science progress

The Full Potential of University Research

A Model for Cultivating New Technologies and Innovation Ecosystems

Krisztina "Z" Holly June 2010

University research historically forms the foundation for many of the most significant U.S. technological advancements and industries—think biotechnology and the Internet, to name just a few notable examples. Yet many more ideas are left on the shelves and in the laboratories of universities across the country. These ideas are waiting to be developed into new products and services to fuel the United States in the 21st century. To be sure, hundreds of academic discoveries are transformed every year by entrepreneurs and established corporations. Yet even greater opportunities await to boost our nation's economic growth and social wellbeing, through ideas that never make the leap.

This paper proposes a pilot initiative for the federal government to accelerate the great potential of breakthrough innovations arising from academic research. This $20 million pilot program would invest a small amount of federal funding to create rational experiments that test and demonstrate clear, replicable methodologies to bring existing research results into the U.S. commercial marketplace through ten local demonstration sites.

This concept is already gaining steam at an experimental level. The plan appears, in part, in the Obama Administration's National Science Foundation budget request as an additional $12 million for the Partnerships for Innovation Program for Fiscal Year 2011. Also, the U.S. Department of Commerce's Office of Innovation & Entrepreneurship—in partnership with the National Science Foundation and the National Institutes of Health Small Business Innovation Research, or SBIR, programs—recently announced the i6 challenge, making available $1 million per site over two years for the six most innovative regional ideas to address these issues, with an additional $6 million supplemental funding for SBIR grantees associated with the winning projects. The Department of Energy similarly announced a $2.1 million pilot program along the same lines.

Furthermore, funding in the budget for the Department of Commerce's Economic Development Administration would also support the development of regional innovation clusters. These are important first steps but need to be scaled up to have the long-term catalytic effect the administration is seeking and the country needs.

At the moment, the federal government spends over $50 billion dollars in basic university research, but nearly nothing to directly support programs that expand the commercial potential of ideas and innovations that result from that work. Basic research is the fundamental fuel of innovation-based economic development, but capturing the full potential of those advances is a complex process. One could argue that Small Business Innovation Research, or SBIR grants, the federal government's main (but limited) proof-of-concept financing program for young companies, can be used by university spinouts to enhance development on a one-off basis. But what we need is to build local capacity to pull in expertise, to drive culture change, and to nurture ecosystems that enable this to happen. Without this, we are considerably limiting our potential to innovate.

One key step in that process is the work done by the universities' technology transfer offices, which help researchers patent the most promising concepts and license the work to firms that commercialize them into new products and services. A regional innovation ecosystem, or cluster, forms when entrepreneurs and companies spring up in the vicinity of research institutions, taking advantage of not only the intellectual property, but also the talented workforce. Startups in particular create high quality jobs and generate significant economic activity. The annual survey of the Association of University Technology Managers, or AUTM, estimated that university licenses generated an impressive $40 billion in economic value in 1999, the last time they reported economic impact numbers.[1]

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The problem is that many great ideas springing from federally funded research do not make it beyond the lab and into the marketplace, and the reasons are manifold. They can include a lack of funding to scale up and commercialize an idea, a lack of business expertise to understand the next steps for commercialization, a lack of human capital to build start-up companies when appropriate, and a lack of mentoring and educational support for new entrepreneurs. That's where the pilot program presented in this paper enters the picture.

Funding for the ten pilot initiatives to bridge these gaps would equal $2 million per year, per university, for five years. These local sites would nurture a culture of entrepreneurship within each university, create and enhance the innovation ecosystem around each university, and provide the resources necessary for researchers to effectively translate their ideas into products and processes that have significant societal impact. The key components of each program would complement existing activities already in place to provide:

- Proof-of-concept funding with appropriate project management
- Community engagement, networking, and teambuilding
- Business strategy support and mentoring
- Educational resources
- Media relations and showcasing of projects
- Measurement and evaluation of results

The funding could be used to support any aspect of the above activities. The outcomes would be measurable, reproducible, and scalable. We describe these metrics and details of the pilot programs below.

The initiative, which we call IMPACT (Innovation Model Program for Accelerating the Commercialization of Technologies), would not simply provide financial resources, but would build capacity at each funded institution to cultivate sustainable innovation ecosystems. Closely linked engagement with an effective technology transfer operation and local knowledge and expertise will be two crucial components of the effective demonstration programs.

