

Innovation Policy on a Budget: Driving Innovation in a Time of Fiscal Constraint

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Governments can take a wide array of actions to spur innovation that require little or no additional public expenditure.

Innovation—the improvement of existing or the creation of entirely new products, processes, services, and business or organizational models—drives long-run economic growth and quality of life improvements. As such, spurring innovation should be the centerpiece of national economic policies.

To date, much of the focus of innovation policy has been on government investments in science, technology and education, either directly or indirectly through incentives such as the R&D tax credit. We believe that even in a time of fiscal constraint the U.S. federal government should increase, not cut, these key public investments.¹ However, we recognize the political reality that substantial increases in public investment for innovation are problematic at this time. Nonetheless, the government is not powerless to drive innovation without its fiscal policy tool. To the contrary, it can take a wide array of actions to spur innovation that require little or no additional public expenditure. This report lays out a menu of such actions, organized into ten categories:

- repurposing existing resources
- leveraging non-federal resources
- targeting procurement
- tying federal funding to performance and innovation
- restructuring tax policy in a revenue-neutral way to spur innovation
- supporting innovation policies that pay for themselves
- designing regulations that bolster, not inhibit, innovation
- leveraging standing in the international community to better support U.S. innovation
- using information to drive innovation and change
- spurring productivity and innovation within government.

Before discussing the policy ideas, it is worth first discussing the critical importance of innovation and reiterating why policies to spur it should be a focal goal of national economic policy.

INNOVATION IS CENTRAL TO ECONOMIC PERFORMANCE

Innovation is important to achieving economic goals, including employment, productivity and wage growth and to sustaining international economic competitiveness.

Employment and Income Growth

Some have argued that given the economic downturn, now is not the time to focus on innovation; rather, our chief concern should be job creation. Yet fostering innovation and creating jobs are by no means mutually exclusive. To the contrary, most studies of the issue have found that innovation is positively correlated to job growth in the mid- to long-term.² Innovation leads to job growth in three fundamental ways. First, innovation gives a nation's firms a first-mover advantage in new products and services, expanding exports and creating expansionary employment effects in the short term. In fact, in the United States, growth in exports leads to twice as many jobs as an equivalent expansion of sales domestically.³ Second, innovation's expansionary effects lead to a virtuous cycle of expanding employment. For example, in the early- to mid-1990s, the emergence of information technology as a general purpose technology drove broad-based economic growth, creating hundreds of thousands of new jobs, which, in turn, led to additional job growth in supporting industries. Finally, when innovation leads to higher productivity, it also leads to increased wages and lower prices, both of which expand domestic economic activity and create jobs.⁴

Yet more jobs alone, while a critical step for recovery, will not be enough to get America's economy back onto the trajectory of the growth rates experienced in the 1990s. Instead, the economy will need to shift from low-skilled, low-wage jobs to higher-skilled and thus higher-wage jobs; and from our traditional industrial manufacturing makeup to a 21st century mix of employment in high-tech fields such as biotechnology, clean energy, information technology, nanotechnology, and advanced manufacturing. Innovation will be indispensable in helping us get there. Highly innovative economies are characterized by a diverse mix of high-paying, capital-intensive, productive industries, while less dynamic economies tend to focus on a handful of commodity-driven industries that are low-wage and concentrated in lower portions of the value chain.

If the recent economic recession has taught economists anything, it should be that economic growth and stability stem from a mix of highly productive and innovative industries. Thus, if one sector falters, others can pick up the slack. For example, would GM have invested as much as it did on its failed hedge fund (making it more of a financial services firm than a manufacturer) if the company had been able to produce globally competitive hybrid cars? As the Organization for Economic Co-operation and Development (OECD) explains the relationship between innovation and employment, "Technology both eliminates jobs and creates jobs. Generally it destroys lower wage, lower productivity jobs, while it creates jobs that are more productive, high-skill and better paid. Historically, the income generating effects of new technologies have proved more powerful than the labor-displacing effects: technological progress has been

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accompanied not only by higher output and productivity, but also by higher overall employment.”⁵

While it is true that unemployment is dangerously high and policies should be put in place to create jobs, policies focused on short-term employment alone are a sprinter’s strategy; mid- and long-term growth will rely on more substantive innovation policies.

The point is that it is not enough for the United States to just “create jobs, any jobs,” for if we are not concerned about the mix of jobs our economy is creating, the United States increasingly risks seeing its employment base shift towards a lower value-added, lower-wage composition. We are already seeing evidence of this. The Bureau of Labor Statistics found that the average wage increase for all U.S. workers from 2000 to 2007 was 11 cents an hour. However, the average salary that companies paid their workers actually increased by 22 cents an hour over this time frame, meaning that there was a - 11 cent change in U.S. wages through occupational shift.⁶ This means that if the United States had had the exact same composition of jobs in 2007 as in 2000, the average wages paid to U.S. workers would have increased 22 cents an hour. However, on average, U.S. workers only realized one-half that increase, because a larger share of workers in 2007 were working in lower paying occupations. No doubt, this has resulted in part from increased global competition and the continued relocation of not just low value but also high value-added manufacturing and R&D activities to foreign countries. Even more worrying, this deterioration in U.S. employees’ income occurred well before the onset of the Great Recession. Going forward, innovation will be critical to ensuring higher real wages for American citizens across the board; indeed up to 90 percent of per-capita income growth stems directly from innovation.⁷

Quality of Life Benefits from Innovation

But innovation drives not just the economic, employment, and income growth fundamental to long-term prosperity, it also plays a central role in improving citizens’ quality of life. As the Information Technology and Innovation Foundation (ITIF) documented in its *Digital Quality of Life* report, information technology (IT) helps individuals in a variety of ways. It enhances access to real-time information; provides a vast array of choices; gives consumers higher quality goods and services; improves health care quality and access, including to people with disabilities; and empowers citizens to hold governments and organizations accountable. Beyond helping individuals, innovation improves the world by fostering a more sustainable environment through the development of cleaner energy and transportation alternatives.

Innovation has profoundly improved health quality and life expectancy. Innovations in health care practices, techniques, management, and public health have increased life expectancy so rapidly that half the babies born in developed countries in 2007 will live to be at least 103—meaning that, life expectancy, just 49.2 years in 1900, has doubled over the last century.⁸ Innovation is driving the emergence of gene therapies, synthetic biology, and personalized medicine that offer the promise of individually tailoring responses to once chronic or incurable ailments and diseases. Innovation will be central to “bending the cost curve” of our health system; for example, the implementation and use of health IT in the United States could save as much as \$80 billion annually.⁹

Innovation will be indispensable to meeting growing global energy demand while simultaneously sustaining global growth and decreasing the environmental impact of

energy consumption. The challenge remains enormous, but there are positive signs. For example, between 1997 and 2007, the U.S. economy became more emissions efficient. Carbon intensity declined even as GDP substantially increased, with information technology playing a crucial role in moving the economy from atoms to digits.¹⁰ Every unit of energy consumed by IT today results in a corresponding savings of 6-14 energy units.¹¹

Innovation expands commerce by making it possible to purchase and receive almost anything, anytime, anywhere: to instantaneously download any book ever written, any song ever recorded, or any movie ever made to one's computer or mobile device. Innovation in cell phones has put financial services, such as consumer banking and micro lending, into the hands of hundreds of millions who never previously had access to such services (including some 28 million Americans who lack checking or savings accounts).¹² And innovation has transformed communities and individuals' lives, helping Americans connect with friends and family in ways never before possible. In fact, the Internet has enabled the growth of over 100,000 new organizations focused on social issues.¹³

BARRIERS TO INNOVATION

Innovation is vitally important for individuals, companies, countries, and even the planet itself. Unfortunately, successful innovation is extremely difficult, and all-too-often rare. For companies, the sheer inherent difficulty in conceiving, developing, prototyping, and implementing new products and services, ideas, processes, and business or organizational models is a daunting challenge. Research by Larry Keeley of the consulting firm Doblin finds that, in the corporate world, only 4 percent of innovation initiatives meet their internally defined success criteria. A 2004 *Harvard Business Review* study found that only 10 percent of new products succeed. Other research has found that only 8 percent of innovation projects exceed their expected return on investment. Economist Edwin Mansfield found that only 12 percent of R&D projects exceed their capital cost.¹⁴

Yet, despite these odds, companies must continue to strive to innovate. Research by Larry Keeley and Carl Franklin suggests that firms that do not replace at least 10 percent of their revenue stream annually are likely to be out of business within five years.¹⁵ As management guru Tom Peters notes, the only choice for companies is to "innovate or die" as they must constantly change, innovate and radically adapt in order to stay competitive. But the irony for organizations is that while breakthrough innovations are harder to conceive, because they originate from discovery-oriented activities and are often found at the margins of the organizations' core activity, they are also easier to kill, both because they may run counter to the organizations' current business model and because the return on investment the innovation offers, while significant, is so uncertain.

