Eight Ideas for Improving the America COMPETES Act

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The America COMPETES Act was an important step forward in ensuring that the United States enacts the policies it needs to compete in the innovation-based global economy. However, more can and should be done. We need more innovation in innovation policy.

America's economy has changed a lot in the last 20 years. Innovation – the development of new products, services and business models – has become the key factor in long-term U.S. competitiveness in a globalized world. Hopefully 2010 will be the year of renewed attention to the creation of a more robust national innovation policy. In particular, the America COMPETES Act is up for reauthorization. Passed in 2007, in part in response to the National Academies' report *Rising Above The Gathering Storm*, the Act authorized a number of new initiatives and funding for various programs, particularly for science and science education.

The Act was an important step forward in ensuring that the United States enacts the policies it needs to compete in the innovation-based global economy. However, more can and should be done. In particular, we need more innovation in innovation policy. In other words, it's not enough to simply increase funding for existing initiatives—as important as doing that is. It is also necessary to spur institutional innovation in the U.S. innovation system, particularly by providing more incentives for increased public-private collaboration around innovation. It is toward that end that this report provides eight ideas for the America COMPETES Act reauthorization. These ideas are based on two key principles: 1) when possible, leverage non-federal resources, and 2) spur collaboration between various players in the innovation system. The first principle is important because in an era of fiscal constraint, an effective national innovation policy should provide incentives for other players, especially the private sector, to increase funding for innovation. The second principle is also important because, as Block and Keller have documented, U.S. innovations increasingly come from collaborations between universities, federal labs, small firms and large firms. Federal innovation policies need to explicitly support and incent such collaborations.[1] Finally, it is important to note that this report lists just some of many ideas for improving the America COMPETES Act.

ITIF The Information Technology & Innovation Foundation

The ideas are organized into three key areas: 1) STEM education; 2) technology commercialization; and 3) federal institutional reforms to spur innovation. In particular, we urge Congress to:

1. Fund specialty math and science high schools.
2. Fund joint government-industry STEM Ph.D. fellowships.
3. Allow foreign students receiving STEM Ph.D.s from U.S. universities to automatically qualify for green cards.
4. Create an SCNR program (Spurring Commercialization of Our Nation's Research) modeled after the SBIR and STTR programs to support university, state and federal laboratory technology commercialization initiatives.
5. Create a university-industry collaborative R&D tax credit.
6. Fund industry-university-government manufacturing research and deployment centers.
7. Establish an Office of Innovation Policy in OMB (i.e., an Office of Information and Regulatory Affairs for Innovation).
8. Institute a National Innovation and Competitiness Strategy modeled on the National Broadband Strategy.

SCIENCE, TECHNOLOGY, ENGINEERING AND MATH (STEM) EDUCATION AND SKILLS

The United States faces a new and pressing competitiveness challenge as a growing number of nations seek to gain global market share in technology-based economic activities. While the national policy response must be multi-faceted, ensuring an adequate supply of talented scientists and engineers is one key step. However, on a host of science, math, and engineering metrics, America is falling behind. The United States now lags behind much of the world in the share of its college graduates majoring in science and technology. As a result, the United States ranks just 29th out of 109 countries in the percentage of 24 year olds with a math or science degree. Following are three proposals to address the STEM challenge.

1. Fund Specialty Math and Science High Schools

A wide array of proposals would seek to intervene farther upstream in the STEM pipeline at the K-12 level. These include expanding professional development programs for science teachers; enhancing science enrichment programs; using No Child Left Behind to judge scientific educational outcomes; and boosting science teacher quality, either through stricter requirements, providing incentives to attract higher quality teachers to science, and/or making it easier for scientists and engineers to become teachers.

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While these proposals have received the lion's share of attention in the policy debates over STEM education, we believe that the focus is too broad. If funding were unlimited, such a broad-based strategy might make sense. But since funding is limited and since less than 10 percent of the U.S. workforce is engaged in STEM-related careers it makes more sense to focus limited funds more narrowly. In particular, we believe that the most effective strategy to address the STEM challenge at the high school level is to significantly expand the number of specialty math and science high schools (MSHS).

There are only about 100 math and science high schools across the nation, ranging from pull-out programs with 125 students, to full day programs and dedicated high schools of over 4,000 students, to state sponsored residential schools, enrolling over 47,000 students in total.[2] By creating an environment focused more intensely on science and technology, these schools have succeeded in enabling students to study science and math, often at levels far beyond what students in conventional high schools are at. These students can then go on to degrees in math and science at relatively high levels. It's time to build upon this successful model and significantly expand the number and scope of our nation's math and science specialty high schools.

