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TESTIMONY BEFORE THE SENATE SMALL BUSINESS AND ENTREPRENEURSHIP COMMITTEE MAY 15, 2019 SMALL BUSINESS TECHNOLOGY COUNCIL (SBTC) JERE GLOVER, EXECUTIVE DIRECTOR

Robert N. Schmidt, Kevin Burns, & Alec Orban

Chairman Rubio, Ranking Member Cardin, members of the Committee, thank you for the opportunity to appear here today to discuss the importance of technological innovation to the United States, and the reauthorization of the SBIR and STTR Programs.

I am Jere W. Glover, Executive Director of the Small Business Technology Council (SBTC) of the National Small Business Association (NSBA), in Washington, DC. I have been involved in federal science and technology innovation programs since 1978, when I staffed joint Senate/House hearings and the resulting report that showed severe under-utilization of small business high-tech companies in the Federal R&D programs.[1] The SBTC is an outgrowth of the White House Conference on Small Business in 1995, and is the nation's largest association of small, high-tech companies across diverse fields.

When Arthur Obermayer was inducted into SBIR Hall of Fame at the White House as one of the key founders of the SBIR Program, he stated that next to the GI Bill after WWII, SBIR was one of the most significant pieces of legislation ever passed by Congress. After considering his comments, I'm inclined to agree with him.

Executive Summary

Thirty-seven years ago, I had the privilege of testifying before Congress in support of passing the first SBIR legislation. A lot has changed since then, and a lot has remained the same.

In 1982, the U.S. was the undisputed worldwide leader in innovation**.** Then and now America's small businesses are the most innovative sector of the economy and the wellspring of entrepreneurial energy. Yet even though small business employs one third of our scientists and engineers, even though study after study has shown these small businesses produce the most new, good ideas, small businesses are only tapped to do about 5% of DOD's external R&D. We are underusing a primary resource for innovating America's future.

The U.S. was once the undisputed leader in developing technology and had clear technology advantage on the battlefield. The U.S. was where innovation happened. Today the rest of the world is catching up and passing us by. Thirty-seven years ago, America dominated venture capital, and we had the best education system, strong patents and private funding for

innovation. No other country was even close in these necessary elements. Today, about half the Venture Capital is being invested worldwide, our patent system is severely weakened, we now publish patent applications shortly after they are filed disclosing our technology to the rest of the world, and foreign governments have discovered the benefits of funding innovation

- As Chairman Rubio's report shows, China is rapidly challenging the U.S. in technology and innovation. Separate from trade practices and taking others' intellectual property, they are putting big money into developing their technology and small businesses.
- The European Union is investing 20% of its R&D in small businesses.[2] Even France is now putting $13 Billion into "disruptive technologies".[3]

The US is continuing its decline in inventing and commercialization. America is now third in receiving Intellectual property payments, behind Ireland and The Netherlands.[4] Even worse, on a per capita basis, the US is currently 11th, behind Switzerland, Sweden, the United Kingdom, Hungary, Australia, and Israel. This is in part due to our weakened patent system. Of most importance, **America is number 8 in Bloomberg's Innovation Index (behind South Korea, and Finland)**.[5]

If we are going to change these disturbing trends and have America regain the world's leadership in technology and innovation, we need to take action. It is time to put our money where our innovation is, in small business.

The SBIR/STTR Program works. It works because it combines the entrepreneurial drive of America's small businesses with those business's scientists and engineers to create remarkable new innovations, which meet the mission requirements of Federal agencies and departments, and which the businesses use to create 21st century products and services and high value jobs. SBIR taps the potential for greatness in American small business, and is a key factor in driving our economy in competition with the rest of the world. After 17 National Academy studies and 4 detailed Economic Impact Studies, we can clearly state that the SBIR/STTR program is an economic engine that drives innovation in America. **The return on investment for the SBIR/STTR program is between 22% and 33%, depending on the agency. For every dollar invested the economic impact results in three dollars in Federal state and local taxes.** These studies show that, from an economic perspective, the best return on Federal R&D dollars flows from the SBIR program.

The just-finished SBIR/STTR economic impact study for the National Cancer Institute shows a return of $3.68 in taxes for every dollar invested in SBIR R&D. In other words, SBIR at NCI not only paid for itself, it returned more than 2.6 times to the Government more than what was invested in SBIR. The NCI study looked at 12 years and 690 NCI Phase II SBIR/STTR awards totaling $787 million dollars to develop new medical devices, drugs, research tools and in-vitro diagnostics for treating cancer. The results were $9.1 billion in sales, $2.9 billion in tax revenues, and 107,918 new jobs, as well as 45 spinouts, 103 licenses, $4.26 billion in added outside investment, and 103 of the companies being sold for another $21 billion to invigorate larger companies looking for new technologies. SBIR success stories were for Breast, Lung, Prostate and multiple other cancers.

SBIR provides new technologies for fighting cancer, good jobs from the new life-saving products and services, and we get back more in taxes than we invested – excellent returns on Federal R&D dollars. This is shown true throughout the SBIR program. SBIR is a GDP and jobs engine producing high leverage economic power. There are literally thousands of success stories here, and all of our lives are better for them.

Here are the results for just the National Cancer Institute's SBIR/STTR Program.

National Cancer Institute Economic Impact (1998-2010)

Total Phase II Awards	690
Total SBIR/STTR Award Investment	$787
Rate of Commercialization	53%
Cumulative Sales	$9,144 (11.62 times SBIR investment)
Follow-on R&D	$957 (1.22 times SBIR investment)
Total Value of Acquired Firms	$21,630 (27.48 times SBIR investment)
Total Outside Investment Funding	$4,260 (5.41 times SBIR investment)
Total Economic Output	$26,100
Return on Investment	**33:1**

**dollar amounts in millions*

The DOD-wide study that has only been partially released has similar results. I guarantee that you use at least two technologies funded by the SBIR/STTR Program on a daily basis and probably have products using these technologies in your pocket or purse right now. Dr. Reza Rofougaran developed GPS on a chip with SBIR, which is used in cell phones. And the fast CMOS camera technology was developed for military use but is now in most cell phones and digital cameras. One of the earliest DOD SBIR success stories is QUALCOMM, which was nurtured by the SBIR program and has maintained its leadership in cell phone chip technology, and now leads America's path to 5G networks. For a list of SBIR success stories by state, follow this link: https://sbtc.org/wp-content/uploads/2019/05/SBIR-Success-Stories-Book-2019.pdf

SBIR IS THE BEST R&D PROGRAM IN THE US

And has a great commercialization record

SBIR generates $**23 in economic returns**
for every **$1** invested.

SBIR Investment **$15B**	Sales **$135B** 9:1	Value Acquired Firms **$30B** 2:1
Outside Investment **$18B** 4.5:1	Economic Output **$351B** 23.4:1	Percent Commercialized **58%**

This chart is a summary of 4 economic studies funded by the Air Force, Navy, DOD and National Cancer Institute. 5,000 SBIR and STTR firms were surveyed. Returns are reported as understated. The study was conducted by TechLink, a federally funded technology transfer center at Montana State University-Bozeman, in collaboration with the Business Research Division (BRD) of the Leeds School of Business at the University of Colorado Boulder.

No other program has such a remarkable record of commercialization success as that of the SBIR/STTR program.

**DOD-wide numbers are from a preliminary report and are not official yet*

We are at a crossroads with the world catching up. If we don't change, they will pass us by. Congress has the ability to take action to restore America to the leadership role in innovation.

SBTC believes America needs to:

- invest more money on R&D funding,
- encourage innovation by increasing and strengthing the SBIR program,
- encourage commercialization of new technologies by expanding the RIF program and funding Phase III SBIR projects.
- restore and strengthen the U.S. patent system.

What this committee can do is spend the federal R&D dollars more productively. Get the best possible return on investment on the Government's R&D dollar. As DOD's 809 committee has recommended, double the SBIR/STTR program and RIF funding, make SBIR/STTR permanent, streamline and simplify the Program and make the Government put the SBA Policy Directive and legislative changes to SBIR/STTR Program into the FAR and DFAR.

If you take these actions, you will unleash new technologies for America and for our warfighters while strengthening our economy and rejuvenating America's leadership in innovation.

SBIR/STTR Overview

The SBIR/STTR Programs together account for $2.5-3 billion dollars, or about 3.5% of the Federal **extramural** R&D budget. SBIR/STTR represents less than 2% of the **total** Federal R&D budget. Each year 11 Federal agencies make almost 5,000 awards on a highly competitive merit basis (only 1 in 20 Phase I proposals advances to Phase II), with almost one half coming from the Department of Defense. For a description of how the program works see www.SBIR.gov .

It bears repeating that the National Academy of Sciences and its National Research Council's (NRC) 17 reports have shown that the SBIR/STTR Programs have met most of the Congressional objectives for the Program: (1) to stimulate technological innovation, (2) use small businesses to meet federal R&D needs, (3) foster and encourage the participation of socially and economically disadvantaged small businesses, and (4) increase the private sector commercialization of innovations derived from federal R&D. (While the NRC indicates that only number (3) has not been meet, NRC says it is not a SBIR/STTR problem, but a STEM problem). The SBIR and STTR firms also work closely with universities and their faculty. For example, the National Cancer Institute study showed 63% of awardees reporting being involved with universities. SBIR firms and small firms provide jobs to thousands of university graduates. Small and start-up firms license over 70% of all university licenses.