Moreover, innovation and change are inextricably linked; you simply can't have one without the other. Thus, even after organizations overcome the challenge of conceiving and developing an innovation, a new hurdle emerges: overcoming both the active internal organizational antibodies and the passive bureaucratic inertia that resists change. As Clayton Christensen explains in *The Innovator's Dilemma*, middle managers in many organizations who see the perpetuation of the status quo as safer than introducing the risk of innovations that might fail or cannibalize existing product lines

or profit streams often make perfectly (individually) rational choices to stifle innovation in their organizations.¹⁶

And if innovation is difficult enough for businesses—which must respond to external market forces demanding profits and growth—it’s even more difficult for governmental organizations (or organizations dependent on government funding), where, given the lack of external market forces demanding profit-generating innovation, new incentives to innovate must be found to encourage personnel to innovate in the face of the risk of failure or opposition by colleagues. (Indeed, there is often a disincentive to innovate in these environments, as the reward for not risking failure through attempting innovation is likely to be greater than the rewards for success.) Moreover, government organizations (or organizations dependent on government funding) may feel constrained to operate within the bounds of their authorizing legislation, and hesitant to innovate if new activities aren’t obviously consistent with that.

Even if organizations manage to navigate the harrowing gauntlet of internal impediments to innovation, they often encounter resistance from external forces—business competitors, interests groups and even governments and elements of civil society—who fear that innovation will disrupt the status quo and their grip on the established order. Often these groups will attempt to manipulate the political process in rent-seeking behavior that attempts to block competitors (or, in the case of unions, their own businesses) from using innovative technologies. Noted innovation economist Joseph Schumpeter explained the source of this resistance: “In capitalist reality, it is not price competition which counts but the competition from the new commodity, the new technology...which strikes not at the margins or the profits of the existing firms...but at their very lives.”¹⁷ As a result, Schumpeter notes, “The resistance which comes from interests threatened by an innovation in the productive process is not likely to die out as long as the capitalist order persists.”

Finally, innovation has to fight against a ubiquitous barrier: the status quo. For too many innovative activities—whether introduced by “intrapreneurs” in existing organizations or by “entrepreneurs” from the outside—the response is often to ignore the need for innovation, assuming that we’ve always done it that way and we always will. “More of the same is what we need, not something different” is the all-too-common refrain. Thus, as Machiavelli noted, “There is nothing more difficult to execute, nor more dubious of success, nor more dangerous to administer than to introduce a new system of things, for he who introduces it has all those who profit from the old system as his enemies, and he has only lukewarm allies in those who might profit from the new system.” Noted political scientist Mancur Olsen elaborated on this collective action challenge to innovation, observing that while the benefits of innovation are widely dispersed, the costs of change are usually imposed on a small minority who are incentivized to be engaged.¹⁸ Meanwhile, the innovators usually have less power and financial wherewithal than well-established incumbents. For all these reasons, and especially because there are so many who are on the side of inertia and the status quo, government policy needs to explicitly support innovation.

In addition to resistance from discrete economic actors, economies themselves are subject to a host of innovation-cramping “market failures” leading them to innovate at less than optimal levels. In other words, even if the drinking water supply contained a magical drug that turned the fear of innovation into a desire for it, economies would still under-produce innovation unless government helped address key market failures. Such

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failures include externalities, information asymmetries, chicken-or-egg dilemmas, moral hazards, and system coordination challenges that inhibit innovation.¹⁹ Following are but four market failures (there are certainly others) that preclude economies from achieving optimal levels of innovation:

1. ***Because individual firms cannot capture all the benefits of their own innovative activity, firms will produce less innovation activity than society needs.*** This market failure pertains to who benefits from private companies' investments in innovation. The knowledge needed to create new products, processes and organizational forms is not something that can be completely contained within an individual firm. It inevitably spills over to other firms, which can use it without paying the costs of creating it. For example, an entrepreneur develops a new business model that others copy. A university transfers discoveries from the lab to the marketplace. A company makes a breakthrough that forms the basis of innovations that other companies can use. Studies have found that the rates of return to society from corporate R&D and investments in IT are at least twice the estimated returns to the innovating company itself.²⁰ Firms' inability to capture all the benefits of their own innovative activity discourages innovation at the level society needs. This is a key rationale for policy tools like the R&D tax credit.
2. ***R&D increasingly depends on collaboration between firms and universities, but the interests of the collaborators are not well-aligned.*** Problems with the important interactions of firms and universities represent another area of market failure. As short-term competitive pressures make it difficult for even the largest firms to support basic research and even much applied research, firms are relying more on university-based research and industry-university collaborations. Yet, the divergent needs of firms and universities can hinder the coordination of R&D between these two types of institutions. University researchers are not necessarily motivated to work on problems that are relevant to commercial needs. University technology transfer offices do not always promote the licensing of university intellectual property to firms. Conversely, individual businesses sometimes want to "rent" universities' research capabilities and appropriate the resulting research discoveries for themselves. This can impede the free flow of knowledge that can contribute to innovation elsewhere in the economy.²¹
3. ***Many industries lag in adopting proven technologies.*** Market failures also plague the diffusion of innovation. Outside of relatively new, science-based industries such as information technology and biotechnology, many industries lag in adopting more productive technologies. For example, the health care industry has lagged in adoption of available technologies, such as health IT, which could boost productivity and quality.²² The residential real estate industry has resisted moving toward more Internet-enabled sales.²³ The construction industry is plagued by inefficiencies and failure to adopt best-practice technologies and techniques.²⁴ A host of market failures, including chicken-or-egg issues related to standards and technology adoption, and principal-agent problems where innovation may hurt the implementers of it (e.g., real estate agents embracing e-realty systems) impede innovation in these sectors.

The challenge becomes particularly acute when technology platforms must be developed to enable new commercial markets to emerge. For example, for a

country to successfully deploy mobile payments systems, a wide range of actors must coordinate, including: mobile network operators, handset manufacturers, financial institutions (including major banks and credit card issuers), commercial retailers and merchant stores, public transit authorities, government agencies, and, of course, the customer. Mobile payments thus represent a complex ecosystem with many players whose success is dependent on joint action at the same time by all the players together, and this is not something that markets are often very good at achieving.²⁵

4. ***The interests of geographically mobile firms in locating innovative activity may diverge from those of U.S. residents.*** An additional challenge has emerged in the last decade or so that, while not a market failure per se, results in too little innovation in the United States. That failure is the potential divergence between the interests of geographically mobile firms and those of the residents of the United States.²⁶ Firms' decisions about where to locate innovative activity are rightly based on their own interests (and those of their consumers), which may or may not coincide with the interests of local or national populations. Decisions that are in the best interest of multinational corporations are not always those in the best interest of American workers. Following World War II and the emergence of a truly national market, all U.S. states put in place policies to tilt the choice of corporations to invest in their states. Today, even the most liberal governors recognize and respect the power and primacy of markets as the key driver of prosperity. But even the most conservative governors recognize that this market-produced bounty does not always automatically end up flowing to their own jurisdiction. For this reason, both Republican and Democratic governors "intervene" in their economies with robust economic development policies. They are not content to let the "market" determine what kind of and how many jobs are created: they work to ensure that they gain more high-paying, high-productivity jobs. With the rise of the globally integrated enterprise, the United States now is essentially one big state. It faces the same reality individual states faced after World War II: without robust economic and innovation policies, it risks losing out in global competition.

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THE NEED FOR SMART INNOVATION POLICIES

Given the myriad challenges to innovation, including its inherent difficulty, the resistance it encounters from both internal and external forces, and the market failures that afflict the innovation process, the market, left to itself, is likely to produce less innovation than the nation needs. Thus, there is a compelling rationale for smart innovation policies that incentivize R&D and innovation inside corporations, government agencies, universities, and other players in the national innovation system.