These types of activities have already shown results at a grassroots level; however, funding has been uneven, sustainability has been a challenge, and the approach has not yet scaled nationally. Addressing this opportunity with a systematic federal approach would be low-hanging fruit in the quest for long-term economic growth and new jobs.

Ultimately, a successful demonstration program would lead to a Phase II where the program is institutionalized across the country, successfully accelerating existing efforts to turn university research into economic and societal impacts in the form of innovations that improve the lives of American citizens.

Background: The State of University Innovation

When we think of technological innovation, we think of entrepreneurs who join the genius of invention with market timing and capital formation. Yet the partnership between the U.S. government's science and technology efforts and the nation's public and private universities plays a larger role than most observers recognize. A 2009 study found that the most important, world-changing innovations—those highlighted annually by the R&D 100 awards—are no longer being developed by private industry to the extent they were almost forty years ago.[2] The majority of these award-winning innovations now arise from early discoveries supported through federal funding.

Universities are among the few places, including federal laboratories, that conduct the type of game-changing and disruptive research that has formed the foundation of the most significant U.S. technological advancements today. Entire industries such as biotechnology and the Internet can be traced back to fundamental discoveries at universities. Universities play a crucial role in the innovation pipeline for the country.

But by its very nature, most university research tends to be early stage and removed from market concerns—that is, researchers are doing basic science focused on building knowledge rather than on building new inventions, let alone developing new products and companies. Even the most promising breakthroughs face very real hurdles as they

struggle to translate into the market where they can make societal impact.[3] These early innovations might emerge through a spectrum of knowledge-transfer routes,[4] such as

- Research collaborations with industry
- Faculty consulting
- Students graduating and taking jobs in firms
- Inventions licensed to established companies
- Start-up efforts to turn ideas into new high-growth companies.

Although many institutions have focused their own considerable resources on commercialization efforts, this crucial stage of the innovation process has been greatly underfunded to date.

Studies show that early-stage capital has a significant impact on the new venture process at universities[5]—as well as programs that enable university innovators, entrepreneurs, and investors to connect with each other.[6] Some universities are fortunate to receive assistance through major gifts or local funding and have created innovation centers demonstrating great leverage. In a Kauffman Foundation report, Christine Gulbranson and David Audretsch wrote about two programs centered in engineering schools, the MIT Deshpande Center for Technological Innovation and the University of California, San Diego von Liebig Center.[7] After granting less than $10 million to projects, these centers helped advance 26 startups that at the time of the report had raised a total of $160 million in outside investments; the numbers have swelled even further since then.

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Although this is not the only successful model and may not work for every region, proof-of-concept centers have been adapted to various situations with success. Related programs include Georgia Tech's VentureLab; Innovation Works, which has collaborated with local universities in Pittsburgh; and Coulter Translational Partnership Awards in Biomedical Engineering, funded by the Wallace Coulter Foundation.

A different example is the USC Stevens Institute for Innovation at the University of Southern California, launched three years ago with a $22 million gift. That funding is being used so far to significantly reengineer business development and licensing operations, extend support beyond traditional technology transfer to reach all schools and disciplines, reach out beyond faculty to support student innovators to create a university-wide culture of innovation, and raise visibility for the university's and local region's innovative capacity. Early signs indicate these activities are working; in the two calendar years 2008-2009, and in the depths of the recession, USC spinoffs alone have raised over $148 million in capital and currently support at least 500 jobs.

And yet another example is the University of Utah, which through providing a much more hands-on "venture bench" service and engaging student interns through their Lassonde Fellows program has incubated approximately twenty new startups a year for the last four years.

Despite the progress to date, this important part of our innovation economy should not be left to chance. Overall, sustainability and scalability continues to be a challenge for programs. The next step is a concerted effort to support a set of rational experiments that move this phase of technology transfer into business models that can be scaled for maximum impact.