What is the critical role the SBIR/STTR program plays? Uniquely among Federal programs, and in fact in our overall economy, the SBIR program enlists America's small high tech firms to innovate on problems and opportunities for new technologies identified by the government agencies. We know that small businesses bring new innovations that transform our economy and prepare it for the future. The winning concept behind SBIR is that it creates new technologies needed by America and creates those technologies precisely within the small businesses that are already competitive and entrepreneurial in nature and well-suited to carry the new innovation into the economy.

The Federal government defines the problems to be solved, the small businesses compete to create the best solutions, with only the best surviving the screening to Phase II. The SBIR program pays for R&D, with the businesses responsible for subsequent commercialization. The small businesses bring their entrepreneurial drive and determination, and their flexibility and new perspectives, and use their innovative technical skills (employing approximately 1/3 of America's engineers and scientists) to create new, high value solutions. Venture capital rarely supports such early stage innovation, tending to invest much later in the new product development process, after products have been proven by prior R&D. Banks certainly do not lend for such early stage purposes. And small businesses do not have the internal capital to finance such R&D. By linking together these high performance drivers and enlisting small businesses to do R&D work, the SBIR program produces the very high innovation, government transition, and commercialization outcomes that multiple studies have now documented. The combination builds on uniquely American strengths and produces the remarkably large commercial outcomes. SBIR is a policy that works, and we should do more of it.

In addition to providing research meeting the Government's needs and leading to more tax revenues than had been invested through SBIR, SBIR also saves the Government money. In just one example from one program, the J-35, Joint Strikefighter, SBIR saved over $500 million according the Lt. General Christopher Bogdan, PEO of the Joint Strikefighter program. From a Phase II NIH program to conduct sleep apnea tests at home, healthcare payers have saved over a quarter billion dollars using this home sleep apnea test.

The Market loves SBIR

The Federal government benefits tremendously from SBIR technology. But the market also appreciates SBIR technology. Some facts that show that SBIR makes a difference include:

- 10% of all VC investments go to SBIR firms
- 19% of IN-Q-Tel investments are in SBIR companies (In-Q-Tel is the strategic investor for the U.S. intelligence and defense communities)
- 829 SBIR related firms have gone public
- 1300 or 9% of SBIR firms have been acquired
- L3 Com, GE, SAIC,BAE,Lockheed Martin, Raytheon, Gen Dynamics, Philips, Teledyne have each acquired 10 or more SBIR Firms
- The Section 809 Panel recommends doubling SBIR and RIF for DOD, and the Section 813 Panel recommended the same SBIR data rights as those under private expense

SBIR success stories

SBIR has many, many success stories. In addition to the success stories mentioned above, the agencies publish their list of success stories. I would like to thank the Montana firm Techlink for their work on the agency Economic Impact Studies. Techlink took the National Academy Studies and using modern techniques and hard work were able to reach over 90% of SBIR Phase II winners and report on the award winners. Attached to my testimony is a chart showing the names and technologies of selected DOD success stories in states represented on this Committee. It is interesting to note that every state represented on the Committee had at least one success story. These success stories can be viewed in more detail at: https://sbtc.org/wp-content/uploads/2019/05/SBIR-Success-Stories-Book-2019.pdf

- SBIR Success Stories: https://www.sbir.gov/news/success-stories
- DOD: http://www.acq.osd.mil/osbp/sbir/about/success-stories.shtml
- NIH: https://sbir.nih.gov/statistics/success-stories
- DOE: http://science.energy.gov/sbir/highlights/
- NIST/DOC: http://www.nist.gov/tpo/sbir/sbir-success-stories.cfm
- USDA: http://nifa.usda.gov/impacts
- EPA: http://www.epa.gov/sbir/sbir-success-stories-and-highlights

Tibbett's Award & SBIR Hall of Fame: https://www.sbir.gov/about-tibbetts-awards

Some Agencies are innovating to streamline and further improve effectiveness, speed, and transitions

A few examples:

- Air Force Pitch Day
  - 51 Small Businesses competitively awarded simplified 1-page Phase I contracts
  - $8.75 million paid by government credit card over 2-day event
  - SBTC letter to President Praising Sec Roper and AF Team
- GSA Phase III Assisted Acquisition
  - GSA pilot program provides contracting service to DOD SBIR offices who want to more rapidly award post-Phase II funding ("Phase IIIs")
- SBA Issued new SBIR/STTR Policy Directives in April
  - Included many legislative changes made in the last 10 years.
  - Congress has directed the agencies to standardize and simplify their procedures and contract for the SBIR.

  The SBA Policy Directive needs to be incorporated into the FAR and DFAR

- Navy has been a program innovator, with a sustained focus on SBIR for new technologies and well-documented results, and multiple policies accelerating tech transitions to the warfighter.

Staffing and Budget

SBTC is concerned that the transfer of SBIR to R&E at DOD is not working nearly as well as it could relating to the SBIR program. Despite the studies showing such strong successes, there is no permanent staff in the SBIR program office at DOD. Solicitations which were due earlier in the year were issued weeks late. While parts of DOD have issued memorandums and directives implementing legislative change to the SBIR program, DOD overall has not. Eight years after SBIR laws were changed in 2011, the FAR and DFAR have still not been updated. We are concerned that DOD is not organizing to most effectively take advantage of the new technology development opportunities offered by the SBIR/STTR program.

Another concern is that the SBA's SBIR/STTR staff and budget are too small. According to the SBA's ''Historical Summary, Office of Technology,'' in 1991, the Office of Technology had a budget of $907,000 and 10 positions. While I do not have current information, I believe the program is in need of more funding and personnel. Running a multi-billion dollar program with just 3 or 4 people and a very limited budget makes no sense. SBA is behind in submitting its Annual Reports to Congress and only recently issued guidance directing the Agencies to comply with the provisions of the prior Reauthorization bills. Lack of personnel and funds are a serious problem at SBA's Office of Innovation. Some of the 3% Administrative funds should be used for this.

SBIR/STTR Legislative Recommendations

Increase SBIR/STTR Allocation

- Sec 809 Panel recommended increasing SBIR to 7%.
- The SBIR program is remarkably productive, with documented high performance in producing technical breakthroughs and commercial success. At this time DOD needs to step up its R&E effectiveness, programs that are documented to be remarkably productive should be expanded. SBIR is currently only a small 3.2% of the external R&D budget, far short of the potential for small business technology to help resolve DOD's technology shortfall.
- Despite its success, SBIR is constantly a target for carve-outs or experimental pilot programs diverting funds, like expanded I-Corps or marketing programs. SBTC opposes taking valuable SBIR R&D dollars and diverting them to other purposes.

SBIR/STTR Permanency

- Sec 809 Panel recommends making both SBIR and STTR Permanent.
- Success of the program over 35 years, with dozens of papers and studies proving its effectiveness and economic benefits justify making SBIR/STTR permanent.

Require agencies to use 30% of the 3% administration funds for training contracting officials on SBIR

- Lack of training and understanding of the law by contracting officials and program offices has been cited by SBTC members as the #1 obstacle for getting Phase III contracts.
- SBIR companies often have to educate contracting officers on what the law says when pursuing Phase III funding.
- One purpose of the 3% administration carve-out is to streamline SBIR/STTR awards, there is no better investment of that money than by ensuring that contracting officers know and understand the law, particularly with regards to Phase III preference and SBIR data rights.

Get legislative and Policy Directive changes, especially the new SBA SBIR/STTR policy, incorporated into the FAR & DFAR within 180 days (Appendix A)

- FAR and DFAR regulations have not been updated to reflect the statutory language changes and SBA Policy Directive made by Congress and SBA in this decade.
- Contracting Officials and Program offices regularly ignore or discount statutory law if the changes are not reflected in FAR and DFAR because they do not have a legal understanding that the statute takes precedence over the Regulations. This lack of understanding goes back to the need to provide proper training to agency personnel.
- There is no indication that the FAR and DFAR will ever be updated to include changes by both Congress and the Policy Directive unless Congress compels them to be added.
- Report quarterly on progress for implementing these provisions.
- Update all training manuals procurement docs in 180 days.