Mathematics, science, and technology high schools differ from the general education found in comprehensive high schools in key ways. First, as the name implies, MSHSs focus much more extensively on STEM curricula. For example, in addition to the three years of lab science and three years of mathematics required by the state for high school graduation, Florida's Center for Advanced Technologies offers students an opportunity to declare a mathematics and science major by taking four additional courses in mathematics and science, often Advanced Placement Courses.[3]

Second, students don't just take more STEM courses; they take more advanced courses and do more advanced work. Indeed, the coursework and integrated curricula of MSHSs go over and above the normal graduation requirements for general education students. For example, students at the Arkansas School for Mathematics, Sciences, and the Arts can take courses in Biomedical Physics, Immunology, Microbiology, Multivariable Calculus, Number Theory, Differential Equations, Math Modeling, Computer Programming III, and Web Application Development.

A third distinguishing feature of these schools is their level of partnership with other organizations. Collegiate, corporate, and alumni organizations have formed significant partnerships with these schools. While some partnerships have been in support of specific events, others have been long-term partnerships supporting research and innovation among students and faculty. Collegiate partners, for example, often provide classroom, dormitory, research, and financial support to these schools. For example, at the Governor's School of South Carolina, every rising senior is placed for six weeks in the summer at an off-campus program. Many of the students work with a research professor at an in-state university.

While the educational environments are exemplary, the key question is whether they produce results. While formal studies are few, there is some evidence that these schools are highly effective at producing graduates not only with high levels of aptitude in STEM, but who go on to further study and careers in STEM. For example, one study of 1,032 graduates finds 99 percent of graduates enroll in college within one year of high school (compared to 66 percent nationally) while 79 percent complete college in 4 years (compared to 65 percent in private universities and 38 percent in public universities).[4] Moreover, graduates earn undergraduate and graduate degrees in mathematics, science, and technology fields in significantly higher numbers than the general population. Approximately 56 percent of MSHS graduates earn undergraduate degrees in mathematics or science-related fields, compared to just over 20 percent of students who earn an undergraduate degree. Over 40 percent of females earn such degrees, nearly double the national average.

Congress should allocate $100 million a year for the next five years to the National Science Foundation to be matched with funding from states and local school districts and industry to invest in both the creation of new MSHSs and the expansion of existing ones.[5]

A key part of any solution to the STEM challenge needs to be the significant expansion of specialty math and science high schools. But because more so than other high schools, math and science high schools produce benefits that local communities, and even states, will not capture, local school districts will under invest in them. Rather than be seen as solely the responsibility of local school districts, or even states, they should be seen for what they are: a critical part of the scientific and technological infrastructure of the nation. Thus, we believe that the National Science Foundation should play a key role in supporting and expanding such schools. As a result, Congress should set a goal of approximately quintupling enrollment at such high schools to around 250,000 students. This will require both the creation of a significant number of new high schools, but also expansion of others with room to grow. To do this, Congress should allocate $100 million a year for the next five years to the National Science Foundation to be matched with funding from states and local school districts and industry to invest in both the creation of new MSHSs and the expansion of existing ones.[5] Moreover, a share of these funds should go toward establishing MSHSs focused on under-represented populations. States and/or local school districts would be required to match every dollar of federal support with two dollars of state and local funding. Industry funding would count toward the state and/or local school district match.

2. Fund Joint Government-Industry STEM Ph.D. Fellowships

One key factor in producing more Ph.D. degrees in STEM, especially by U.S. residents, is the ability to support doctoral fellowships. But as Richard Freeman notes, the number of NSF graduate research fellowships awarded per thousand of college students graduating with degrees in science and engineering went from over seven in the early 1960s to just over two in 2005. Today the same number of NSF graduate research fellowships are offered per year as in the early 1960s, despite the fact that the number of college students graduating with degrees in science and engineering has tripled.[6] But rather than simply expand funding for the NSF Graduate Research Fellowship program (funded at $102 million) to do this, Congress should instead create a new NSF-industry Ph.D. fellows program. Currently the program provides up to three years of support over a five year period and supports approximately 3,400 students per year at $40,500 per year.[7] The new NSF-industry program would work by enabling industry to fund individual fellowships of $20,250 with NSF to match industry funds dollar for dollar. Congress should allocate an additional $21 million to a joint industry-NSF STEM Ph.D. fellowship program. This would allow NSF to support an additional 1,000 graduate fellows.