While innovation is the lynchpin to economic growth and higher standards of living, the current political and economic realities have limited the funds available for innovation policy. Indeed, the global economic downturn and recent stimulus spending will cause the federal budget deficit to balloon to an estimated \$1.35 trillion by the end of 2010, with the total national debt reaching over \$13 trillion. While many economists counsel that a nation's debt should not exceed 60 percent of GDP, in 2009 U.S. debt equaled 89 percent of GDP. And in its latest budget outlook, the Congressional Budget Office (CBO) warned that federal debt could reach 185 percent of gross domestic product by 2035. As CBO Director Douglas Elmendorf put it, "U.S. fiscal policy is on an

unsustainable path to an extent that cannot be solved by minor tinkering.” Indeed, the interest expense alone on the national debt equaled \$260 billion in 2009—more than the government spent on Medicaid. And the budget crisis isn’t just a federal problem. Forty-eight of the fifty states face a cumulative \$196 billion in budget shortfalls in 2010 and many have made unsustainable government worker pension and retirement benefit promises that will soon come due, putting them under further fiscal stress.

While ITIF has argued that any long-term solution to the problem of the national debt actually requires increasing, not decreasing, government investments in innovation and productivity growth—investments that are particularly important with unemployment hovering near 10 percent—political pressure for deficit reduction has limited the range of freedom for Washington policy makers. The growing fiscal crisis has caused policy makers to tread cautiously when passing legislation with large price tags. Indeed, the current political landscape is such that short of legislation to increase employment, few bills that cost taxpayers anything are successfully being shepherded through Congress. For example, although prospects for passage of the America COMPETES Act—legislation aimed at strengthening American competitiveness by investing in education, technology and innovation—look promising, with legislative drafts having passed the House floor and one Senate committee, they did so under intense political scrutiny by those with cost concerns, leading the Senate to scale the authorizing legislation down. Meanwhile, budget hawks continue to argue that “everything should be on the table” when it comes to cutting government spending and raising government revenues, even investments in innovation.²⁷ However, if Congress should be funding anything, it should be policies and investments that will spur innovation and, by extension, increase economic growth and the tax revenues needed to extricate the United States from this daunting fiscal predicament.

A “POOR MAN’S” INNOVATION POLICY

Given this reality—the pressing need for more innovation and the unwillingness to expand funding for it—it is important to identify other policy levers that can help spur more innovation. In fact, if policies are crafted carefully, achieving the higher standards of living that follow from sound innovation policy, and taming the current budget crisis need not be mutually exclusive medium- and long-term goals. Even in a time of budget constraints, there are many pro-innovation policies Congress and the White House can pursue that will add little or nothing to the federal deficit.

This report aims to encourage policies that achieve two crucial goals over a 0-5 year period: 1) produce more productivity and more innovation, which is what fundamentally drives higher real wages and quality of life improvements; and 2) do so in ways with minimal negative or even positive budget impacts. Some may not see all the following recommendations as traditional innovation policies if they view such policies as limited to scientific or technological programs such as those at the National Science Foundation (NSF) or the Defense Advanced Research Projects Agency (DARPA). However, this report takes a more all-encompassing view of innovation. Indeed, innovation can be both technological and non-technological in nature, with the former stemming from scientific and technical advances, and the latter yielding benefits through the design and implementation of superior processes, business models, or even organizational forms. Indeed, the first two of the ten categories of recommendations pertain to more effectively using existing budgets and resources to spur innovation.

REPURPOSING EXISTING RESOURCES

Existing budgets should be used whenever possible to incentivize innovation. Congress and the Administration have a wide spectrum of options for tying resources to innovation, from explicitly making innovation priorities a requirement for federal dollars, to “nudging” citizens, industries, and governments to think innovatively. Often, too little existing funding goes to activities that would do the most to spur U.S. innovation and competitiveness. Thus, shifting current funding toward those activities that would do more to spur innovation and competitiveness can be a powerful revenue-neutral tool.

Within most agencies, some budgeted activities clearly are more important to spurring innovation and productivity than others. Yet, all too often the budget process in the Office of Management and Budget (OMB) and Congress either increases or cuts budgets across the board. We see this, for example, in the current legislative process reauthorizing the America COMPETES Act. Among other things, the proposals include across-the-board funding increases for NSF. Yet, some activities in NSF are much more focused on industry-university collaborative research than others and we know that this form of research is more likely to be commercialized.²⁸ These programs not only leverage non-federal monies, making federal dollars go further (see below), they do a better job of ensuring that the research has larger impacts on innovation. Therefore, **programs promoting collaborative industry-university efforts, such as the Engineering Research Center (ERC) and the Industry & University Cooperative Research Center (IUCRC) programs, should receive a larger share of the overall NSF budget.**²⁹

In other cases, existing monies allocated to activities that no longer spur innovation should be transferred to other more up-to-date activities. A case in point is the Federal Communication Commission’s Universal Service Fund for telephony. This fund, collected in part from charges to telephone bills, largely supports rural telephone companies to provide circuit-switched telephone service. Instead, **the FCC’s Universal Service Fund should be repurposed and the funds required to be invested in broadband.**

In other cases, powerful interests outside the agencies lobby for “their” particular programs, even when they may not be the most effective at driving innovation. A case in point is highway funding. Given the ability of intelligent transportation systems (ITS) to maximize the capacity of existing highway capacity, expanding funding for ITS is the optimal use of highway transportation funding. Yet states have significantly underinvested in ITS, preferring to fund traditional transportation investments such as new highway capacity. As one GAO study on the state of ITS deployment in the United States found, “unfortunately, information on benefits does not have a decisive impact on the final investment decisions made by state and local officials.”³⁰ This challenge is amplified as elected officials often find ITS investments less appealing than highway construction. The GAO study quoted Chicago- and San Francisco-area transportation officials lamenting that since ITS applications, “do not usually offer groundbreaking ceremonies which offer positive media attention,” elected officials were generally less motivated to support ITS projects.³¹ Clearly, **repurposing transportation funds to ITS systems that have a far greater cost-benefit return would spur innovation and improve performance of the transportation system.** Making transportation funding

more contingent on performance, as discussed subsequently, would go a long way in this regard.

In other cases, agencies devote considerable resources to activities which they know best and are most comfortable with, even if those activities may not be the most effective at driving innovation and competitiveness. A case in point is the relative lack of focus on technology commercialization in federally-funded research. The current federal system of funding R&D still is based on a “linear model” of research that simply assumes that basic research will get transferred into new products and services. For example, only two percent of the NSF budget goes to programs focused on commercialization through industry-university partnerships. Yet, given institutional inertia, coordination and communication challenges, and lack of funding for proof of concept research, overcoming the “valley of death” between basic research and its real world application is often the most difficult part of the innovation process. One way to address this would be **to establish a set-aside program taking a modest percentage of federal agency research budgets (around 0.15 percent) and allocating this to a technology commercialization fund to fund university, federal laboratory, and state government technology commercialization efforts.**

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LEVERAGING NON-FEDERAL RESOURCES

Federal dollars can go further if they leverage non-federal dollars. But too many federal programs fail to take advantage of this opportunity. One way to do this is to create more federal programs that try to leverage industry funding. Industry may be willing to support some government-funded activities with its own funds. As discussed above, NSF’s ERCs and IUCRCs receive industry matching funds. But other NSF programs could also leverage industry funds. A case in point is Ph.D. fellowships. NSF’s Graduate Research Fellowship (GRF) program provides support to graduate students in science and engineering, but it is currently underfunded. The same number of NSF graduate research fellowships are offered per year today as in the early 1960s, even as the number of college students graduating with degrees in science and engineering has tripled. One way to expand the effective GRF budget would be to create a new NSF-industry Ph.D. fellows program, where industries and NSF split the cost.