Streamline and speed up R&D contracting at DOD

- DOD should issue a standard, simplified contract for Phase I across all agencies. Pilot programs to expedite the contracting process should be implemented.
- Last year the NDAA had a provision requiring DOD to develop a simplified and standardized contracting procedure for Phase I and II.
- Despite the stated goal of the Administration to reduce regulatory burden, new FAR and DFAR regulations are continually being added to DoD contracts. This practice of adding to the regulatory burden of small businesses needs to be reversed. (Firms with fewer than 20 employees already spend **36 percent more** per employee than larger firms to comply with federal regulations.) A committee should be established with DoD and small business company leaders to reduce FAR/DFAR clauses in SBIR/STTR contracts with a goal of reducing the number of clauses by 60%. Small business cannot be held to the same regulatory expectations that huge multi-billion dollar defense contractors meet.
- The first payment for Phase I shall be paid on the day the agreement is signed. (The Air Force proved this model can be implemented with its Air Force Pitch Day, which included a standardized Phase I contract, and payment upon signing the contract.)
- Monthly payments shall be in advance for Phase I and II SBIR/STTR programs. This will help small companies with cash flow. (Since taxes for many small businesses went up in the last tax bill (from 15% to 20%, when large companies obtained huge windfalls), this will help keep these small businesses healthy.)
- We support pilot programs that help streamline and simplify the SBIR awarding and contracting process.

Pass Section 813 Panel legislative language from Sec. 21

- "an item or process developed under a contract or subcontract to which the SBIR regulations apply shall be treated as though developed at private expense during the protection period authorized in the SBIR regulations"
- This change clarifies that SBIR data rights protections should be the same as data rights that apply for technology developed at private expense.

Prioritize speedy security clearance for small businesses

- Many small businesses are caught in a Catch-22: they can't submit proposal without security clearance, and can't get security clearance without a contract. The absence of an available security clearance is reported by multiple companies as the reason provided by agency personnel for why Phase III was not awarded to the company that developed the technology.
- There is a severe backlog in security clearances exacerbating the problem.
- If DOD wants innovative, non-traditional businesses to contract with the government, the backlog and difficulty in getting a security clearance is a huge obstacle that needs to be overcome.

Establish Military Medical Evaluation Pilot Program (MMEPP)

- Designed to develop and evaluate new technologies for the battlefield, evacuation and treatment without regard to FDA requirements.
- Warfighter needs are frequently different than civilian medical treatments. FDA approvals can delay medical developments for years or decades, denying the warfighter the benefits of improved battlefield technology. The MMEPP will expedite development and evaluation of new life saving technologies for the warfighter

Other information and data

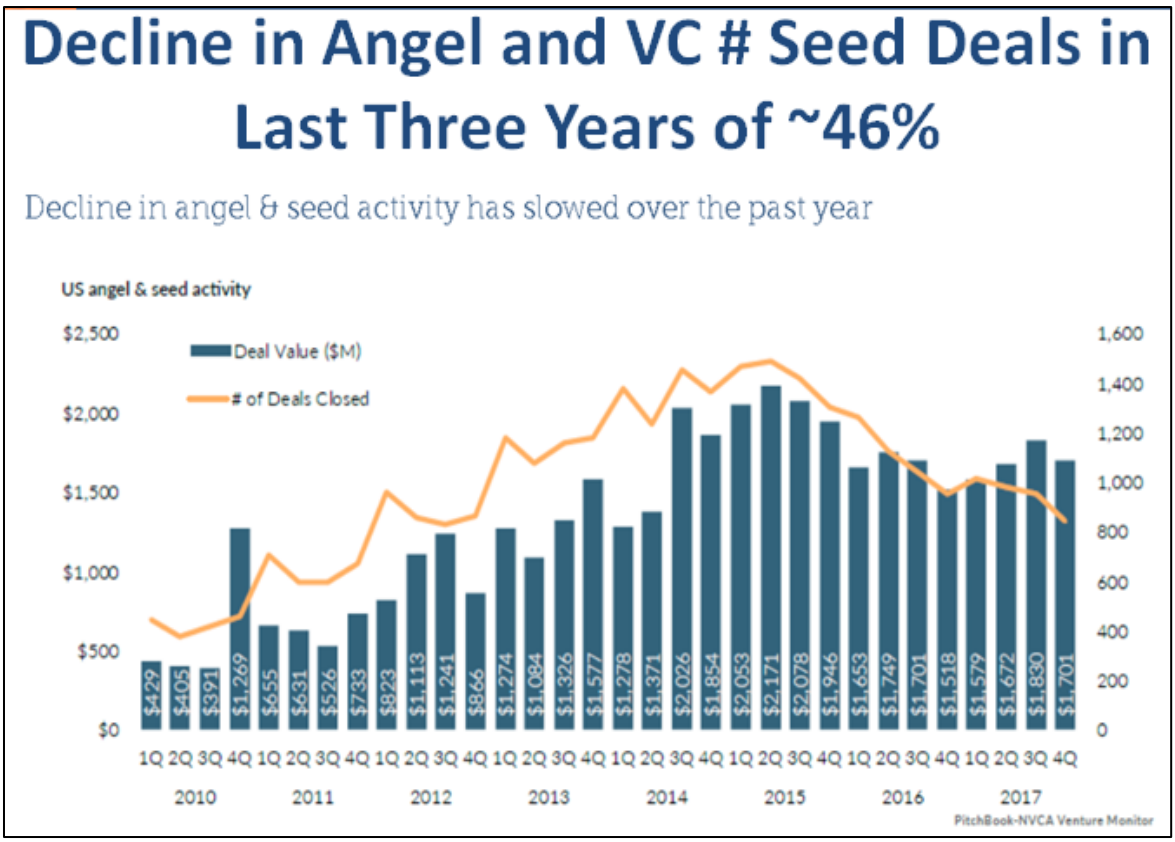
Some have questioned why small business is so protective of the SBIR Program. Why we do we oppose taking money away from the SBIR Program to fund other ideas or programs?? And why have we opposed changes to the SBIR Program that would loosen the underlying structure and other competitive aspects of the program? To understand how important SBIR is to small business one should look at the comments from the success stories attached.

We also do this because we believe the SBIR program is greatly underfunded in comparison to the potential American small business has to help build America' future technological strength. America needs new technology and new technology businesses because **over half of the S&P 500 have disappeared over the past 15 years**, with the future trending to faster obsolescence. While other ideas and programs may have individual merit, funding them by taking money from the truly successful SBIR program to test the other approaches would reduce program R&D dollars to small businesses developing SBIR technologies, and in some cases would divert the money from small businesses altogether to other sectors of the economy. The focus on the SBIR program is on development of technologies selected for their potential to solve Federally-identified mission problems and opportunities, not on business development or commercialization. While SBIR program funding is about one-tenth the share of scientists and engineers in the small business sector (3.5% vs. 33%), and while the small technology-based businesses are doing so well in developing the new technologies and commercializing them, we do not believe the funding should be tapped for other objectives.

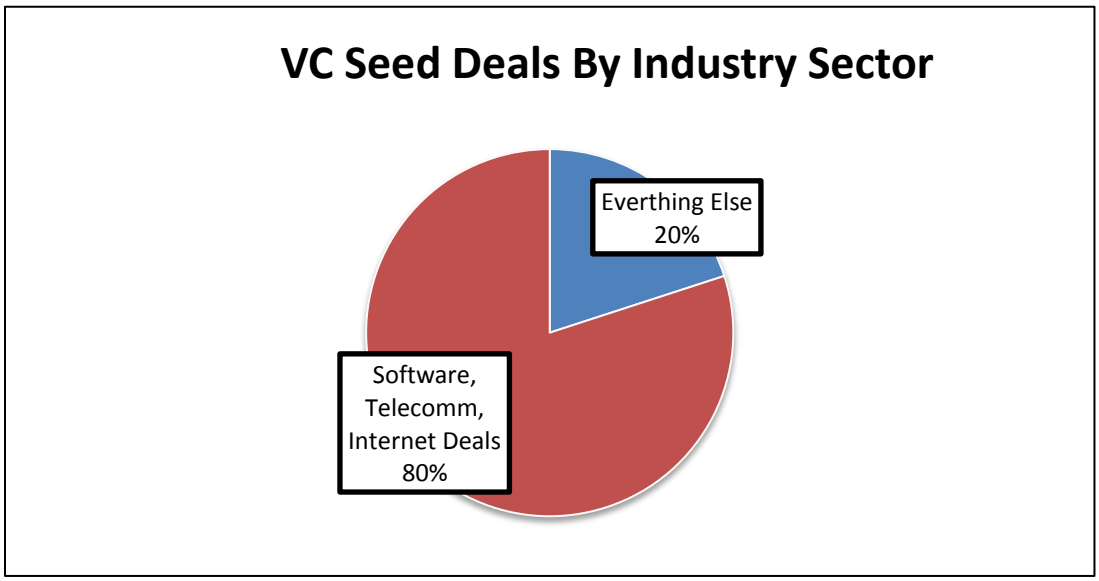
So why is this funding so important to small business? For many small business and entrepreneurs, the SBIR Program is the only substantive source of funds and the only hope for the America's innovators to create their new technologies to take to market. To understand the importance of SBIR to small business, one should read the quotes from the success stories companies that are attached further below. To better understand why we are so protective of the SBIR program, we want to discuss the market that small business, inventors and entrepreneurs and changes in the market have made it even more difficult for small technology companies to succeed.