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Individual companies could commit to supporting American residents in whatever fields that the companies are interested in. Students would of course be under the supervision of their university faculty, and ultimately dissertation advisor, but industry would be able to build a relationship with the student. For example, a company might offer the student a summer internship at one of the company's laboratories, helping the student get a better sense of actual research challenges the company faces.

To be sure, this program would be slightly more complicated to administer. First, companies would have to be informed of the program and propose graduate fellow areas of study. Prospective fellowship applicants would have to identify which awards they are most interested in applying for. However, with the Internet, such matching would be relatively straightforward, with students indicating their intended areas of study and the online program identifying relevant fellowship opportunities. If after three years, it turns out that industry does not support the program in great enough numbers or students and universities are not interested in the program, then it could and should be terminated and the funding redirected into the regular fellows program.

However, this program would have two advantages over the regular NSF fellows program. First, by leveraging industry funds, federal dollars would go twice as far. Instead of having to appropriate $42 million to fund 1,000 additional fellowships, they could appropriate $22 million instead. Second, and more important, engaging industry as a partner would help selected graduate students better understand how research is conducted in industry and better understand the interdisciplinary nature of today's innovation process. Both of these challenges have been the subject of increasing focus by scholars writing about STEM graduate education. There have been several studies about the growing disconnect between the training that graduate students receive and their future job responsibilities.[8] Most doctoral programs still train students as if they were going to be going into academic teaching and research careers. But increasingly this is not the case.[9] For example, one survey of doctoral chemistry found that only 36 percent intended to go into academia (compared to 76 percent of English students).[10] As Campbell, Fuller, and Patrick have argued, "graduate education needs to be broadened from its research focus to include a wider range of training for the careers students are pursuing and to reflect the versatility needed to work in an increasingly global job market, where collaboration between industry, universities, and government agencies is the norm rather than the exception."[11] Finally, for those who worry that industry funding will somehow taint the scientific learning process, it is important to remember that students would be guaranteed the funds as long as the university agreed that the student was performing up to standards.[12]

3. Allow Foreign Students Receiving STEM Ph.D.'s from U.S. Universities to Automatically Qualify for Green Cards

While ideally the supply of American STEM workers will expand to fill the gap, the likelihood of that happening in the near to moderate term is unlikely, even if federal efforts to support STEM education expand significantly. Yet welcoming the world's most skilled foreign-born scientists and engineers into the land of economic opportunity that America affords has long been one of the strengths of the U.S. national innovation system. The U.S. economy and the standard of living for American citizens have benefited enormously from this influx of foreign talent. AnnaLee Saxenian, a professor at the University of California-Berkeley, has shown that Indian and Chinese entrepreneurs founded or co-founded roughly 30 percent of all Silicon Valley startups in the late 1990s.[13]

Congress should automatically make recipients of advanced science and engineering degrees eligible for permanent residency.

Recognizing this, over the last decade many nations have liberalized their policies regarding high-skill immigration, while the United States, in stark contrast, has restricted its policies. In a study benchmarking high-skill immigration policies in eight nations (the United States, Canada, New Zealand, Australia, Japan, Great Britain, Germany, and France), ITIF found that the United States trails other peer countries in developing a proactive approach to attract high-skilled foreign workers.[14]

Moreover, the current system of employer sponsorship signals only that potential immigrants are desirable employees. A system that allowed additional criteria to be considered, like those used in the point systems of Australia, Canada, and New Zealand, would meet policy objectives better. (Applicants for immigration in these countries receive points for such characteristics as education, work experience, and language skills. Those surpassing an adjustable point threshold are admitted. Having a job offer in hand and meeting a designated occupational shortage may add points to an individual's application, but it is usually possible to meet the pass mark without either of these attributes.) Toward that end, foreign graduate students in STEM fields should be given special preference within such a system, even if they have not received job offers. To do this, Congress should automatically make recipients of advanced science and engineering degrees eligible for permanent residency. Providing additional opportunities for green cards not tied to employment could allow highly skilled foreign graduates to make more creative contributions to the economy more quickly by working in smaller and riskier businesses.

TECHNOLOGY COMMERCIALIZATION

While the United States remains a leader at nurturing innovation and commercializing new inventions, the process can and should be improved. The United States will forfeit technology leadership unless it finds ways to accelerate entry of growth sectors. The U.S. innovation system separates fundamental research from incremental development, with the former increasingly performed at research universities and labs with federal support, and the latter performed by industry. Connections between these sectors need significant strengthening, so there is a smoother and more active hand-off process. Recommendations include:

4. Create an SCNR Program (Spurring Commercialization of Our Nation's Research) to Support University, State and Federal Laboratory Technology Commercialization Initiatives

The current federal system for funding research pays too little attention to commercialization of technology, and is still based on the linear model of research that assumes that basic research gets easily translated into commercial activity. In fact, the process is choked with barriers, including institutional inertia, coordination and communication challenges, and lack of funding for proof of concept research and other "valley of death" activities. It is time for federal policy to explicitly address this challenge and allocate more funding to commercialization activities.