Likewise, firms could also help reduce the government’s costs of bringing trade violation suits before the World Trade Organization (WTO). Most of the largest violators of international trade or intellectual property laws are WTO countries, yet the United States brings too few cases against these countries at the WTO. Companies don’t do as much as they could to help the Office of the United States Trade Representative prepare and bring cases in part because they have an incentive to be “free riders,” letting other companies or the government incur litigation costs while reaping the benefits. **Therefore, firms should be allowed to take a 25 percent tax credit for expenditures related to bringing WTO cases.** While a tax credit does represent a marginal cost, the economy-wide benefits would far outweigh the costs of the tax cuts.³²

In other cases, the federal government can leverage other resources by relying more on user fees. User fees can not only help raise funds, they can also spur innovation. A case in point is how for the United States funds roads and highways. Currently, roads are predominately paid for out of the gas tax, which treats all drivers and driving times equally. Yet as congestion grows—nearly half of all the urban interstate road miles in the United States are congested³³—a better method would be to tax drivers based on

when and where they drive. **Congress should reduce the regulatory barriers preventing states from using tolling to fund maintenance and expansion of highways and the Department of Transportation (DOT) should use existing federal highway trust fund dollars as targeted incentives to spur state and local governments to embrace tolling and pricing.** This will foster greater overall investment that will in turn allow federal dollars to go further.

Finally, volunteers can serve as a leverage source for innovation. For example, the open data movement entails governments opening up their data stores and inviting citizens to add value to them, e.g., by creating application mash-ups. Washington, D.C. has a contest every year for the best online application of public data called “Apps for Democracy.” Similarly, the 2010 Health 2.0 Developer Challenge links user-submitted health care “challenges” with teams of developers to find solutions to health IT problems by mashing up and creating applications for government health databases.³⁴ **Another way to increase the use of public knowledge is through Wikis.** Wikis are a technology that helps pool knowledge by allowing interested members of the public to add to and to comment on existing content. A good example is the U.S. Patent Office’s “Peer-to-Patent: Community-Patented Reviews Pilot” that allows the public to participate in the patent examination process by reviewing patent applications and uploading “prior-art”—publications and research that reflect on the novelty of the patent in question. To ensure the program does not become an outlet for unproductive online commentary, the system only accepts the top ten prior-art references, as determined by the online community. **More broadly, everywhere possible, federal and state government agencies should create digital data using interoperable standards, such as shareable and reusable extensible markup language (XML).**

Federal support for regional innovation initiatives offers another way the federal government can leverage non-federal resources, and do so in a manner that directly supports regional business-led strategies. This can help overcome the long-standing challenge that too often federal efforts in support of regional innovation initiatives have been either unconnected to other federal programs or to the regional economy in which they are to be situated. Federal support can take the form of matching state grants or providing grants to capitalize state-run revolving loan funds to increase access to low-cost capital. Federal support for regional cluster strategies are appropriate in times of fiscal constraint because: 1) the amount of support needed is not large by federal standards; 2) federal support will be leveraged by other resources, including private investment; and 3) organizing federal efforts in support of regional economic strategies will increase the efficiency of federal operations.

TARGETING PROCUREMENT

While government can do a better job of funding outside activities to spur innovation, it can also do a better job of buying goods and services to spur innovation. Congress and the Administration should see innovation as an explicit goal of the procurement process. Infrastructure, general services and defense are particularly attractive areas for the government to use procurement policies to promote innovation because the government is generally the sole purchaser and dictates the rules of the road.

One way to spur innovation in procurement is to enable and incentivize more innovative proposals from contractors. **For example, innovation should be an explicit criterion within the government procurement process, whereas currently it is not.**

Some countries such as the United Kingdom have made innovation a clear goal of their procurement process for years. The UK's Department of Trade and Industry (DTI) requires all levels of government to consider innovation when awarding government contracts. They also have developed public-private partnerships to help public sector employees with “unconventional but innovative procurement projects.”³⁵ In Australia, agencies are encouraged to single out innovative ideas by evaluating extra unique features of proposals as a separate criterion. Finland both includes “innovativeness” among the criteria for public procurement decisions and reserves a percentage of appropriations granted to administration agencies for innovation and development activities.³⁶ While these countries recognize that innovation should be a key element of government procurement, according to a report by the European Union, “the United States has a strategic orientation in their public procurement as well, but not primarily connected to innovation.”³⁷

Government can and should lead by example. **When practical, government should be an early adopter of new technology rather than solely relying on industry to lead the way.** Government can and should do these things not just to drive innovation but to cut government costs (over the moderate term) and/or to improve quality. Through technological leadership in its purchases, government can play an important role in spurring markets and proving concepts. A number of opportunities exist in the area of green innovation. As technology creates new opportunities to cut energy costs, “greening” the procurement process is not only politically popular, it is a good policy for agencies faced with long-term budget constraints. For example, the U.S. General Services Administration (GSA) requires new federal building contracts to achieve Silver certification as part of its Green Building Rating System. The initiative was put in place in part because of environmental concerns. Yet green building designs and smart grid technology also have the potential to dramatically cut the cost of government property—particularly for large buildings in urban areas at risk of the “heat island effect.” For example, coordinating and controlling air conditioners with IT can cut maximum power consumption by 40 percent.³⁸ Retrofitting three out of every four U.S. federal buildings with optimized heating, cooling, and lighting systems could save as much as 55 percent on energy costs per building while boosting demand for geothermal heat pumps, LED lighting and other energy-saving products.³⁹ There are many other possibilities. **Government agencies can pursue green IT initiatives by fostering telework and purchasing lower energy-using IT products. Government can buy leading edge vehicles (like plug-in hybrids) for its vehicle fleets.**

One key to driving innovation through procurement is to support open standards architectures. By adopting technologies that are interoperable with non-federal applications, federal procurement can help drive widespread adoption. For example, **GSA should commit to installing contactless point of sale (POS) terminals in all cafeterias and parking garages it directly operates in government agencies and facilities** (thus promoting technology uptake and saving money since contactless POS terminals reduce the need for attended checkout stations). Additionally, **government ID programs such as the Department of Defense's Common Access Card and the Transportation Worker Identification Credential (TWIC) should move to an open architecture that allows electronic wallet applications to be housed on the card.**⁴⁰ Further, in the reauthorization of the Surface Transportation Act, **Congress should require that any transit authority receiving federal public transportation funding that has a contactless fare payment system move to an open-loop outside payments network approach.**⁴¹ This would have the effect of encouraging transit agencies

receiving federal funding to deploy near field communications (NFC)-enabled contactless fare payment systems that are interoperable with those of other transit agencies throughout the country. Thus, government employees or public passengers would be able to use a common fare card to pay for ridership across the country (e.g. they could use their WMATA SmarTrip card to make payments on New York’s MTA subway system).

Government can also spur widespread digital transformation of the economy, not only by transforming its own operations, but by requiring that organizations interacting with it do so digitally. The federal government should require organizations it interacts with to provide information in digital, interoperable formats. For example, the American Recovery and Reinvestment Act (ARRA) requires health organizations to submit data electronically to the federal government by 2015 or pay a penalty. **Government should also promote digital signatures for e-government applications.**⁴²

TYING FEDERAL FUNDING TO PERFORMANCE AND INNOVATION

The federal government routinely provides monies to other organizations (state and local governments, educational institutions, health care providers, etc.) to achieve some public purpose. But all too often, the accountability is a process-based one—did the funds get spent the way the organizations said they would?—not an outcome-based one. Moreover, to achieve process-based accountability, federal rules often stifle creativity and innovation in the organizations receiving support.

The federal government could be a major engine of innovation if it tied its funding more closely to performance and organizational innovation. **Indeed, the federal government should explicitly use the power of purse strings to drive innovation among the recipients of those funds and allocate money on the basis of having recipient agencies, departments, or benefactors implement innovative policies or approaches.** The idea is to take the same amount of money, but allocate it on the basis of incentives, to drive performance improvements and innovation. In this case, the federal government has a role to play in developing policies that use performance-based funding and/or incentives to push back against institutional inertia.

The Department of Education’s “Race to the Top” initiative offers an excellent illustration of spurring organizational innovation by allocating funds on the basis of performance. The Department is offering \$4 billion in grants to states committed to reforming their education systems. States unwilling to leverage data and accountability systems to improve measurable performance outcomes, that have legislation preventing the development or expansion of innovative school approaches, or that cannot demonstrate effective alliances with local teachers’ unions on performance accountability are not eligible to apply for funds.⁴³ After Tennessee and Delaware were awarded the first \$600 million, non-qualifying states worked to pass conforming legislation, including addressing longstanding union issues. While Race to the Top represents an excellent first step in reforming the U.S. educational system, further stimulus on educational funding should be focused not just on evidence-based “reform” but also on innovative education models such as Math and Science High Schools and other charter schools.