Economic Impact of University Startups

In 1980, the Bayh-Dole Act enabled universities to own and manage the intellectual property arising from federally sponsored research, with royalty revenues shared between the university and inventors. From an economic development standard, the Bayh-Dole Act was a boon to local economies and to society at large as new technologies were introduced to market. Shortly after 1980, the number of startups and products based on university IP rose steeply as universities and faculty had incentive to commercialize their inventions. In 2008 alone, the AUTM annual survey reports that at least 595 startups based on university licenses were created across the country and 648 new products were introduced to market. As of the survey, 3,381 university startups were still operational.[8]

In addition to the value university technologies contribute nationally, these innovations have a large influence locally as well. According to the 2008 survey, 72 percent of university spinouts established headquarters in the same state as the university from which they spun out.[9]

The Innovation Gap and the Role of the Private Sector

Congress enacted the Bayh-Dole Act to encourage universities to commercialize their research, but private, state, and federal funding has been insufficient to drive transformative change.

University technology transfer offices, or TTOs, on average tend to lose money, in part because a successful invention can take ten years or more to generate royalties.[10] So although TTOs provide benefits to their local communities, they have limited ability to reinvest resources to enhance interactions with industry in a strategic and proactive manner.

Some unfamiliar with the commercialization process may look to private industry to address this opportunity through investment in early-stage innovations. But as Gulbranson and Audretsch point out, "University research does not passively spill over for commercialization and innovation."[11] Early stage venture markets are inefficient and most university innovations are much too early and risky for investors.[12] Further, most researchers currently lack knowledge, connections, and even interest to bring ideas to market. Therefore, university innovations face a large feasibility and funding gap.

The approach proposed here does not supplant the role of the free market, but instead would create more opportunities for the private sector to invest in the fruits of university innovation and better allow the free market to work. Funding would be used to support proof-of-concept work in the laboratory, not to fund companies. Past experience shows this type of early gap support is highly leveraged and will attract considerable private sector funding later.[13]

Unfortunately, none of the tens of billions of federal dollars currently invested in early-stage university research can be used to explore the commercialization potential of the resulting innovations and help bridge the gap.

Federal investment in this gap stage is more important than ever. Although universities are more productive today in transferring innovations because of the Bayh-Dole act, the size of the global marketplace and the emergence of other national science and technology efforts call for the federal government to renew and facilitate the next level of translating innovation from universities for the benefit of the American taxpayer. The policy proposals detailed below will leverage that government investment by supporting the virtuous cycle from early stage research to commercialization and getting the most out of taxpayer investments.

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Existing Federal Programs of Potential Benefit

The proposed initiative takes into full consideration existing federal incentives beyond Bayh-Dole. Three ongoing programs are often mentioned in the context of addressing this missed opportunity:

- Small Business Innovation Research, or SBIR, program
- Small Business Technology Transfer, or STTR, program
- The Partnerships for Innovation, or PFI, program

While these are valuable programs, they do not address the opportunity discussed here.

SBIR provides research funding to the nation's small companies by enabling them to participate in the federal government's research and development efforts. Some university spin-offs have benefited from this funding, which plays an important role. Yet SBIR grants require creating a corporation; university innovations are often too early to form a company around. STTR funds collaborative research between small companies and university faculty. Like the SBIR program, a small company has to be in place.

Most notably, the above programs provide grants centrally from agencies to individual projects. They do not provide a structure for faculty and graduate students within universities to learn more about the startup process, do not inspire high-tech entrepre-

neurial ventures from individuals who may not otherwise think about doing them, nor do they create an ecosystem of entrepreneurs and industry experts that can mentor entrepreneurs and coax new ideas from the universities. What is needed is local and programmatic support for these activities.

The only program that approaches this goal is the PFI program. Managed by the National Science Foundation, it aims for economic development through knowledge transfer from universities, and focuses efforts on smaller institutions that would help broaden participation in the innovation process. The maximum amount of the awards is $600,000. In many cases, these grants are too small and focused to have the broader impact sought by the proposed initiative. However, the administration clearly sees the synergies and recognizes the need in its FY2011 budget request, proposing to double the program with a new "Innovation Ecosystems" component. Congress and the nation should wholeheartedly support this first step in light of the challenges ahead and the short and long-term economic benefits available; NSF should structure the program in such a way to address the needs outlined in this paper.

A successful program to accelerate academic innovations would build capacity at each funded institution to offer educational programs and cultivate sustainable innovation ecosystems, in addition to providing the resources necessary to assist researchers to effectively translate their ideas into economic and societal impact.

Proposed Demonstration Programs

The first step in accelerating university innovation nationwide would be a pilot study, with ten model programs funded through grants to universities. Funding would equal $2 million per year per university for five years and would complement existing activities already in place at the university. The pilot programs would be university-wide so that researchers from any school or discipline would be eligible to participate.