However, in an era of fiscal constraint adequate new funding may be difficult to obtain. As a result, one idea would be to establish an automatic set-aside program taking a modest percentage of federal research budgets and allocating this to a technology commercialization fund. Currently the SBIR program allocates 2.5 percent of agency research budgets to small business research projects; the STTR program allocates 0.3 percent to universities or nonprofit research institutions that work in partnership with small businesses. Congress should allocate 0.15 percent of agency research budgets (around $110 million per year) to fund university, federal laboratory, and state government technology commercialization and innovation efforts. The 0.15 percent share could either be added on top of the existing 2.8 percent allocation currently going to SBIR and STTR, or it could be taken from the SBIR share.

This program would be different than the STTR program which funds small businesses working with universities.[15] Half the funds would go to universities and federal laboratories that could use the funds to create a variety of different initiatives, including mentoring programs for researcher entrepreneurs, student entrepreneurship clubs and entrepreneurship curriculum, industry outreach programs, seed grants for researchers to develop commercialization plans, etc.

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The other half of funds would go to match state technology-based economic development (TBED) programs. Since the 1980s, when the United States first began to face global competitiveness challenges, all states have established TBED programs. Republican and Democratic governors and legislators support these programs because they recognize that businesses will not always create enough high-productivity jobs in their states without government support. State and local governments now invest about $1.9 billion per year in TBED activities.[16] This is about 70 percent of the amount that the federal government spends on its principal innovation programs and agencies.

States and regions engage in a variety of different TBED activities. They spur the development of cutting-edge, science-based industries by boosting research funding. For example, Oregon's NanoScience and Microtechnologies Institute serves as a forum for R&D synergy among Oregon's three public research universities, the Pacific Northwest National Laboratory, the state, and the "Silicon Forest" high technology industry cluster. States also try to ensure that research is commercialized and good jobs created in both cutting-edge, science-based industries and industries engaging in related diversification. For example, the Georgia Advanced Technology Development Center at Georgia Tech is a technology incubator that offers services including consulting, connections to university researchers, and networking with other entrepreneurs and service providers. States have also established programs to help small and mid-sized firms support collaborative research at universities. For example, Maryland's Industrial Partnerships program provides funding, matched by participating companies, for university-based research projects that help companies develop new products or solve technical challenges.[17] Finally, states have established initiatives to help firms commercialize research into new business opportunities. For example, Oklahoma's non-profit i2E organization helps Oklahoma companies with strategic planning assistance, networking opportunities, and access to capital. i2E's Oklahoma Technology Commercialization Center assists researchers, inventors, entrepreneurs and companies to turn advanced technologies and high-tech startup companies into growing companies.[18] But without assistance from the federal government, states will invest less in TBED activities than is in the national interest. A formula-based allocation to help fund state TBED efforts would help correct this limitation.

We propose that NIST be responsible for administering this program. Universities and federal labs would submit proposals explaining their proposed activities. States would submit proposals to NIST laying out their TBED strategy and explaining how NIST support would enable them to do more and better. Qualifying activities would include a host of TBED activities, such as technology commercialization centers, industry-university research centers, regional cluster development programs, regional skills alliances, and entrepreneurial support programs. In addition, where relevant, states would need to spell out in detail how they intended to create innovation alliances among local governments, businesses, educational institutions, and other institutions (such as economic development organizations or labor unions) in metropolitan areas. States would have to explain how their activities would meet the needs of firms following innovation trajectories that currently exist or that can reasonably be developed within the state. The precise mix of TBED activities would be left up to each state because the mix of innovation trajectories and the specific needs of firms in each trajectory vary among and within states. However, proposals would have to be economically realistic. For example, a state proposal to develop a new biotechnology cluster in a metropolitan area that had no existing institutions to support such a cluster and no realistic strategy to develop those institutions would be unlikely to be funded. Proposals that built appropriately on TBED activities in neighboring states or that included plans for interstate collaboration in TBED would receive extra points in the review process. To be eligible for NIST funding, states would need to provide at least two dollars in actual funding for every NIST dollar they receive.