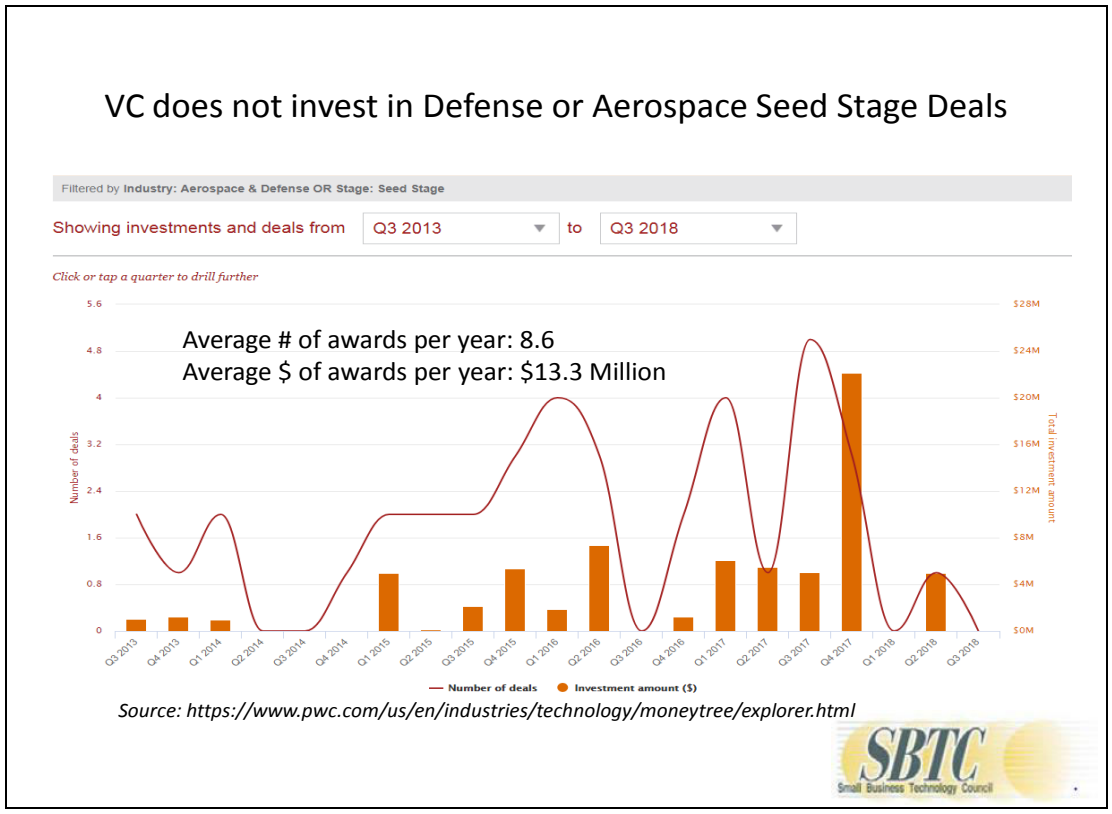
The SBIR program provides the results-based structure to ensure Federal R&D funding actually goes to small businesses to encourage technological innovation and to tap entrepreneurial energies to commercialize those technologies for the benefit of the U.S. economy. America needs the unique solutions provided by these small businesses, and it needs the "disruptive" drive of new technologies from small businesses to invigorate our economy, to maintain competition, and to provide a counter-balance to the labor rationalization that is now underway in larger businesses sending so many of our best jobs overseas.

Below we present further information on the financial market facing small business, why it is making it ever more difficult for small technology companies to succeed, and on SBIR success stories.



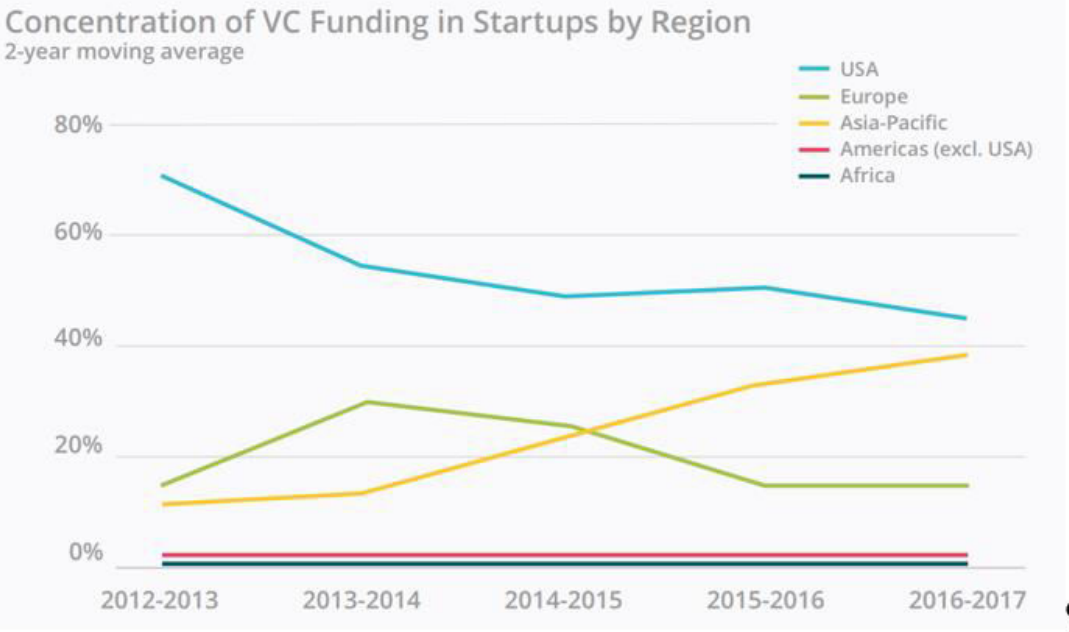
Companies that aren't in software, telecommunications, or the internet have a particularly hard time.





Source: https://www.pwc.com/us/en/industries/technology/moneytree/explorer.html

Most importantly, Venture Capital is moving overseas. (This is in part due the weakened patent system in the US.) A smaller VC pool, reduced by about 40% due to investments outside America, makes it even harder for small high-tech businesses to grow.



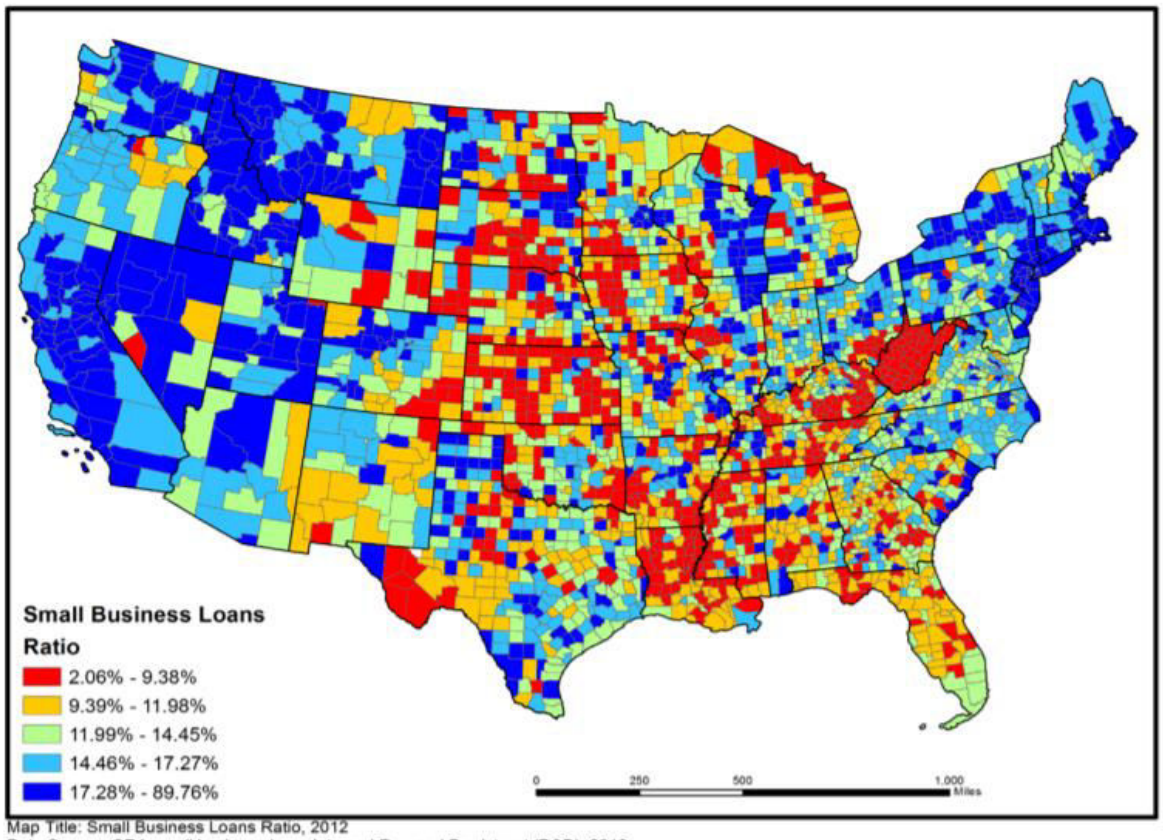
Startup· Genome,· Global· Startup· Ecosystem· Report,· 2018,· page· 11,· https://startupgenome.com/all-report-thank-you/?file=2018

Financing Innovation is difficult

SBIR & STTR are the only Federal programs designed specifically to help small high technology firms grow and succeed. In general, VCs do not support early stage technology creation and development and banks do not lend for this purpose. But even after a technology is created, bank lending to small business is limited, and venture capital is difficult if not impossible to obtain in most areas of the country. For thousands of inventors and small businesses, SBIR is their only hope of funding their inventions, and America's best opportunity to create American jobs.