Success Factors

The most effective innovation centers and programs to date have had strong leadership—with highly dynamic and dedicated directors who have startup and business development experience, as well as experience working with universities so that they understand and relate to the unique culture within academia.

Along the same lines, the investment in each program will only be effective if the technology transfer operation at the university is effective and closely linked to the IMPACT program. It is critical to ensure that the university's licensing operations are streamlined, with a service and societal impact orientation and an eye towards identifying business opportunities rather than reducing risk.

For maximum long-term impact, the programs should strike a balance between culture change and the commercialization of the most promising ideas. It might be tempting to focus on the number of ideas commercialized as a top-line metric, but this would overlook the longer-term benefits of investing in lifelong innovators within the university. If encouraged and coached, such innovators will continue to develop innovative ideas and inspire others, even if the commercial potential of their first idea is questionable. Structuring the program to provide coaching and allow fast failure before grants are made, and studying participants before and after engagement in the program are both very valuable approches.

Local leadership of each demonstration program is critical in order to engage the local business community and to select and coach the researchers that are the most likely to benefit from the program. A university forms an ideal nexus for innovation ecosystems: with its teaching mission, faculty and students generating groundbreaking ideas, strong brand and links with alumni, commitment to the local community, and ability to serve as a neutral convener of partnerships with industry. The IMPACT program can only maximize its objectives if all of the activities and grants are run by, or in close association with, the recipient university.

Community engagement should be a cornerstone of the program. Although faculty and students must be the ultimate champions of their own ideas, no one person is equipped to know the best path to commercialization, and in particular not the typical academic who likely does not have very much industry experience. Experts from industry and the new venture community would be called upon to review projects, provide coaching to applicants as they put together their plans, mentor grant recipients, and open their rolodexes to provide further contacts that can help with the commercialization process. Mentors would help innovators learn about developing business models, understanding the market and the competition, creating and communicating the value proposition, and identifying the key risks that might discourage future investors so that they can be addressed in the proof-of-concept phase. Mentors could further provide introductions to potential investors, customers, partners, licensees, and experts who understand the related industry in more depth. In the case of nascent startups, some of the most valuable introductions would include entrepreneurial executives. In return, mentors will deepen relationships on campus and be exposed to innovative ideas, creating an ecosystem that can ultimately strengthen and expand on its own. Programs should carefully select volunteers from the business community with clear expectations for involvement and guidelines around conflict of interest and confidentiality; they would serve for a fixed term that can be renewed. Participants should view this as a prestigious affiliation.

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Public relations are important to facilitate community engagement and increase the projects' chances of success. PR activities can range from media relations to showcase events. Further, engaging donors, industry partners, service providers that can provide pro bono work, and economic development support from local government can help sustain the program and the ecosystem.

Proof-of-Concept Grants

Although each university has its own unique circumstances, each demonstration site should dedicate a portion of its budget to support proof-of-concept projects. Depending on the research expenditures of the institution, each demonstration program would likely fund anywhere between four to twelve projects per year. Based on experiences from existing gap funding programs, we can expect at least 20 percent of projects in a well-functioning program will become viable (funded) startups or licenses, and the remaining projects should have a candid feasibility assessment and plan for next steps if viable. Projects should be funded with the expectation that they would spin out within one to two years; however, in reality some may take longer, and many more will fail. Fast failure is an important part of the process.

Some of the faculty and students will learn that their commercialization ambitions for their project are not worth pursuing, but the grant will have provided valuable experience that will help focus their energies better next time. This educational process is an important part of the program and an investment in the long-term effectiveness of the ecosystem.

All faculty and students involved should gain skills in business strategy and understand better whether they would be interested in pursuing startups in the future.

Each university might adjust for its particular situation, but based on experience gained from past innovation funds and centers, the projects supported by IMPACT demonstration programs should be selected locally and carefully using criteria such as the following:

- **Team:** Is there at least one devoted champion that will focus on the project? Are students and other resources available and ready to go? Are the researchers coachable and committed to the program? Are they likely to continue being engaged and helping attract others to the program past the term of the grant? Because ideas evolve after contact with mentoring, the team could be the most important criterion.