Rotating panels of TBED experts would review proposals. In most cases these would be experts in the field (e.g., consultants, academics, venture capitalists, and economic development professionals). For states there would be a two-stage proposal review process. States would submit initial proposals describing activities and use of funds. Based on review from the TBED panel and NIST staff, the program would provide feedback to states on how to modify and improve their proposals. States would then submit final proposals that would be reviewed and scored by the outside panel of experts. Proposals that were judged acceptable would be funded to the extent that funds were available, with priority going to those with the highest scores. States with proposals judged not fundable would be eligible to receive modest planning grants and technical assistance from NIST staff to develop a proposal for the subsequent year's competition.[19]

5. Establish a Collaborative R&D Tax Credit

Increasingly, firms are collaborating with other firms or institutions in order to lower the cost of research and increase its effectiveness by maximizing idea flow and creativity. Indeed, a growing share of research is now conducted not only on the basis of strategic alliances and partnerships but also through ongoing networks of learning and innovation.[20] Moreover, participation in research consortia has a positive impact on firms' own R&D expenditures and research productivity.[21]

Yet, most collaborative research, whether in partnership with a university, national laboratory, or industry consortium, is more basic and exploratory than research typically conducted by a single company. Moreover, the research results are usually shared, often through scientific publications. As a result, firms are less able to capture the benefits of collaborative research, leading them to under-invest in such research relative to socially optimal levels.[22] This risk of underinvestment is particularly true as the economy has become more competitive, and a reflection of this is the fact that for the first time since the data were collected in 1953, the percentage of U.S. academic R&D supported by industry has declined in each of the last five years.[23] This may stem from the fact that university contracts are often undertaken as discretionary activities and are the first to be cut when revenues are down.[24]

Congress should delete this restrictive language from current law and allow any research expenditures at universities to qualify for the basic research credit.

Other countries, including France, Norway, Spain, and the UK, provide firms more generous tax incentives for collaborative R&D. Denmark and Hungary provide more generous tax deductions for collaborative R&D with public research institutions.[25] Japan's R&D incentive is almost twice as generous for research expenditures companies make with universities and other research institutes.[26] France provides a 60 percent flat tax credit for business funded research conducted at national laboratories.

The U.S. tax code allows firms a basic research credit of 20 percent of expenses above a base period amount.[27] But the credit is not significantly more generous than the regular credit. Moreover, its applicability is limited because rules require that such research not have any "specific commercial objective." At minimum, Congress should delete this restrictive language from current law and allow any research expenditures at universities to qualify for the basic research credit.

But Congress should go further and not only expand the R&D credit,[28] but provide a more generous incentive for collaborative research. As part of the Energy Policy Act of 2005, Congress created an energy research credit that allowed companies to claim a credit equal to 20 percent of the payments to qualified research consortia (consisting of five or more firms, universities, and federal laboratories) for energy research. In 2006, several bills were proposed allowing all research consortia, not just energy-related ones, to become eligible for a 20 percent flat credit.[29] Congress should go further and allow firms to take a flat credit of 30 percent for collaborative research conducted at universities, federal laboratories, and research consortia.

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6. Fund Industry-University-Government Manufacturing Research and Deployment Centers

The debate over science and technology policy has tended to oscillate between those who argue that the federal government should fund industry to conduct generic pre-competitive R&D and those who maintain that 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. Science analyst Donald Stokes has described three kinds of research: purely basic research (work inspired by the quest for understanding, not by potential use), purely applied (work motivated only by potential use), and strategic research (research that is inspired by both potential use and fundamental understanding).[30] Moreover, there is widespread recognition in the research community that drawing a bright line between basic and applied research no longer makes sense. 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.

While the government supports a few sector-based research programs, they are the exception rather than the rule.[31] Moreover, existing ones are largely underfunded. As a result, the America COMPETES Act should fund a competitive Industry Research Alliance Challenge Grant program to match funding from consortia of businesses, businesses and universities, or businesses and national labs. This program would resemble the current Technology Improvement Program (TIP) operated by NIST but would have an even greater focus on broad sectoral consortia and would allow large firms as well as small and mid-sized ones to participate. It could be housed in either NSF or NIST.

To be eligible for matching funding, firms would have to: form an industry-led research consortium of at least five firms, agree to develop a mid-term (three-to-ten year) technology roadmap that charts out generic science and technology needs that the firms share, and provide at least a dollar-for-dollar match of federal funds. This initiative would increase the share of federally funded university and laboratory research that is commercially relevant. In so doing it would better adjust the balance between curiosity-directed research and research more directly related to societal needs.