Federal dollars can go further if they leverage non-federal dollars. But too many federal programs fail to take advantage of this opportunity.

Race to the Top should serve as a model for using performance incentives to drive innovation across a range of government agencies. There are many agencies where this kind of effort could be implemented. For example, the Department of Transportation could incorporate performance-based criteria in its funding allocations to states. Currently, states receive transportation dollars based on current need (state lane miles, vehicle mile traveled, etc.) or compliance with federal mandates like drinking and driving laws, yet performance measurements are notably absent. To remedy this, **DOT should allocate a portion of its highway funds to states on the basis of improvement in transportation outcomes (e.g., safety, congestion, road surface quality, etc.).** Doing so would incentivize states to break from the tired “dollar per mile” mentality and begin to adopt innovative technologies such as intelligent transportation systems. ITS offer the cheapest way to realize systemic performance improvements.

The federal government could also use a similar process to provide stronger incentives to recipients of federal research funding to commercialize their research. To incentivize universities to place greater focus on research activities more likely to lead to practical or commercializable products or services that benefit society and/or spur economic growth, **the federal government should designate a small share of research funds to be allocated to universities based on their demonstrated prior success in both achieving technology commercialization and attracting industry R&D funds.** Other countries have implemented similar policies. In Sweden, for example, 10 percent of regular research funds allocated by the national government to universities and university colleges are distributed using performance indicators. Half of these funds are allocated based on the amount of external funding the institutions have been able to attract, and half on the quality of scientific articles published by each institution (as determined through bibliometric measures such as the number of citations).⁴⁴ Finland has also started to base its university budgets on performance—25 percent of Finnish universities’ research and research training budgets are based on “quality and efficacy,” including the quality of scientific and international publications and the universities’ ability to attract research investment from businesses.⁴⁵ France has taken steps in this direction as well.

The federal government should direct public funds not only to spur innovation outside the government, but internally as well. Private companies are increasingly doing so. For example, GE measures its senior leaders on “courage” in the face of uncertain risk/reward tradeoffs, such as decisions to enter new markets in foreign countries, when the opportunity is promising but the return on investment is not perfectly clear. Here, **the goal would be to incentivize innovative behavior in federal agencies by explicitly making innovation a part of performance expectations and reviews for senior leaders.** Moreover, government managers should see coaching their staff in the process of innovative thinking and use of innovative tools and methodologies as part of their job description.

RESTRUCTURING TAX POLICY IN A REVENUE-NEUTRAL WAY TO SPUR INNOVATION

Just as expenditure policy can better spur innovation, so too can tax policy. Indeed, the tax code could be used in a more effective, revenue-neutral manner to spur innovation. And tax policy can be used to tax the “bads” (the negative externalities) such as greenhouse gas emissions, in order to finance the “goods” such as a better R&D tax credit and first-year expensing for new capital equipment. Smart tax policies can

incentivize innovation, which increases productivity and tax receipts. Any change in tax policy to spur innovation in this fiscally constrained budget environment must address both revenue increases and tax decreases.

With regard to revenue increases, taxes should be increased in a way that spurs innovation and/or competitiveness. There are two key targets: carbon taxes and border-adjustable business activity taxes. Now that cap and trade legislation is off the table, it is important to consider other policies to spur clean energy use. There are several options. **Congress could institute a carbon tax.** Such a tax would be significantly easier to implement than a cap and trade regime and by raising the price on dirty energy it would spur clean energy innovation. In addition, **corporate taxes should also be restructured by creating a border-adjustable business activity tax that is imposed on imports and exempted on exports.**⁴⁶

Clearly the place to cut taxes to drive innovation is on the corporate tax side and in particular on corporate investments in the building blocks of innovation—research, new capital equipment and workforce training. The United States has the second highest effective corporate tax rate of the 30 OECD countries, behind only Japan. Using the taxes raised through a carbon tax and business-activity tax to offset corporate taxes related to investments in research, workforce training and new capital investment would spur productivity, innovation and competitiveness.

There are other aspects of the tax code that limit innovation, one of which discourages industry-university partnerships. Currently, if a U.S. corporation funds a particular area of university research, the university cannot guarantee that the company will own the resulting intellectual property, or that it won't be licensed to their competitors. This results from an unintended consequence of tax laws pertaining to universities performing industry-funded research in buildings that were originally financed by tax-exempt bonds.⁴⁷ Specifically, revenue Procedure 97-14 of the U.S. tax code precludes companies sponsoring university research projects from receiving preferential treatment in licensing. In effect, it requires universities to essentially stipulate that companies cannot own the IP coming from research they fund. It is a barrier unique to the U.S. and a major competitive disadvantage. Efforts were made in Revenue Procedure 2007-47 to mitigate the impact of these provisions, but these changes still largely preclude the ability of companies to readily obtain exclusive licenses for research that they fund in buildings financed with tax exempt bonds.⁴⁸ **Revenue Procedure 97-14 of the U.S. tax code should be amended to lift this restriction.**

SUPPORTING INNOVATION POLICIES THAT PAY FOR THEMSELVES

While some innovation policies cost money or are neutral in the short run, some actually generate more tax revenues than they cost. These policies can simultaneously raise money for the government while acting as drivers of innovation, and thus offer a win-win proposition for budget and innovation hawks alike.

There are a variety of policies that can accomplish this. Some can raise funds because the cost of providing the service by the government costs less than the revenues received. A case in point is the H-1B visa. Despite the economic crisis and high unemployment rates, the United States faces a shortage of high-skilled workers. Similarly, every year, far more foreign high-skilled workers apply for H-1B visas than the current cap of 65,000 allows. Some argue that foreign workers drive down the

wages of U.S. workers, yet according to a 2010 study in the journal of *Management Science*, foreign workers with H-1B visas earn on average 6.8 percent more than domestic workers.⁴⁹ **Expanding H-1B visas earns the government revenue**, as each H-1B visa carries a \$390 application fee, \$500 Fraud Prevention and Detection fee, and \$230 in consular fees. Thus, allotting 65,000 H-1B visas generates \$73 million directly. Additionally, companies employing more than 25 H-1B visa holders must pay a \$1,500 fee per visa holder, and those employing less than 25 must pay a \$750 fee per holder imposed by the American Competitiveness and Workforce Improvement Act (ACWIA), generating well about \$75 million more in revenue.⁵⁰ (Additional fees, such as an optional \$1,000 expedited pricing fee, can bring the average cost of an H-1B closer to \$3,600, raising government revenues from H-1B visa issuance to about \$235 million.)

If Congress does not want to increase the current H1-B cap, or only wants to increase it on a temporary basis, **it could better allocate the visas to the organizations that best need them by implementing an auction system for H-1B visas.** An auction system for some temporary visas would direct high-skilled workers to the sectors in which demand is the strongest and where the impact on the economy is most beneficial as well as maximize revenue from the issuance of the visas.

Another policy that can raise funds while driving innovation is auctioning off wireless spectrum, a valuable public resource. There is still a lot of spectrum both in the hands of the government and in specialized assignments that could be made available for auction. As such, the more that the federal government can get spectrum into public use, the more digital innovation will occur. In particular, as WiMAX and Long Term Evolution (LTE) technologies are deployed and more of the prime 700 MHz spectrum is auctioned, more rural places will be able to gain access to wireless broadband. But ensuring that even more spectrum is available will be important. **One way to do this is for the Federal Communications Commission to revise the regulations for unlicensed spectrum in the white spaces between digital TV bands.** The Commission's Report and Order sets the power level for mobile terminals too low for such devices to communicate over distances of a few hundred feet, effectively making the white spaces nothing more than another home networking option at this point.

Congress and the Administration should see innovation as an explicit goal of the procurement process.

While white spaces spectrum is an important driver of innovation, it does not lead to direct revenues to government. Auctioning off other spectrum, however, can. As a result, **the Commission should proceed with its proposed efforts to auction off the use of digital TV spectrum by broadcasters.** Most of America receives TV programming from a cable or satellite system that offers substantially more choice than over-the-air (OTA) delivery, so OTA television broadcasting has limited value. Moreover, many OTA broadcasters are using their spectrum allocations for multiple low-value program streams. The public interest would be better served by the re-allocation of at least a portion of the digital TV spectrum to the highest and best uses as identified by auctions. If past auctions are any guide, the FCC could raise billions of dollars in revenue, even if they used a portion to pay broadcasters for agreeing to give up "their" spectrum.