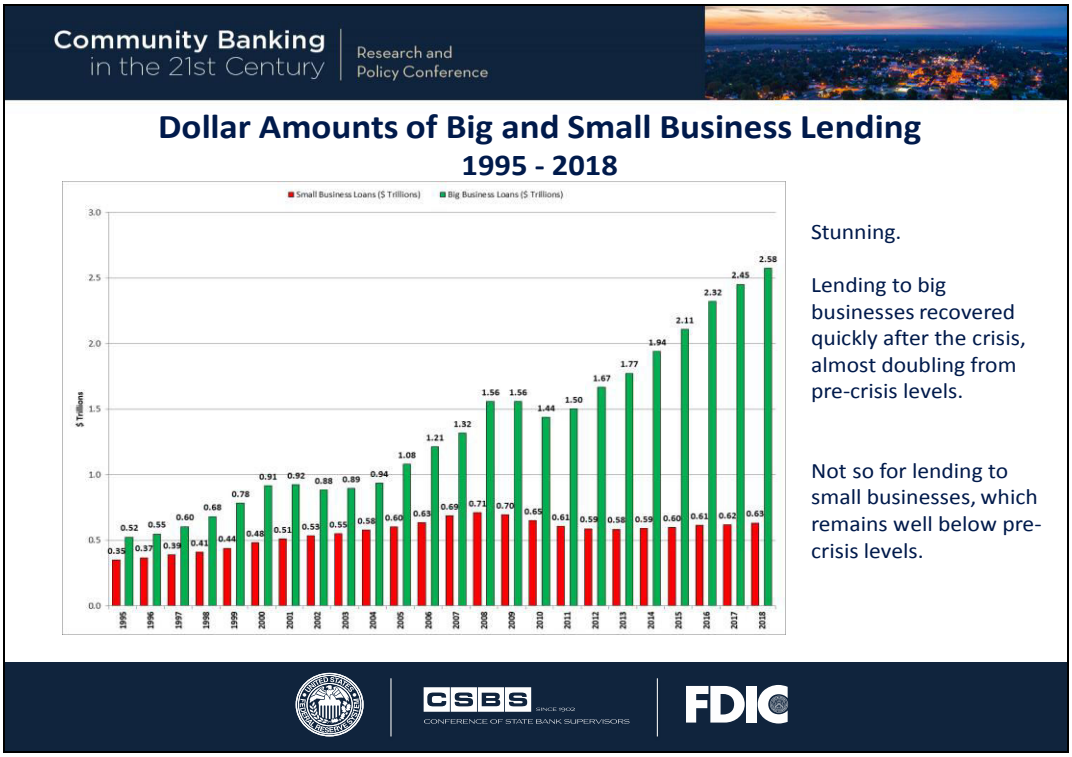
BANKING: Small business options for financing growth and commercialization of their innovations are very limited. Bank lending has declined dramatically since 2007, and is not readily available for most innovative small businesses, particularly in states in the center of the country. The amount of lending to small businesses by banks is down over $80 Billion over the last 10 years. According to Professor Cole at Florida Atlantic University, lending to small business is 50% lower than it should be. (SBA Office of Advocacy Study.)The lending market for all small business is challenging. For innovations firms especially those without sales, getting a loan is impossible.

The below chart shows what has been referred to as the "lending desert." The Plains States, the Midwest, and the South are most severely affected.[6]

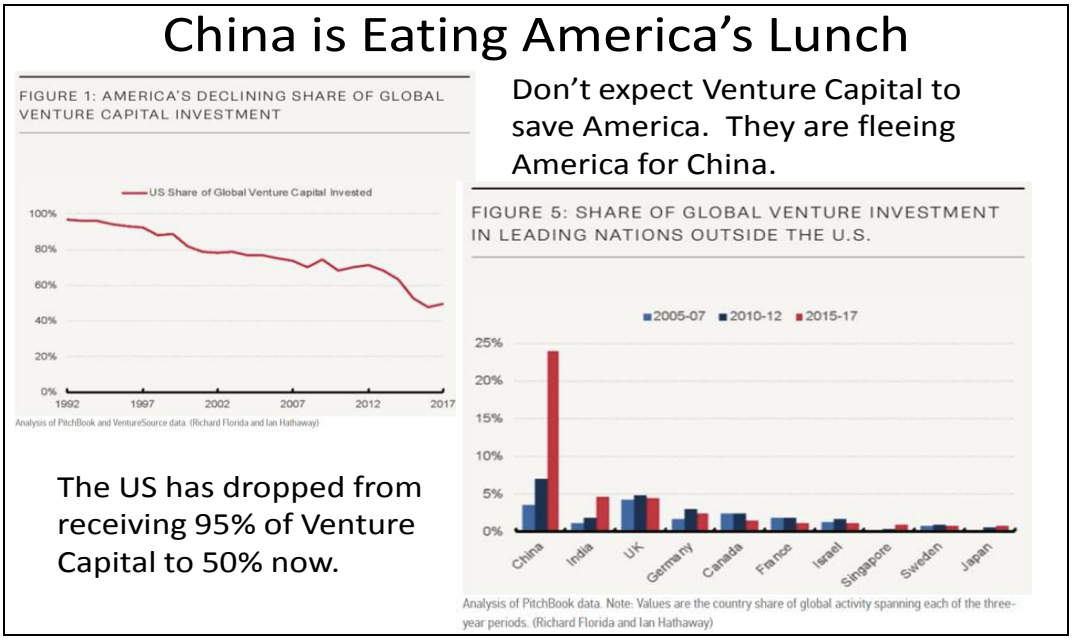


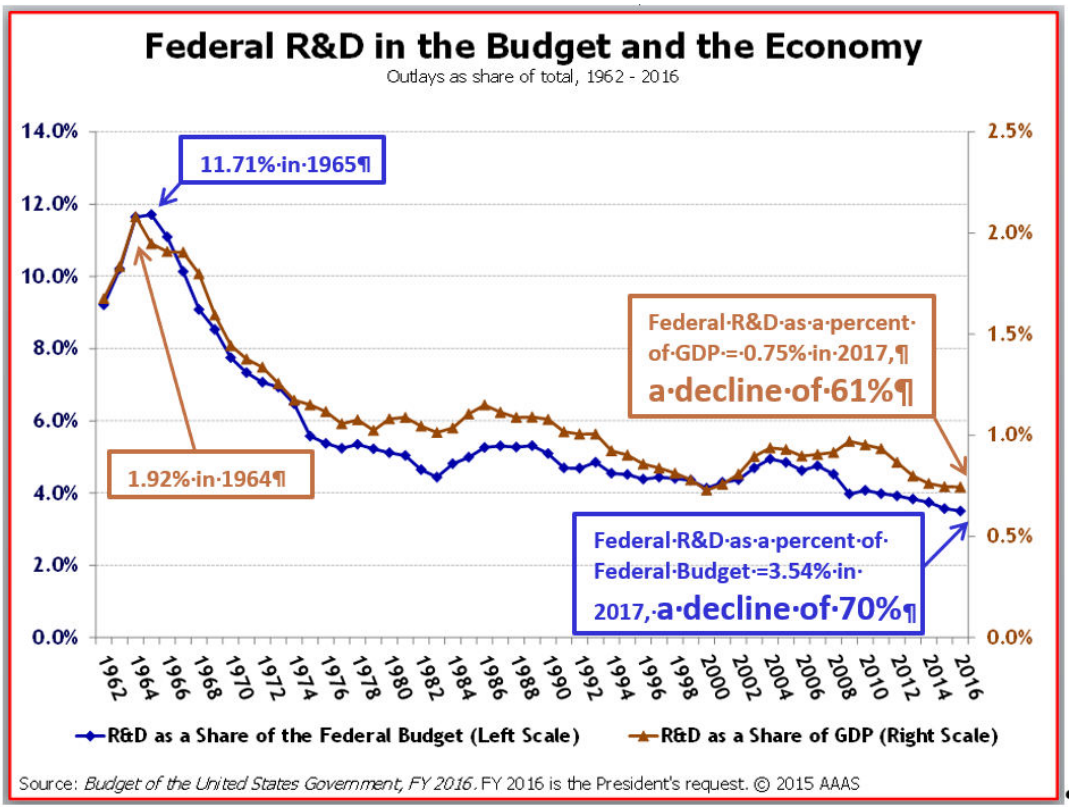
Map Title: Small Business Loans Ratio, 2012
Data Source: CRA small business loan data and Dun and Bradstreet (D&B), 2010

This has not improved since the Great Recession. In fact, Small Business Lending has dropped by $20 billion since 2010, while big business loans have grown by 79% during that same period.