FEDERAL INSTITUTIONAL REFORMS TO SPUR INNOVATION

Innovation policy is not just about tax incentives or funding for government programs. It is about a wide array of government actions that can have an impact on innovation. But currently, the institutional ability of the federal government to strategically and comprehensively spur innovation is tolimited. To remedy that we propose two recommendations:

7. Form an Office of Innovation Policy in OMB (i.e., an Office of Information and Regulatory Affairs for Innovation)[32]

The relative absence of innovation from the agenda of many relevant federal agencies—as well as interagency processes such as the centralized cost-benefit review performed by the Office of Information and Regulatory Affairs (OIRA) within the Office of Management and Budget (OMB)—manifests the confluence of two regulatory challenges: first, the tendency of political actors to focus on short-term goals and consequences; and second, political actors' reluctance to threaten powerful incumbent actors. Courts, meanwhile, lack sufficient expertise and the ability to conduct the type of forward-looking policy planning that should be a hallmark of innovation policy.

To remedy these problems, Congress should create a White House Office of Innovation Policy that would have the specific mission of being the "innovation champion" within these processes. OIP would be an entity that would be independent of existing federal agencies and that would have more than mere hortatory influence. It would have some authority to push agencies to act in a manner that either affirmatively promoted innovation or achieved a particular regulatory objective in a manner least damaging to innovation. OIP would operate efficiently by drawing upon, and feeding into, existing interagency processes within OIRA and other relevant White House offices (e.g., the Office of Science and Technology Policy). It is important to note that OIP would not be designed to thwart federal regulation; as a matter of fact, in some cases, the existence of OIP might lead to increased federal regulation (e.g., more Environmental Protection Agency regulations might pass muster under cost-benefit analysis if innovation-related effects were calculated).

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Some might question the significance of this proposal. Isn't creating OIP a fairly small change to the system? Certainly adding OIP to the existing mix is a smaller change than jettisoning the existing substantive agencies in favor of a new agency with authority to regulate, and promote, innovation across all government agencies. But implementing this proposal will significantly change the regulatory environment. First, an entity focused on innovation would add an important new voice to the regulatory conversation. There would now be an entity speaking clearly and forthrightly on the centrality of innovation. Second, and more important, OIP would not merely have a voice: it would be able to remand agency actions that harm innovation. It would also have as part of its mission proposing regulation that benefits innovation. This is no small matter. Indeed, it would change the regulatory playing field overnight.

To those who might oppose an OIP on the grounds that making predictions about the future is very difficult and that experts are often wrong when they make such predictions, our response is straightforward: Agencies are already making predictions about the future (whether consciously or not) when they make laws that affect innovation. They are simply doing so in a manner that is unsystematic, haphazard, and subject to undue influence by well-funded incumbents. We can do better.

8. Create a National Innovation and Competitiveness Strategy Modeled on the National Broadband Strategy

The United States needs to create millions of new good-paying jobs over the next decade. If the United States wants to do this and be successful in the global economy, it is critical that the federal government develop a serious, in-depth, and analytically-based national competitiveness strategy. We are in fact one of the few nations without one. Denmark, the UK, South Korea, The Netherlands, and Ireland are just a few of the nations that in recent years spent the time and effort to craft a national competitiveness strategy. The last time the United States did anything similar was President Carter's Domestic Policy Review on Industrial Innovation in 1978. This review was in fact extremely important in setting the stage for a number of important Congressional initiatives in the following decade, including the R&D tax credit, the Bayh-Dole Act, the National Cooperative R&D Act, and the Stevenson-Wydler Technology Innovation Act.

It should be noted that ITIF is not advocating industrial policy or top-down direction of innovation. Thus we have deliberately chosen the term "agenda" to describe the outcome of a process that we believe must engage private and civil society constituencies and reflect the bottom up as well as top down nature of innovation. This would allow the development of a robust national innovation agenda. Its value would be apparent in allowing our country to more effectively address complex challenges with "whole of government" solutions, galvanize the public by advancing a useful narrative around innovation, enable us to engage more effectively with global innovation constituencies, and most importantly allow us to reinvent the traditional sources of our economic and societal success.

The American Recovery and Reinvestment Act charged the FCC with the development of a national broadband plan. The next America COMPETES Act should charge the White House Office of Science and Technology with the development of a national competitiveness strategy. Adequate funding should be provided to bring in an outside director with deep technical and policy knowledge and hire individuals with technical and business experience.

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A national innovation strategy would provide an opportunity to engage in a comprehensive analysis of the key factors contributing to future U.S. competiveness. Legislation to create this could require that the strategy focus on a number of broad issues, going more in depth on each. These should include assessing: 1) current U.S. competitiveness, including at the major industry level; 2) current business climate for competiveness (including tax and regulatory); 3) trade and trade policy issues; 4) education and training; 5) science and technology policy; 6) regional issues in competitiveness (including role of state and local government and impacts on rural, urban and other regions); 7) measurement and data issues; and 8) proper organization of government to support a comprehensive innovation and competitiveness agenda.