Other policies that don't generate "excess" revenues directly can spur innovation. A case in point is high-skill immigration policy, especially for students. America's competitiveness is contingent, in part, on the number of science, technology, engineering and math (STEM) PhDs working in the United States. Yet between 1998

and 2005, the number of U.S. citizens or permanent residents earning STEM doctoral degrees declined by 13 percent.⁵¹ While ideally the supply of American STEM workers will expand to fill the gap, the likelihood of that happening in the moderate term is unlikely. Yet welcoming the world's most skilled foreign-born scientists and engineers 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. **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.

DESIGNING REGULATIONS THAT BOLSTER, NOT INHIBIT, INNOVATION

Just as market failures can inhibit innovation, so too can regulation failures, especially when policy-making becomes captured by interest groups. Yet if regulation is designed well it can actually spur innovation.

In order to develop a more proactive approach to designing innovation-spurring regulation, the federal government needs to be better organized for this purpose. One option is to institute a stronger review process for new regulations that takes into account their impact on innovation. Currently, 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—manifest 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 incumbents. Courts, meanwhile, lack sufficient expertise and ability to conduct the type of forward-looking policy planning that should be a hallmark of innovation policy. To remedy this, the Administration or Congress could **create an Office of Innovation Policy (OIP) within the Office of Management and Budget that would have the specific mission of being the “innovation champion” within OMB.** This entity would be independent of existing federal agencies and 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.⁵²

Policymakers can also spur innovation by avoiding innovation-hindering regulations, such as stringent data privacy rules and heavy-handed net neutrality regulation. Policy for fast-changing technologies promotes innovation best when it takes a fresh approach to emerging technologies, judging social impact on the facts and not on mere speculation or fear. Innovation in IT network applications depends on continued investment in Internet core technologies and in the development of new business models to monetize applications. Regulatory policy tends to put new shoes in old boxes, but revolutionary technologies such as mobile networks and the Internet present altogether new opportunities to improve quality of life if they're allowed to develop and flourish on their own terms.

Likewise, data privacy regulations can restrict the free flow of data in the name of consumer privacy. For example, proposals have been considered to limit sharing of certain types of consumer data, medical data or data stored in the cloud. Limits on data

sharing impose costs on consumers and businesses. In fact, many businesses would not exist today if data sharing was not allowed. Proposals for expanding privacy regulations rarely consider the impact such proposals have on consumers as a group. Rather, the focus is all about the impact of strict privacy regulations for individuals. **Policymakers should recognize that privacy, like any other value, must be balanced against other competing interests and can come at a real financial cost to all consumers.**⁵³

At the same time, **key government agencies that “regulate” innovation can be better designed to understand innovation and to enable it.** A case in point is the patent system and the Federal Drug Administration (FDA) drug approval process. The U.S. Patent and Trademark Office (PTO) and the FDA were once the envy of other nations around the globe because of their effectiveness and efficiency. But the backlog (currently over 750,000 patents) at the PTO means that most patent applicants will wait years before finding out if their invention is granted a patent. Similarly, the increased delays at the FDA have slowed the process of bringing new drugs and devices to market.

To reduce the delay, uncertainty and poor quality of patents that currently plague the U.S. patent system, patent fees should be redirected from the U.S. Treasury to the PTO and the PTO should have fee-setting authority to increase fees to meet budgetary needs. The current statute requiring PTO to wait for a congressionally amended fee schedule is inflexible and does not allow PTO to respond to increased costs. Likewise, the FDA has experienced an increase in the number of delays for drug and device approval due to difficulties in upgrading the agency’s scientific expertise needed to expeditiously and effectively evaluate new drugs and biological submissions. Affording the FDA more flexibility in fees would help reduce these deficiencies.⁵⁴

While the federal government can and should redesign its own regulatory agencies to be more supportive of innovation, it can also press state and local governments to do the same. One key area is state and local government permitting. Often, organizations seeking to innovate are dependent on state and local governments for permits and all too often state and local governments operate on “incremental time,” not “innovator time.” Yet, the federal government can require state and local bureaucracies not to impede innovation. An excellent example of federal regulatory reform that promotes innovation is the cell-tower-site shot clock, which the Federal Communications Commission unanimously voted to impose. The rule addresses the problem that over 760 applications for new tower sites have been waiting for responses by state and local governments for over a year and about 180 applications have been waiting for more than three years. The new timeframes mandate that state and local authorities respond to requests in 90 to 150 days, depending on the application.

The Federal government should also use its regulatory authority to press states to eliminate laws that hamstring innovation by sheltering old industries from new firms and business models. A number of professions and industries, including optometrists, veterinarians, travel agents, insurance agents, mortgage brokers, securities traders, college professors, radiologists, and even undertakers selling caskets have sought, often successfully, government regulatory protection from more efficient and lower cost e-commerce competitors. For example, automobile franchise laws in all 50 U.S. states prohibit U.S. automobile manufacturers from selling vehicles directly to customers over the Internet (rather than through locally franchised dealers). Eliminating such regulatory barriers to market-based competition would substantially increase

innovation. One way to do this would be to link the ability of states to impose e-commerce sales taxes to the removal of state barriers to e-commerce.⁵⁵

Another example where regulation could bolster, not inhibit, innovation would be to **allow more venture capital-backed firms to qualify for Small Business Innovation Research (SBIR) grants.** The SBIR program was created to ensure that the nation's small, high-technology, innovative businesses are able to grow and contribute to the country's R&D infrastructure. Between the SBIR and Small Business Technology Transfer (STTR) programs, the federal government allocates over \$2 billion to small firms annually. Yet start-up firms that have more than 50 percent of their funding coming from venture capitalists are ineligible to receive SBIR or STTR grants. It does not make sense to discriminate against small start-up firms that have realized success in attracting venture capital backing.

Encouraging the deployment and use of self-service technology can also spur innovation and productivity, but this is sometimes impeded by those who fear that self-service technology will cost jobs. However, creating an economy that encourages high-skilled labor over low-skilled labor increases the adoption of technology, regardless of whether workers are particularly skilled in the specific technology adopted.⁵⁶ Industries with high-wage workers promote investment in technology, despite skill levels, as the relative cost for performing a task is much higher for higher paid workers, and therefore the returns from training and new technology are also higher.⁵⁷ Yet when labor costs are too low for unskilled workers, firms often take a short-sighted view and align their business models around low-skilled labor instead of high-skilled labor. **One way to incentivize the use of technology and high-skilled workers in firms would be to increase the minimum wage.** Given that the U.S. minimum wage is near the lowest of developed nations, it could be seen as a subsidy for labor against technology. A higher minimum wage, indexed to inflation, could help create a feedback loop where companies invest in technology which increases the demand for higher-skilled workers.

The current system of funding R&D still is based on a “linear model” of research that simply assumes that basic research will get transferred into new products and services.

The United Kingdom has taken impressive steps to reform its regulatory policies, government-wide, to better support private sector innovation. Britain's Web site businesslink.gov.uk, a directive of the Department for Business, Innovation and Skills' Better Regulation Executive (BRE) initiative, empowers businesses to have a direct influence on how the regulations that affect them are devised and delivered.⁵⁸ The Web site allows businesses to submit proposals to the BRE outlining how specific regulations can be improved, such as ideas about how to reduce the amount of time it takes to complete forms or about how regulations that overlap or contradict can be rationalized.

LEVERAGING STANDING IN THE INTERNATIONAL COMMUNITY TO BETTER SUPPORT U.S. INNOVATION

Regardless of how well U.S. federal and state governments restructure their policies and regulations to better support innovation, unless other nations likewise dramatically reduce their innovation-damaging mercantilist policies, it will be difficult for the U.S. innovation economy to thrive. As such, there are a host of things the federal government can do to “level the innovation playing field” that cost little or no money.