Funding opportunities in America decline while other countries are making funds available to their small innovative firms.



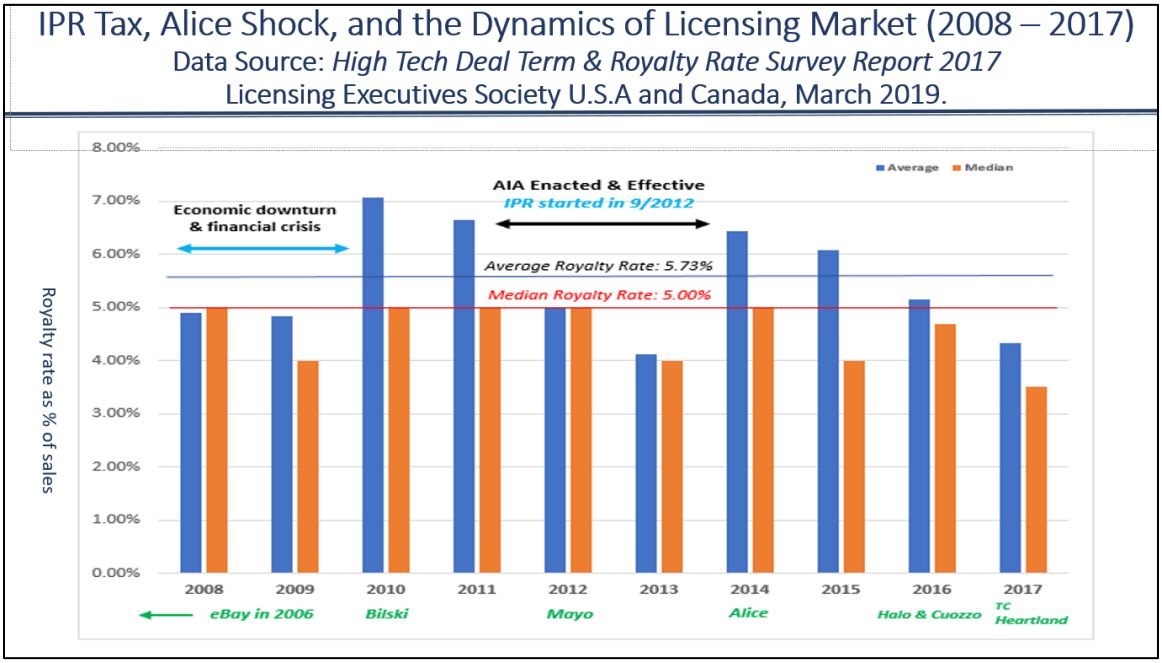

Federal R&D in the Budget and the Economy
Outlays as share of total, 1962 - 2016
14.0%
12.0%
10.0%
8.0%
6.0%
4.0%
2.0%
0.0%
2.5%
2.0%
1.5%
1.0%
0.5%
0.0%
11.71%·in·1965¶
1.92%·in·1964¶
Federal·R&D·as·a·percent·of·GDP·=·0.75%·in·2017,¶
a·decline·of·61%¶
Federal·R&D·as·a·percent·of·Federal·Budget·=3.54%·in·2017,·a·decline·of·70%¶
1962 1964 1966 1968 1970 1972 1974 1976 1978 1980 1982 1984 1986 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016
R&D as a Share of the Federal Budget (Left Scale)
R&D as a Share of GDP (Right Scale)
Source: Budget of the United States Government, FY 2016. FY 2016 is the President's request. © 2015 AAAS

SRENGTHENING PATENTS

Finally, Patents need to be strengthened. Although it was obvious to SBTC's members that the America Invents Act would be extremely harmful to small business and independent inventors, the full effect of its devastation is now just being felt. The value of patents and patent assets has decreased by over 60%[7] in the first few years after passage of the AIA.

The country has seen similar declines in licensing revenues to inventors.[8] The America Invents Act (AIA) and the ensued Inter Parties Review (IPR) procedure at Patent Trials and Appeals Board (PTAB) set off the overall declining trend in licensing royalty rate. The average royalty rate has dropped from pre-AIA in 2010 of about 7.1 % to about 4.3 percent in 2017, or about a 40% drop. This particularly adversely affects small business inventors as the lost royalties would traditionally provide the funds to expand a small high-tech business, and the royalty income stream is the only asset from inventions that a bank will use as collateral. Furthermore, in the last eight years, the share of private company licensors has declined substantially. Specifically, small inventing companies (i.e. non-practicing entities (NPEs)) have to a large extent been shut out of the licensing market and the resulting income, due to large companies' adoption of "efficient infringement" practices.

IPR Tax: IPR challenges escalate the risk and uncertainty in patent monetization and increase the patent enforcement costs for private patent owners, both of which depress patent valuation. Since IPR essentially does not affect governmental entities and state universities, it has an effect analogous to an extra tax levied on the private patent owners. The IPR tax discourages private patent owners' participation in licensing markets.[9]



Inventors pay tens of thousands of dollars[10] out of pocket to obtain a patent and frequently wait years for it to issue.[11] Inventing is also high risk, only 5% of patents are licensed or commercialized.[12] Despite the odds against inventors, they still work to make their dream come true. If they are successful in getting a valuable patent, then they have to enforce it in today's *"efficient infringement"*[13] environment. The decreased use of injunctions encourages prolonged litigation. Before the AIA became fully effective, litigation cost $3-5 million and took 3-5 years.[14] Now it takes even longer and is more expensive for the patent holder.

The declining power of American patents has also played a part in the declining investment by venture capital and by angels. This has caused a decline in startups, adversely impacting the economy[15]. This has been particularly detrimental to "flyover" states like those of the central part of the nation, and even states like Florida.

Patents are critical for small business success. They are the shield that allows a company's equity shares and capital expenditures to have protection in building the markets for America's innovative new products. America has been dissipating this shield for several years

The detrimental effects of the America Invents Act (AIA) have caused a shift in economic power to China and elsewhere overseas. China is overtaking America in patenting.[16] Patents protect new products and services and the equity they generate are key drivers for America's future economic strength. China's State Intellectual Property Office (SIPO) processed 34.6 percent of all patent applications in the world. With over 920,000 total applications, China processed 160 percent more application than the United States.

Source: World IP Organization, "World Intellectual Property Indicators 2017," December 6, 2015

Comparison of Economic Impact Statements

SBTC therefore hopes the Senate and the Small Business and Entrepreneurship Committee will help improve America's competitive position in innovation by voting to restore stronger patent rights. We support the STRONGER Patents Act as strong patents will help improve innovation and America's competitiveness.

Partial list of DOD SBIR success stories

Link to company technologies is https://sbtc.org/wp-content/uploads/2019/05/SBIR-Success-Stories-Book-2019.pdf

ENDNOTES

[1] As Counsel to the House Small Business Committee, I helped convene the first joint House-Senate Small Business Committee hearings on the subject in 1978. These hearings and report showed that, despite their demonstrated superior efficiencies at innovating, small companies received only 3.5% of federal R&D contract dollars. Today, with far more science and engineering talent at their disposal, and a far more widely acknowledged record of innovations, small companies still receive only 5% of those R&D contract dollars. And SBIR/STTR accounts for more than half of that. I subsequently testified before Congress regarding small business and innovation on numerous occasions, as Deputy Chief Counsel for Advocacy at SBA during the Carter Administration, as Chief Counsel during the Clinton Administration, and as Executive Director of SBTC during the George W. Bush, Barack Obama, and Donald Trump Administrations. SBTC represents more companies that are active in the federal Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Program than any other organization. SBTC also serves as the Technology Council of the National Small Business Association, the nation's oldest nonprofit advocacy organization for small business, which represents over 65,000 small-business members in every state and every industry. I appear here today on behalf of both organizations.

[2] Horizon 2020 and the European Innovation Council pilot: a new dynamic for SMEs with breakthrough ideas, https://ec.europa.eu/programmes/horizon2020/en/area/smes

[3] Jean Baptiste Su, France Creates $13 Billion Disruptive Innovation Fund, Hopes To Become The Next Startup Republic, Jan 17, 2018, 06:19pm https://www.forbes.com/sites/jeanbaptiste/2018/01/17/france-creates-13-billion-disruptive-innovation-fund-hopes-to-become-the-next-startup-republic/#62fcc8e5405e,

[4] Inspiring Tomorrow, U.S. Chamber International IP Index, 7th Edition, February 2019, https://www.theglobalipcenter.com/wp-content/uploads/2019/03/023593_GIPC_IP_Index_2019_Full_04.pdf

[5] The world's most innovative countries in 2019, Bloomberg, January 27, 2019, https://businesstech.co.za/news/technology/294614/the-worlds-most-innovative-countries-in-2019-and-2-surprising-areas-where-south-africa-stands-out/ 1/

[6] National Community Reinvestment Coalition Analysis, "Small Business Lending Deserts and Oases,", September 2014, https://ncrc.org/wp-content/uploads/2014/09/ncrc-analysis-small-business-lending-deserts.pdf.