- **Potential Impact:** How important is the problem and how large the potential for impact? What are the chances for sustainability and scale after funding? What is the market feasibility for creating a high-growth organization that will have a significant economic or social impact? Although the creation of new businesses is one goal for this program, concepts for non-profits, new products, services, or organizational innovations should all be eligible if the potential for scalability, sustainability, and impact is high.

- **Idea:** Is the idea groundbreaking and novel? What is the market and technology feasibility? Has the applicant spoken to real customers, and does the idea address a real opportunity? Is there some sort of "special sauce" or fundamental intellectual property (invention, copyright, know-how) associated with the idea? Note: in many cases IP will be important strategically; the university technology transfer office should be

deeply involved to evaluate its ability to protect the invention, if they haven't already filed a patent, and to ensure that prior agreements (with existing licensees or research sponsors) have not encumbered the university's ability to license the relevant IP. In some cases, however, open source, public domain, and generous licensing strategies should be considered for maximum impact, as appropriate.

- **Roadmap:** Would participation in the program enable the idea to spin out within a reasonable timeframe, say 1-2 years? Does the team understand what proof points are required to attract outside investment, and the obstacles to get there? Is the project plan and budget reasonable, with measurable outcomes that would overcome those obstacles? Note: an applicant's roadmap will likely be vague or off-base at first, so time should be built into the process to coach and clearly define a project plan before funding is granted. Is there appropriate community support and available expertise to properly assist?

The selection process should engage a wide range of reviewers, such as investors who have previously worked with universities, industry experts, serial entrepreneurs, and academics.

Of all of the above criteria, the team is the most critical for success. Investors expect the inventor to be involved, but generally not become the CEO of a new company.[14] No matter how promising an idea, if the inventor is not committed to the innovation process, or willing to be flexible about the approach to commercialization, the grant funding will not be a good investment.

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Gap funds for crossing the "valley of death" between concept and product are most appropriately used to cover the cost of materials and labor—students, contract developers, or faculty as appropriate—as opposed to large equipment purchases that are not targeted at the project. Grants should be seen as a carrot to attract the best innovators, but not the end goal—small grants applied effectively can provide fantastic leverage and induce much greater private investment later.

Further, programmatic support including mentoring, networking, and media relations is equally if not more important. Projects need an appropriate level of project management by the demonstration program to set and track high-level milestones. Individuals involved in supporting the projects must have the scientific and business knowledge to provide effective support.

Funding, project management, and educational programs will lead to success stories. But for long-term impact, developing the innovator's skills and experience is even more important than developing the individual innovations. Sometimes the original idea doesn't work, but innovators should be rewarded for learning from mistakes. If engaged properly, the researcher will continue to come back again and again with new ideas, and will inspire others to do the same.

Indeed, flexibility in the direction of these early stage projects is crucial, as is spending resources on setting expectations and providing information about the entrepreneurial process.[15] Expectations and conditions for the grant should include participation in mentoring programs and workshops. If promoted properly, the grants will provide a sense of caché to the projects. This, in conjunction with requiring researchers to participate in special programs for grantees, will attract the right researchers and the best mentors. Selectivity is important.

Structure of the IMPACT Initiative

For long-term success, the IMPACT initiative depends on initially selecting a diverse set of committed universities to develop best practices and metrics that can be shared and scaled across the country.

Criteria for Selection

The ten demonstration sites would be selected with the input of an independent panel with broad experience in industry, technology transfer, venture capital, academia, and entrepreneurship.

Criteria for selection should include:

- **Plan:** The proposal must feature an analysis of the opportunity, core competencies, and gaps; a feasible plan for how funding would be used to address them; and how other resources would be leveraged.

- **Potential for success:** Universities receiving grants must demonstrate high potential for success, given the limited scope of the demonstration stage of this program. This includes sufficient research budget to create a critical mass of projects; an existing local community of industry, entrepreneurs, and investors that can be engaged and mobilized; and infrastructure and leadership in place to support a pilot, preferably with commercialization experience and knowledge of best practices. One or two of the grants could establish experimental partnerships between smaller local research universities.

- **Potential for broader impact:** Universities should demonstrate the impact the demonstration program would have on their innovation ecosystem, and they must be committed to the success of the initiative as a whole through the sharing of best practices with other programs and helping with scale-up. A track record of developing and sharing best practices should be considered.

- **Innovation vs. best practices:** Universities can propose novel structures for their programs and should dedicate resources to experimentation of new approaches, but importantly must leverage best practices and provide, at a minimum, the resources listed in the introduction, above.

