agency, or as a new office in the White House. But whatever way it is organized, we see it as ultimately being a lean and nimble effort, employing a staff of approximately 250 individuals.

NIF should recruit the best practitioners and researchers whose expertise overlaps the areas of productivity, technology, business organization and strategy, regional economic development, and (to a lesser extent) trade. Like the National Science Foundation, NIF would allow some staff members to be rotated into the agency for limited terms from outside of government and to allow some permanent NIF staff members to go on leave for limited terms to work for private employers.

Already there is legislation in the Senate to create an NIF-like organization. The National Innovation Act, introduced by Sens. Hillary Clinton (D-NY) and Susan Collins (R-ME), would create a National Innovation Council, housed in the Office of the President, and consolidate the six programs discussed above.

THE TIME IS RIGHT

Now more than ever, the American standard of living depends on innovation. To be sure, companies are the engines of innovation, and the United States has an outstanding market environment to fuel those engines. Yet companies and markets do not operate in a vacuum. By themselves they do not produce the level of innovation and productivity that a perfectly functioning market would. Even indirect public support of innovation in the form of basic research funding, R&D tax credits, and a strong patenting system, important as it is, is not enough to remedy the market failures from which the American innovation process suffers.

At a time when America's historic lead in innovation is shrinking, when more and more high-productivity industries are in play globally, and when other nations are using explicit public policies to foster innovation, the United States cannot afford to remain complacent. Relying solely on companies acting on their own will increasingly cause the United States to lose in the global competition for high-value-added technology and knowledge-intensive production.

The proposed National Innovation Foundation would build on the few federal programs that already succeed in promoting innovation and borrow the best public policy ideas from other nations to spur innovation in the United States. It would

do so through a combination of grants, technical assistance, information provision, and advocacy. It would address the major flaws that currently plague federal innovation policy and provide the United States a state-of-the-art initiative for extending its increasingly critical innovation prowess.

Yet NIF would neither run a centrally directed industrial policy nor give out "corporate welfare." Rather than taking the view that some industries are more important to the United States than others, NIF is based on the idea that innovation and productivity can grow in any industry and that the nation benefits regardless of the industry in which they do. NIF would cooperate with individual companies, business groups and business-university consortia, and state governments to foster innovation that would benefit the nation but would not otherwise occur.

In a world of growing geographic competition for innovative activities, economic and political actors are already making choices among industries and technologies to serve their own interests. NIF would give them the resources they need to make those choices for the benefit of the nation as a whole. Without the direct federal spur to innovation that NIF would offer, productivity growth will be slower. Wages will not rise as rapidly. U.S. companies will introduce fewer new products and services.

Other nations realize this and now boast highly effective national innovation-promotion agencies. It is time for the United States to do the same. By combining America's world-class market environment with a world-class public policy environment, America can remain the world's innovation leader in the 21st century.

RECOMMENDED READING

Robert Atkinson and Howard Wial, *Boosting Productivity, Innovation, and Growth through a National Innovation Foundation* (Washington, DC: Brookings Institution and Information Technology and Innovation Foundation, 2008).

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