[7] An augmented market approach to patent portfolio valuation, Jack Lu, IAM, Sept/OCT 2016, http://www.iam-media.com/Magazine/Issue/79/Features/An-augmented-market-approach-to-patent-portfolio-valuation

[8] Jack Lu, Licensing Executives Society (LES) 2017 High Tech Deal Term & Royalty Rate Survey, Chapter 5. "Three Surveys, A Decade's Journey: IPR Tax, Alice Shock, and Dynamics of Licensing Markets as Reflected by LES High Tech Royalty Surveys," Available from the Licensing Executives Society, 2019

[9] Jack Lu, IPR Tax, *Alice* Shock, and the Dynamics of the Licensing Market as Reflected by the LES High-Tech Royalty Surveys, IP Watchdog, March 5, 2019, https://www.ipwatchdog.com/2019/03/05/licensing-executives-society-high-tech-deal-term-royalty-rate-survey/id=107013/

[10] HIGH TECHNOLOGY ENTREPRENEURS AND THE PATENT SYSTEM: RESULTS OF THE 2008 BERKELEY PATENT SURVEY, BERKELEY TECHNOLOGY LAW JOURNAL,
Stuart J.H. Graham, Robert P. Merges, Pam Samuelson, & Ted Sichelman, http://ssrn.com/abstract=1429049 The Berkeley study found that the average out-of-pocket cost to obtain a patent was over $38,000 (not including invention costs).

[11] Many of SBTC's members wait 6-8 years (and we have an example of a 12-year wait) for a US patent to be issued in arts such as medical devices or aerospace.

[12] The Real Patent Crisis Is Stifling Innovation, Forbes, JUN 18, 2014, https://www.forbes.com/sites/danielfisher/2014/06/18/13633/#2bc12036f1c0. "Of today's 2.1 million active patents, 95 percent fail to be licensed or commercialized."

[13] Adam Mossoff & Bhamati Viswanathan, Explaining Efficient Infringement, May 11, 2017, https://cpip.gmu.edu/2017/05/11/explaining-efficient infringement/ .

[14] For Most Small Companies Patents Are Just About Worthless, Forbes, OCT 4, 2013, https://www.forbes.com/sites/toddhixon/2013/10/04/for-most-small-companies-patents-are-just-about-worthless/#3dfbbee33ef3 .

[15] Dynamism in Retreat: Consequences for Regions, Markets, and Workers, Economic Innovation Group, Feb 2017, http://eig.org/wp-content/uploads/2017/07/Dynamism-in-Retreat-A.pdf .

[16] "And in three of the last four years, at least half of the top ten largest venture investments in the world have occurred outside the U.S." Statement of Scott Kupor Managing Partner, Andreessen Horowitz Chair-elect, National Venture Capital Association before the U.S. Senate Small Business Committee on "Searching for Capital: How Venture Capitalists and Angel Investors Fund Entrepreneurs and Startup Companies" July 14, 2016.

Quotes from SBIR success stories at DOD

1. This meant, Chen said, that “the 3eTI technology, funded by DOD SBIR, scaled with chips from Intel.”

2. “The SBIR/STTR programs are important to the US commercial market because they give small businesses the chance to actually put new technologies to the test,” he said, noting that otherwise, potential solutions are just sitting on a piece of paper as somebody’s brainchild. “Every young entrepreneurial type—we were young once—has new ideas they want to try, but might not have the opportunity without SBIR funding.”

3. Teamed with Dr. Watkins at Woods Hole Oceanographic Institution (WHOI), Duke University Marine Laboratory, and Advanced Acoustic Concepts, Inc., and thanks in no small part to the DOD’s SBIR/ STTR program, AD&D has successfully addressed the Navy’s marine mammal detection need.

4. “The SBIR was crucial to accelerating development of the technology at a critical time when industry was looking to develop a standard for efficient data exchange,” said Schneider. “If we had missed this window, industry would have likely developed a standard based on older, less efficient technologies that weren’t going to meet DOD needs.”

5. The SBIR program provided foundational financial and networking support that Sedgewick called “absolutely fundamental” to companies, no matter their size or ambitions. Having access to resources that can help develop new technologies is critical to small business, and drives increased performance for both military and commercial application. “(The SBIR program) sustained us through those couple years which were very tough on the commercial side,” he said. “There’s still a fundamental need for development in this country that will bridge to the next technology. The diversity provided by the SBIR, in the same way you diversify your stock portfolios, can really be helpful for a company.”

6. Blake credits the SBIR program for giving his company a shot in the arm when it needed it most, propelling it to the successful position it’s in today. “To me, it’s an ideal way to drive new technologies,” he said. “All new technology has risks, and if the envelope is really being pushed there will be failures. SBIR funding enables the ability to work through failures to achieve new levels of performance that benefit everyone.”

7. Early SBIR funds awarded to Idaho Technology in 2001 enabled the group to develop the freeze-dried reagents, and additional Air Force SBIR contracts allowed the company to create the rapid PCR machine and further develop the technology for military bio-threat testing.

8. , “This SBIR funding, as well as internal investment, helped us develop and test our new battery capability down to 6,000 meters. That spun off into a new power line that is now available to everyone.

9. “We utilize the SBIR program to facilitate the incorporation of novel technologies that come out of small businesses

10. “For multi-dimensional, complex technologies like this,” said Rozzi, “SBIR funding is absolutely critical to take something from a nice science project, if you will, to a technology that can be integrated into real machines.”

11. Toward the end of the Phase II contracts, the technology was transitioned to Creare’s affiliate company, Edare, for production, sales, and subsequent technical support. Last year, Lockheed Martin placed the first order of 18 systems with the expectations that additional sales will follow. Initial SBIR funding to build the fastener measure like a cryocooler for the Hubble Space Telescope, a spin-off dedicated to micromachining, licensing of Envelop® protective coverings, and delivery of specialized equipment for aircraft carrier catapults.

12. The SBIR funding itself was very important, but the Air Force involvement also facilitated a process where we got connected to key stakeholders at both Lockheed and the Air Force,”

13. The SBIR program was a critical part of CTSi’s growth, Sanders said. “The SBIR program is what allowed us to get our start, and this would have never happened without the funding and the opportunities that they provided. It’s led to a lot of new opportunities and capabilities for CTSi. It’s opened up doors for us with all the Services and NASA to use Independently-owned small business successfully researches, engineers, tests, manufactures, and markets gear for outdoor enthusiasts worldwide.

14. In order to make the idea a reality, CyPhy Works turned to the Small Business Innovation Research (SBIR) program for development funding. Greiner cited SBIR funding as being vital to the development of the engineering concepts underlying both the pocket-sized drone as well as PARC.

15. GL Studio and other technologies developed with SBIR support have helped DiSTI expand to an 80-employee company. “Today, we’re growing in the automotive space and the embedd world,”

16. “SBIR is an amazing asset to U.S. small business firms…In addition to providing a path to commercialization, it allows inventors to invent!”

17. The SBIR-supported innovations by H.C. Materials have benefited both the military and commercial sectors

18. Sliwa went on to add that the company wouldn't have survived without the SBIRs. "And the technology that we delivered during that time was the foundation for growing the company,"

18. "The Army SBIR helped us cross the valley of death, and we came out the other side with products that we could sell to both civilian and military customers."

19. "Other than the funding, which helps any small company, the SBIR program helps with efficiency," said White. "We can sit here all day and try to guess what products we need to make in the future, but if the military comes out with an SBIR solicitation, it gives us that much-needed direction regarding what we need to focus on."

20. Like most small businesses, Light Age is undercapitalized, according to Heller, and government programs like SBIR have helped the company "support research and development" over the past three decades.

21. Ten or fifteen years ago, anybody who had memory chips in their computer benefitted from a Lightwave laser," said Arbore. "One of the reasons today's microelectronics work as well as they do, and are as cheap as they are, is thanks to semiconductor manufacturing technology that relies on lasers." And thanks as well to the SBIR program and the small businesses that seize their oportunity and run with it.

21. Virtually all of the innovation on ECUs began with Mainstream's first SBIR contracts, and he credited that early support with helping to significantly advance the technology.

22. MSI's SBIR contracts formed the baseline for developing and commercializing the firm's Sentry™ software, which has two versions.

23. The SBIR program, through its support for growing businesses and nascent technologies, provides a launch--pad for passionate innovators looking to develop their ideas. "You have some technical people who have an idea and want to commercialize it, but who know nothing about business or production—

24. "I believe in the SBIR program," said NAVAIR's Brian Ramsay. "If we had tried to do this through a regular acquisition process, it would have cost much more money.

25. Under the SBIR, the company developed more than 250 variants of nanoparticles. "The SBIR," Oldenburg said, "allowed us to reach out to the nanotechnology and nanosafety communities, and massively accelerated our ability to help out."