- **Diversity of candidates:** Programs should be distributed across region, size, public vs. private, and so on, to determine whether these factors require different approaches.

Institutional Commitment

The universities selected for IMPACT grants must be committed to the program and provide an environment where it can flourish. Because measurable outcomes of innovation activities often take 5-10 years, and many universities are experimenting with new approaches, universities should not be measured based on their past commercialization track record alone. No two universities will be identical; their success will depend on their unique circumstances. Key criteria would likely include the following:

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- Demonstrated strategic priority of meeting societal needs through innovation—this should include a wide range of educational and knowledge dissemination activities, including but not limited to patenting and licensing
- Strategic placement of a dynamic and committed innovation champion in the hierarchy of the university (vice president or vice provost) who is a Principal Investigator on the grant
- Presence of existing infrastructure (internal or external) to support a *university-wide* program
- Budget and staff already committed to interdisciplinary commercialization and innovation activities, with significant support for technology transfer plus other less traditional channels of knowledge transfer
- Comprehensive conflict of interest policies that provide a mechanism for faculty to engage in the startup process while maintaining academic integrity
- Commitment to flexibility in faculty engagement, including support for leaves of absence to pursue start-ups
- Willingness of the university or affiliated organization to take equity in startups, which has been shown to be an important factor in university spin-off activity[16]
- The university technology transfer office reporting to the PI, or serving as co-PI
- The technology transfer office performance being measured primarily on service, societal impact, and/or economic development, rather than primarily revenues and number of patents
- Technology transfer leadership that has shown an openness to creative approaches to managing IP for maximum impact, such as creative commons, open source, public domain, and generous licensing strategies, as appropriate
- Technology transfer staff with business development and startup experience, or plan in the budget to hire accordingly.

Deliverables

Each university should be expected to show initial progress along the objectives in innovation advancement, community-building, and education outlined in the Goals and Success Metrics section, below.

Additionally, during the pilot phase, the ten demonstration programs should share key findings with the Department of Commerce, the National Science Foundation, other relevant federal research agencies, the Office of Science and Technology Policy, and each other, and should learn from each others' mistakes. Possible venues for this would be the following:

- an annual best practices roundtable
- proposed approaches to measuring success (metrics)
- an annual report for each program
- faculty and student participant survey.

Mistakes should not be treated negatively if they are shared and participants learn from them. Experiments with results should be valued as much as successes. Ultimately the end goal will be to develop and scale effective models nationally for maximum economic and societal benefit.

Goals and Success Metrics

The primary goal of this federal pilot initiative is to create one or more models for accelerating innovation from universities, demonstrate effectiveness, and provide guidance for implementation on a larger scale.

Additional outcomes would include one or more sets of guidelines for universities to increase commercialization success and a growing community of university programs that share best practices. This initiative may even uncover new approaches that warrant further study. And of course, each pilot university would be expected to demonstrate progress along predetermined success metrics.

The ongoing success of each program at the university level will be judged based on its ability to do the following:

- Broaden the impact of the most promising university innovations through commercialization and start-up formation
- Increase the enthusiasm, engagement, and skills of faculty and students across all disciplines in the innovation and entrepreneurship process
- Develop a local community that supports the innovation ecosystem around the university.

The human capital and social impacts of the program should be valued as much as economic impacts. The demonstration sites, in partnership with the federal government, will be tasked with collaborating to further define and refine a set of metrics for success.

Ultimately, a successful demonstration would lead to a Phase II where the initiative is institutionalized on a wider scale across the country. The initiative, for example, could permit all universities that receive federal research funding and meet certain criteria to be eligible for an IMPACT grant to accelerate the impacts of their most promising research results. If used effectively, additional support to a university on the order of only 1-2 percent of research volume could be transformative, because it would be so highly leveraged and focused on the most promising ideas.

Conclusion

Since the Bayh-Dole act first engaged universities in the commercialization process in 1980, university research has had a profound impact on economic development and the well-being of Americans through the creation of new innovations, new companies, and new products. Today—with our growing investment in science and technology research and our renewed appreciation for the important role that technological innovation plays in global competitiveness—it is time to ensure that our investments in early stage research find their full potential. The proposed IMPACT initiative is a highly leveraged and scalable way to harness these great opportunities from our country's research universities.

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