One key area is to **press for stronger treaties and enforcement that are innovation supporting.** A case in point is the Anti-Counterfeiting Trade Agreement (ACTA) that

establishes international standards for intellectual property (IP) rights enforcement outside of the traditional international organizations such as the World Trade Organization (WTO) and World Intellectual Property Organization (WPO). Because ACTA is essentially a treaty amongst nations, it would be more able to outline what constitutes IP violations by other countries and give victim nations greater recourse. Doing so would help stem the growing trend of individuals, organizations and nations systematically stealing, extorting or otherwise gaining U.S. intellectual property without paying for it.⁵⁹

Internally, **the government needs to be better organized and assertive in taking action against foreign mercantilist innovation policies.** One key area is currency manipulation. Many countries, particularly China, use currency manipulation to give their nations' products and services a subsidy in the global marketplace—such subsidies, if implemented explicitly, would likely violate WTO regulations. Currency manipulation severely distorts global trade, increases the cost of U.S. exports and costs American jobs. Moreover, by raising the costs of U.S. exports it retards the development of innovation-based jobs in the United States and the development of innovation globally. The administration can do much more to push back against countries that manipulate their currencies.

Another example is USTR's relative lack of focus on enforcement. USTR's primary goal is to open markets, yet if open markets are significantly skewed by unfair foreign trade practices there is little reason for pursuing them. **Congress should increase funds for trade enforcement (versus negotiating new trade deals) and restructure USTR to focus more on enforcement with regard to currency manipulation, discriminatory tariffs, and the use of regulations and laws to discriminate against foreign firms.**

USING INFORMATION TO DRIVE INNOVATION AND CHANGE

Information can be a powerful driver and enabler of innovation. At the most basic level, better information about what is happening in the economy in terms of innovation can make it easier for policy makers and the public to understand the importance of innovation. In addition, as an input to the innovation process, more widely available information can help to more widely diffuse knowledge. Finally, widely available information on the performance of market actors can change organizational behaviors by spurring competition as a means to drive innovation and performance improvements among otherwise recalcitrant institutions. For all these reasons, government should seek to make more information more widely available.

One of the key ways the government could do so is by establishing an innovation measurement system. As is often said, you can't manage what you can't measure. Unfortunately, while innovation is driven by knowledge-based intangible capital, most government statistics still only report labor and physical capital within firms. **Allocating a relatively small amount of money to improved innovation measurement could accelerate an upgrading of the statistics, with a big impact on policy.** For example, NSF's new U.S. business R&D innovation survey expands collection of a broad range of data on the innovation-related activities of U.S. manufacturing and services firms.⁶⁰

Likewise, *The Annual Economic Report to the President* submitted by the Chairman of the Council of Economic Advisors is seen as a weathervane of the nation's economic climate, yet it largely ignores the role of innovation in the economy. Given that innovation is responsible for at least 75 percent of economic growth, the economic picture painted by the Council of Economic Advisors is woefully incomplete. **Thus, *The Annual Economic Report to the President* should contain a section explicitly reporting on the state of American innovation.**

The government should also strive to make more knowledge pertaining to innovation public. The federal government both conducts within federal labs and funds externally a considerable amount of research. Too often this research is not publicly disseminated or hard to access. Federally funded research should be made publicly accessible and easy to obtain. To that end, **Congress should create a federal labs knowledge bank (e.g. such as an online database) that makes all ideas generated from federally funded research publicly available to entrepreneurs or other researchers.** Government contract managers making federal research fund awards should know what intellectual property is being developed and has potential. In addition, a process should be put in place to increase communication, collaboration, and coordination among all technology transfer institutions. Moving ideas, people, money, facilities and equipment seamlessly among the collaborators (government, university, industry, NGO, foundation, etc.) is essential in a global, knowledge-based economy. Creating these partnerships would go a long way towards facilitating commercialization through the development of a cluster of essential actors such as research and business partners as well as those with specific expertise in economic development, financing and regulation. Building these new networks will create a more complete innovation system. **The Stevenson-Wydler Technology Innovation Act of 1980 could be revised to require such collaboration among at least the federal laboratories.**

Another challenge is that all too often publicly funded research is published in academic journals that can cost hundreds, if not thousands, of dollars a year in subscription fees, limiting public access. **Congress should pass open publishing rules that allow researchers receiving federal funds to publish their findings solely in proprietary journals for up to six months, after which the publication must become free and available to the public.**

The government can more extensively use data to hold organizations accountable for performance. Competition is a powerful force for innovation as it forces organizations (public, for-profit, and non-profit) to continue to improve. Yet, all too often data on organizational performance is either not collected or is collected but not reported. Government can play a key role by ensuring that a much larger share of its activities are subject to the collection and reporting of performance data.

In some cases, the simple reporting of such data is likely to drive change and innovation. A case in point is The National Survey of Student Engagement.⁶¹ The survey reviews student participation and involvement in 1,300 U.S. colleges and universities to gauge how undergraduates spend their time and what they are gaining from their college experiences. According to Indiana University, which manages the survey, "Survey items on the National Survey of Student Engagement represent empirically confirmed 'good practices' in undergraduate education. That is, they reflect behaviors by students and institutions that are associated with desired outcomes of college."⁶² However, most colleges refuse to make the data public, with the result that

students and parents have less effective data on which to make educational decisions. Moreover, colleges that score poorly can continue to hide their poor performance. **The federal government could require that any institution receiving federal support—Pell Grants, student loans, National Science Foundation grants, and so on—make its results public on the Web site of the National Survey of Student Engagement in an open, interactive way.**

SPURRING PRODUCTIVITY AND INNOVATION WITHIN GOVERNMENT

To reduce the budget deficit both entitlements and direct government operating budgets must be addressed. Too often policymakers believe the only way to reduce budget deficits is to either cut programs and budgets or reduce the number of federal employees. Yet governments can also overcome budget challenges the same way successful firms do—by achieving higher productivity.

For example, the government can use competition to promote e-government initiatives or to promote ideas to achieve better government practices. E-government has a unique ability to change government because good ideas can often be implemented relatively cheaply and, if successful, scaled quickly. For example, GSA has already consolidated 26 federal payroll systems into 4, and the Environmental Protection Agency has reduced payroll costs by 59 percent through electronic payments. Yet much more can and should be done. For instance, there are over 10,000 federal forms in 173 agencies that could be automated. The Treasury Department's E-File program has saved over \$100 million.

International leaders in e-government such as South Korea, Norway and Denmark have traditionally used carrots (maintaining budgets for agencies that are leveraging e-government applications) and sticks (budget cuts) to incentivize agencies to develop more sophisticated e-government applications. In a time of tight budgets, creating the incentive for agencies to invest in e-government without spending a lot is difficult. But one way several countries have found to overcome this hurdle is **by creating competition amongst agencies, with the best applications being publically showcased by the government.** For example, Singapore incentivizes the best public sector employees to share their ideas through their Knowledge Management Experimentation Program (KMEP). KMEP gives technologically savvy bureaucrats a platform to share e-government proposals, with the best innovators given funding to pursue their concepts (and often prizes and promotions.)⁶³ Denmark sponsors similar competitions. While e-government applications are often created by private contractors, government employees represent an untapped resource in the digital age.

The GSA has recently taken a strong step towards helping federal agencies answer President Obama's call to increase their use of prizes and challenges to spur innovation and further open government by partnering with the firm ChallengePost (www.challengepost.com) to create an online innovation challenge platform that can be used by any federal agency at no cost.⁶⁴ New York City, which through Challenge Post hosted a *Big Apps* challenge for developers to create new software applications making the city more transparent, accessible and accountable, found that just \$20,000 in prize money generated 85 software applications, with a value of \$4.25 million in development time alone, suggesting at least a 200 to 1 return. **The Administration can promote the extensive use of the online innovation challenge platform throughout the federal government.**

Policymakers can spur innovation by avoiding innovation-hindering regulations, such as stringent data privacy rules and heavy-handed net neutrality regulation.

While governments have made some progress in e-government, all too often that progress has meant simply digitizing their existing complicated forms and applications and putting up web links to help people find them. Yet, the forms are still complicated and difficult to understand and complete. Moreover, many activities that businesses or citizens need to do with government require interactions with more than one agency or even level of government.