CONCLUSION

In the last two decades, there have been at least three major changes to the U.S. economy. The first is that it has become truly global. Fifty years ago states and regions (e.g., the Northeast) largely competed against each other. Today, the United States competes with nations around the globe. This fundamental change means that the United States needs to think of itself as a big state and proactively put in place a national economic development strategy.

The second big change is that innovation has become a more central driver of growth and competitiveness. In the old economy it was low costs, accumulation of large pools of capital, and economies of scale that drove competitive advantage. In that environment, places that wanted to succeed economically focused on offering firm-specific financial incentives designed to attract or retain establishments of large, multi-region firms. Today, innovation—the development of new products, new services, new or improved production processes, and new business models—drives growth. Indeed, the application of innovation throughout an economy is critical to prosperity and competitiveness.

The third big change is that the United States' position as the global innovation leader has been lost. As ITIF documented in its *The Atlantic Century* report, the United States ranks 6th out of 40 nations on innovation-based competitiveness (e.g., corporate R&D, venture capital, scientists and engineers), and most troubling the United States ranks 40th of 40 nations in the rate of progress over the last decade. Absent robust policy changes, the United States will likely continue its relative decline in innovation performance.[33] The result will be relatively slower growth in standard of living.

These three factors provide a compelling rationale for increased federal efforts to spur innovation. But as noted above, more funding is not enough. To be successful, we also need institutional innovation, and the reauthorization of the America COMPETES Act provides a critical opportunity to do that.

ENDNOTES

1. Fred Block and Matthew Keller, "Where Do Innovations Come From? Transformations in the U.S. National Innovation System, 1970-2006," The Information Technology and Innovation Foundation, July 2006, http://www.itif.org/files/Where_do_innovations_come_from.pdf.
2. Robert D. Atkinson, Janet Hugo, Dennis Lundgren, Martin J. Shapiro, and Jerald Thomas, "Addressing the STEM Challenge by Expanding Specialty Math and Science High Schools," The Information Technology and Innovation Foundation, April 2007 http://www.itif.org/files/STEM.pdf
3. Many MSHS students are able to take these extra courses by taking regular education graduation requirements such as Economics, American Government, Physical Fitness, and Health online at the Florida Virtual High School.
4. Source for national figures are: U.S. Department of Education, National Center for Education Statistics, "Digest of Education Statistics," Table 181: http://nces.ed.gov/programs/digest/d05/tables/dt05_181.asp, and U.S. Department of Education, National Center for Education Statistics, "2000/01 Baccalaureate and Beyond Longitudinal Study," http://nces.ed.gov/das/library/tables_listings/show_nedrc.asp?rt=p&tableID=1378.
5. Some of the expansion would come from construction and creation of new specialty MSHSs. Costs of building such a high school can range from around $11 million (for rehabilitating an existing building) to over $50 million for constructing a new MSHS in an area where land prices are more expensive. Some expansion of enrollment would come from expanding existing high schools, where the price would presumably be less. However, even at these schools the costs can be higher, particularly for more extensive laboratory equipment. Overall these funds will be used as a federal incentive to spur states and local school districts to create more specialty math and science high schools.
6. Richard Freeman, "Investing in the Best and the Brightest: Increased Fellowship Support for American Scientists and Engineers," The Brookings Institution, 2006, http://www.brookings.edu/views/papers/200612freeman.pdf.
7. Established in the early years of NSF, the program provides the nation's most promising graduate students with great flexibility in selecting the university of their choice and gives them the intellectual independence to follow their research ideas unfettered by the exigencies of mode of support.
8. Donald Wulff, Ann Nquiest, and Jo Sprague, "The Development of Graduate Students as Teaching Scholars: A four-year longitudinal study," in Paths to the professoriate: Strategies for enriching the preparation of future faculty, ed. Donald Wulff and Ann Austin (San Francisco: University of Chicago Press, 2006); Chris Golde and Timothy Dore, "At Cross Purposes: What the experiences of today's doctoral students reveal about doctoral education," Pew Charitable Trusts, 2001, http://www.phd-survey.org/report%20final.pdf.
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13. Government Accountability Office, "Streamlined Visas Mantis Program Has Lowered Burden," GAO 05-198, February 2005, http://www.gao.gov/new.items/d05198.pdf.
14. David Hart, "Global Flows of Talent: Benchmarking the United States," The Information Technology and Innovation Foundation, November 2006, http://www.itif.org/files/Hart-GlobalFlowsofTalent.pdf.
15. U.S. Small Business Administration, "Description of the Small Business Technology Transfer Program," http://www.sba.gov/aboutsba/sbaprograms/sbir/sbirstir/SBIR_STTR_DESCRIPTION.html.
16. Dan Berglund, State Science and Technology Institute, in-person interview with Rob Atkinson, February 21, 2010.
17. Connecticut's Yankee Ingenuity program and Pennsylvania's Ben Franklin Technology Partners program work in a similar manner. See Yankee Ingenuity Competition, http://www.ctinnovations.com/funding/ccef/yankee.php, and Ben Franklin Technology Partners, http://www.benfranklin.org/about/index.asp.
18. The Great Lakes Entrepreneur's Quest, a program in Michigan, is similar. Its organizers represent Michigan's