26. The SBIR program provides a tremendous benefit to our country, allowing small companies to pursue big ideas."

27. The SBIR program gave us the flexibility to explore more possibilities."

28., Dr. Sullivan credits the SBIR program with reducing the technical and market risks, making it possible for Oceanit to create this innovative technology.

28. "The SBIR program gave rise to the birth of our company and kept us from going out of business when times were lean. And it has allowed us to develop the technology

29. Along with development, the SBIR program also helped Holemans and his PSC team with the last, crucial piece needed for the Lightband's success: proving it worked in actual missions. Holemans noted that his own success can be attributed in large part to good government leadership, as shown through the SBIR process.

30. Liesenfeld noted that the SBIRs "helped us to really better understand what we could do with the technology and show some fantastic research results.

31. This small company could not have built this world-class technology without SBIR. As Bolander said, "SBIR was the genesis for the entire technology. There would be no other way for a small company to build this type of technology…we could not have done it without SBIR."

32. "The best use of SBIR funding is when you use those funds to drive commercialization forward rapidly and realize that the value of your company can increase dramatically following the use of an SBIR," Greenwald said. "It's not trivial money; it's real, important non-dilutive funding."

33. The SBIR funding provided the ability to develop more interactive simulation technology and refine it for specific scenarios, as well as to conduct research studies on the impact of the training that helped give the company's simulations greater credibility in the field. The SBIR also charted a path forward for the small company. "It taught us what products had marketability," Olsen said. "It was transitional as we were trying to spin out as a separate company without a huge organization behind us. It really helped us get moving."

34. Had it not been for the SBIR program, we would not have had a successful product because it not only gave us funding, but also it found us an end user who was very willing to work with us,"

35. The initial research and development resulted from a Small Business Innovation Research (SBIR) award through the U.S. Special Operations Command (SOCOM) and was later extended by SBIR awards from the Navy and the Joint Tactical Radio System program.

36. Air Force SBIR Program helps meet our warfighters' ongoing needs.

37. “SBIR awards have allowed the company to grow from a focus on root-cause failure analysis engineering services into the realm of software engineering and development and systems engineering and manufacturing. With support from the SBIR program, the IFDIS is saving lives, improving warfighter and aircraft readiness, and saving many millions of taxpayer dollars in the bargain.

38. The company was awarded several DoD SBIR contracts that were crucial in establishing the commercialization of MOCVD systems, McKee said.

39. “QuickStrike has been ideal for what you want out of an SBIR project,” said Spaulding. “It leveraged our existing product, satisfied the needs of the ASOC and then was commercialized. And it will continue to benefit from COTS product improvements as well.”

SBTC
Small Business Technology Council

MAJOR DOD SBIR/STTR SUCCESSES

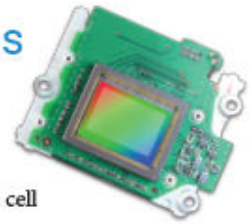
GPS/WiFi/Blue-tooth Chips

Physical Research/ Broadcom

GPS on a chip, and combined WiFi and Blue-tooth communications used globally in cell phones and U.S. military systems, are derived from a DoD SBIR award to Dr. Reza Rofougaran.

CMOS Cameras

Photobit/Micron



SBIR supported Photobit in developing fast CMOS imagers for military use, now used in all cell phones and most other digital cameras.

Precision Artillery

Versatron/GD

The high-accuracy, longer-range Excalibur, enabled by a DoD SBIR, is a game-changer for U.S. military engagements.

Military UAVs

Insitu/Boeing

Insitu's family of military and civil-ian UAVs, including ScanEagle and Blackjack, started with a Navy SBIR, making major contributions to safety, security, and mission support.

Switchblade Armed Drone

AeroVironment

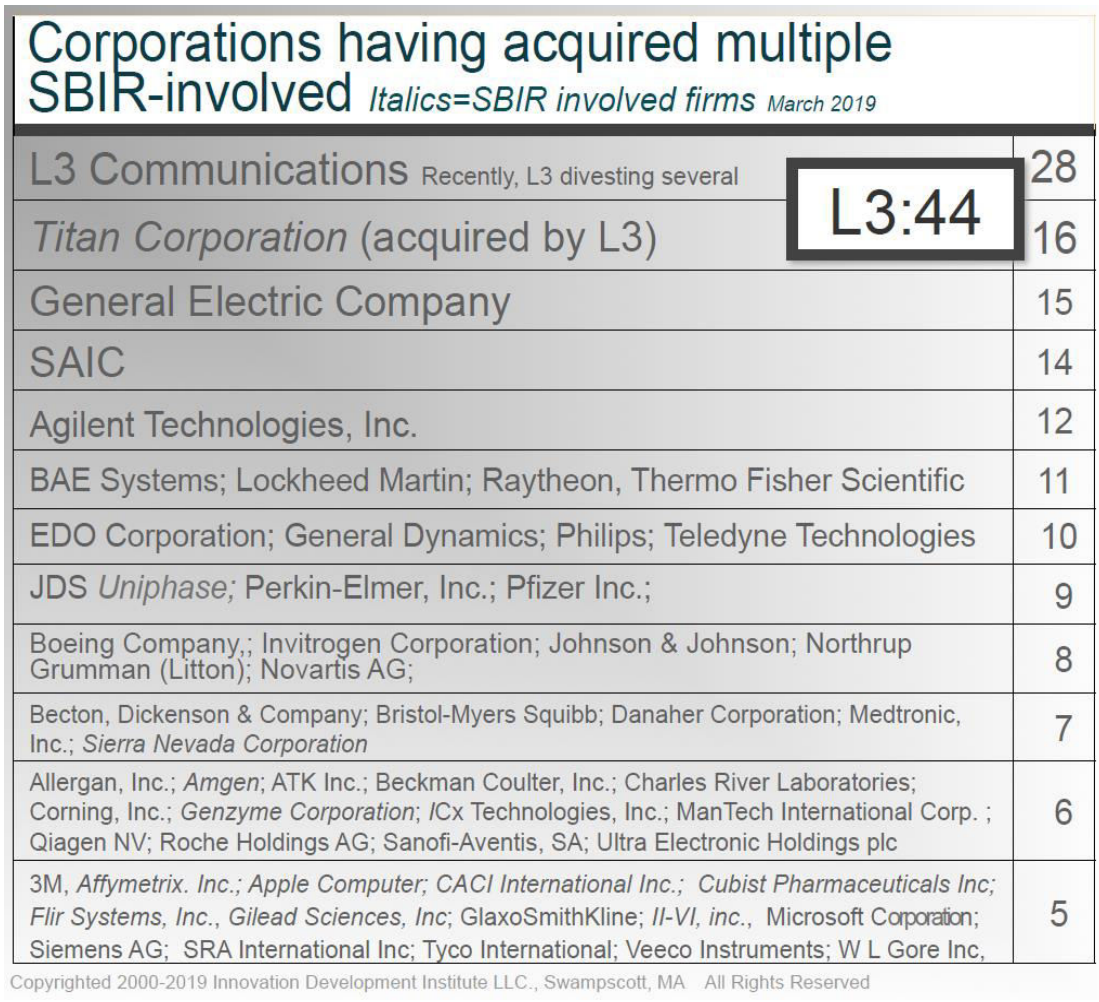
The Switchblade UAV de-livers a precision payload of explosives, changing the very nature of warfare.

Portable Satellite Communications

GATR/Cubic

A highly portable, inflatable satellite terminal offers communications support for both warfighters and civilian first responders.

TechLink


Corporations having acquired multiple SBIR-involved Italics=SBIR involved firms March 2019
L3 Communications Recently, L3 divesting several
28
L3:44
Titan Corporation (acquired by L3)
16
General Electric Company
15
SAIC
14
Agilent Technologies, Inc.
12
BAE Systems; Lockheed Martin; Raytheon, Thermo Fisher Scientific
11
EDO Corporation; General Dynamics; Philips; Teledyne Technologies
10
JDS Uniphase; Perkin-Elmer, Inc.; Pfizer Inc.;
9
Boeing Company,; Invitrogen Corporation; Johnson & Johnson; Northrup Grumman (Litton); Novartis AG;
8
Becton, Dickenson & Company; Bristol-Myers Squibb; Danaher Corporation; Medtronic, Inc.; Sierra Nevada Corporation
7
Allergan, Inc.; Amgen; ATK Inc.; Beckman Coulter, Inc.; Charles River Laboratories; Corning, Inc.; Genzyme Corporation; ICx Technologies, Inc.; ManTech International Corp. ; Qiagen NV; Roche Holdings AG; Sanofi-Aventis, SA; Ultra Electronic Holdings plc
6
3M, Affymetrix. Inc.; Apple Computer; CACI International Inc.; Cubist Pharmaceuticals Inc; Flir Systems, Inc., Gilead Sciences, Inc; GlaxoSmithKline; II-VI, inc., Microsoft Corporation; Siemens AG; SRA International Inc; Tyco International; Veeco Instruments; W L Gore Inc,
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