One key way governments can overcome this problem is to partner with third party organizations. There are a wide range of areas ripe for development. For example, it is still complicated and time consuming to start a business, even with the Internet. Individuals must go to a myriad of government Web sites, figure out the right forms to print out (few forms are in electronic form), and then figure out how to file them. The federal government’s current portal supposedly designed to make this process easier (business.gov) is little more than a clearinghouse of links that is falling well behind state-of-the-art systems that other countries are putting in place. There is a better way. Several countries have taken advantage of business portals that make creating a business a quick and simple task. For example, Portugal went from requiring 20 different forms to create a business (a process that took up to 80 days) to a digitalized process based on one Web site. A firm can be created in under seven days using its new “Firm Online” program. And in South Korea, entrepreneurs can now legally create a firm exclusively on a mobile device.

In the United States, federal tax filing is one relatively easy-to-use application. This is because the IRS partnered with the private sector to enable companies to provide integrated and user-friendly software packages to prepare and file taxes (some are for sale, others are free through the IRS Free File program).⁶⁵ As such, **government should build on this model and work with the private sector to enable a wide array of government interactions to be completed in similar fashion.** These can include applying for an SBA loan, starting a new business, and exporting. For example, the supposedly simple act of exporting—something the President has made a commitment to doubling—can be incredibly daunting and paperwork intensive. “Turbo-business” applications can streamline this and many other areas, but only if government works collaboratively with the private sector to this end.

There are other opportunities for more digital innovation in government. For starters, federal and state government Chief Information Officers (CIOs) could better communicate to share best practices and IT enterprise architecture platforms so as to avoid “reinventing the wheel” in digital government. While federal, state, and local governments have their own priorities and needs when it comes to IT systems, too often they end up duplicating the exact same systems or IT platforms others have already built. If state and federal governments collaborated more on information technology, they could save substantial sums. For example, the National Governor’s Association is bringing states together to standardize justice information-sharing systems, helping to ensure they can timely and accurately share criminal justice information.⁶⁶ **The federal Chief Technology Officer should work with the National Association of State Chief Information Officers (NASCIO) to assist states in sharing best practices in information technology enterprise architecture design, so that IT systems do not need to be recreated across states and agencies.**

Government agencies are increasingly offering self-service technology online to renew driver’s licenses, pay parking tickets, or request government records. By using self-

service technology for routine transactions, agencies can redeploy staff to higher value service and provide better quality service to citizens. For example, the IRS has found that for each tax return filed electronically instead of on paper it saves \$2.15.⁶⁷ As Americans have switched from paper to electronic filings, the IRS has saved over 1,600 staff years and closed three paper processing facilities.⁶⁸ Yet government agencies have only just begun to scratch the surface of how it can leverage self-service technology to improve efficiency, cut costs, and provide better service to its citizens. For example, fewer than 50 percent of citizens who apply for benefits from the Social Security Administration (SSA) do so online. **SSA could install kiosks or public computer terminals in the lobbies of its field offices** to encourage citizens to use self-service options and provide access to a self-service option for those lacking Internet access. **One strategy would be for the Obama administration to create a self-service task force co-chaired by the President's CIO and CTO, and made up of officials from other departments, to plan how the federal government can encourage the use of self-service throughout the government.**⁶⁹

The government needs to get smarter about supporting private sector innovation. The very fact that governments have policies (tax, trade, regulation, spending, etc.) means they inevitably influence innovation, sometimes for good, sometimes for ill, but all too often by happenstance. Governments would be much better positioned to effectively support innovation if they were more strategic and knowledgeable about the impacts of their actions on innovation.

There are several ways to do that. One is to develop a national innovation and competitiveness strategy that would provide an opportunity to engage in a comprehensive analysis of the key factors contributing to future U.S. competitiveness as virtually all other developed countries (and even some underdeveloped countries, such as Ghana) have done. A national innovation strategy is needed to proactively anticipate and articulate the intersections among policies and actors that create value from innovation in the United States.

In order to begin to map out the United States' national innovation system, we will need better metrics and studies to assess the country's current strengths and weaknesses. These should include assessing: 1) current U.S. competitiveness, including at the major industry level; 2) current business climate for competitiveness (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 the 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.

The U.S. government must get more strategic about how it promotes the global competitiveness of high value-added sectors of the economy. While each department does good work with regard to its particular mission (e.g., the Food and Drug Administration in reviewing the safety and effectiveness of medical devices, the Veteran's Administration in procuring such devices, the Department of Commerce in promoting export opportunities, the Department of Health and Human Services in setting reimbursement schedules, etc.), there is no mandate for and little coordination across government agencies to develop a unified strategy to orient government policies to support the global competitiveness of strategic, high-value industries (especially those with strong export potential) such as medical and information technologies.

Accordingly, **the Department of Commerce should develop strategic roadmaps and guide inter-departmental collaboration to ensure that the regulatory policies and activities of disparate government agencies, are, wherever possible, aligned to promote the global competitiveness of strategic sectors of the U.S. economy.**

Moreover, all agencies need to be as focused on helping U.S. companies compete globally as they are with helping foreign firms compete in the United States. For example, the FDA helps foreign companies learn how to navigate our regulatory system regarding pharmaceutical drugs and medical technologies, but does not expend equal effort in helping U.S. firms navigate the FDA system or learn about other countries' regulatory systems.

Another way the Administration can drive innovation (both within government agencies themselves and in the private sector) **is to create science, technology, and innovation advisors at major federal departments and major agencies that lack R&D entities, as focal points for bringing innovation to agency activities and missions.** These persons would become, in effect, innovation advisors at agencies and should have budgetary oversight authority to repurpose funds. This is particularly crucial at regulatory agencies like the FDA, EPA and others which often give short shrift to issues of innovation and competitiveness.

Yet another way the Administration could drive innovation in both the private sector and the government would be **to change the name of the Malcolm Baldrige National Quality Award to the Malcolm Baldrige Quality, Productivity, and Innovation Award.** This would increase understanding of the award as one focusing on productivity and innovation in addition to quality. The name change would both better advertise the broader nature of the award and provide an opportunity to review and modify the criteria to reflect this broader view. The award, headquartered at the National Institute of Standards and Technology, was extended several years ago to include the non-profit sector and government at all levels, allowing the public and private sectors to compete to develop the most game-changing innovations or quality enhancements.

Finally, government can play a constructive role in identifying platform technologies that require industry-government collaboration to be successfully implemented, and in facilitating such collaboration. Indeed, for the United States to successfully deploy and realize the maximal benefits from many critical digital infrastructure platforms—including intelligent transportation systems, the smart grid, Health IT, and contactless mobile payments—the public and private sectors will have to collaborate in determining regulations, funding infrastructure deployment, and encouraging use. Indeed, in order for certain technologies to become commercially viable, many players in the ecosystem must act cooperatively and contemporaneously. For example, mobile payment systems have not been readily adopted in the United States because before consumers are willing to purchase mobile payment devices a minimum level of retailers must have the necessary technology to accept mobile payments; yet retailers are unwilling to make the investment in such technology until they are confident consumers will use them. This type of “chicken-or-egg” problem exists in many technology platforms. Governments can help by bringing different players in the technology ecosystem to the table or by directly investing in the technology infrastructure to prime the pump for consumer and private-sector investments.

CONCLUSION

Innovation drives long-run economic growth, and therefore spurring innovation must be a central goal of nations' economic growth strategies. Government policy must be explicitly pro-innovation, not only because innovation itself is so difficult, but also because so many stand on the side of inertia and the status quo. Government policy should aim to support and facilitate innovation in the private sector and make innovation a reality in the public sector. Fortunately, a wide range of budget-neutral or budget-light policies and strategies exist that can continue to drive innovation through lean times. Repurposing existing resources, leveraging non-federal resources, and demanding performance accountability for funds expended become powerful tools when budgets are tight. Enacting smart tax and regulatory policies, using information to drive innovation and change, and spurring government productivity and innovation can all be achieved with minimal expense. These policies will enhance the competitiveness of U.S. firms, and even the U.S. economic system itself, in the global marketplace. Finally, pro-innovation policies will lead to better quality of life and superior products and services not just for Americans, but for individuals throughout the world.

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ACKNOWLEDGEMENTS

We would like to thank Kathryn Angstadt and Sue Wunder for their editorial support.

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The Information Technology and Innovation Foundation (ITIF) is a nonprofit, non-partisan public policy think tank committed to articulating and advancing a pro-productivity, pro-innovation and pro-technology public policy agenda internationally, in Washington and in the states. Through its research, policy proposals, and commentary, ITIF is working to advance and support public policies that boost innovation, e-transformation and productivity.

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