entrepreneurial community: academics, investors, lawyers, CPAs, corporate executives and other entrepreneurs. Program gives competitors a chance to win seed capital and valuable services (e.g., legal, accounting, and consulting) and provides other opportunities to help entrepreneurs launch or grow a business.

19. This kind of assistance to states with unsuccessful proposals is based on similar assistance that JumpStart, a nonprofit pre-venture capital fund in the Cleveland area, and Adena Ventures, an Athens, OH-based venture capital firm, provide to applicants whose proposals are not yet fundable. See JumpStart at http://www.jumpstartinc.org/Process/Assist.aspx and Adena Ventures at http://www.adenaventures.com/serviceprograms/opsassist.aspx.
20. Jane E. Fountain and Robert D. Atkinson, "Innovation, Social Capital, and the New Economy: New Federal Policies to Support Collaborative Research," Progressive Policy Institute, July 1998, http://www.ppionline.org/ppi_ci.cfm?knlgAreaID=140&subsecID=293&contentID=1371.
21. L. Branstetter and M. Sakakibara, "Japanese Research Consortia: A Microeconometric Analysis of Industrial Policy," *Journal of Industrial Economics*, 46 (1998): 207–233.
22. For example, spillovers from company-funded basic research are very high – over 150 percent according to one study: Albert Link, "Basic Research and Productivity Increase in Manufacturing: Additional Evidence," *The American Economic Review*, 71, no. 5 (Dec. 1981): 1111-1112.
23. According to NSF, industrial R&D support to U.S. universities and colleges in current dollars reached its peak in 2001 and has declined every year since then (to 2004). The share of academic R&D provided by industry peaked in 1999 and has declined every year since. See Alan I. Rapoport, "Where Has the Money Gone? Declining Industrial Support of Academic R&D," National Science Foundation, Division of Science Resources Statistics, Sep. 2006, http://www.nsf.gov/statistics/infbrief/nsf06328/.
24. Barry Bozeman and Albert N. Link, "Tax Incentives for R&D: A Critical Evaluation," *Research Policy*, 13, no. 1 (1984): 21-31.
25. Denmark looks to promote public and private co-operation in R&D by having a 150 percent deduction of investments co-financed by a public university or research institute and the industry.
26. Jacek Warda, "Tax Treatment of Investment in Intellectual Assets: An International Comparison," *OECD Science, Technology and Industry Working Papers*, 4 (2006): Appendix 1.1.
27. Currently the expenditures firms make to outside organizations are treated two ways. Qualified expenses cover just 65 percent of payments for contract research, unless the payments are to a qualified non-profit research consortium at which point the company can count 75 percent of the payments as qualified expenses. However, firms contracting with certain nonprofit organizations (e.g. universities) to perform basic research may claim a credit of 20 percent.
28. Robert Atkinson, "Create Jobs by Expanding the R&D Tax Credit" (The Information Technology & Innovation Foundation, January 26, 2010, http://www.itif.org/files/2010-01-26-RandD.pdf.
29. The 109th Senate considered versions of HR.4297 (Thomas, (R-CA)), S.14 (Stabenow (D-MI)), S.2199 (Domenici (R-NM)), and S.2357 (Kennedy (D-MA)). S.2357 would institute a flat credit for payments to qualified research consortia.
30. Donald Stokes, "Pasteur's Quadrant," Brookings Institution, 1997.
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33. Rob Atkinson and Scott Andes, "The Atlantic Century: Benchmarking EU and U.S. Innovation and Competitiveness," The Information Technology and Innovation Foundation, February 2009, http://www.itif.org/files/2009-atlantic-century.pdf.

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