

Crossing the Valley of Death

The Small Business Innovation Research Program:
An Opportunity for Australia



Entrepreneurship, Early Stage Finance, and SBI R

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The Global Innovation Imperative

- Key Points
 - **Innovation** is Key both to Grow and Maintain a Country's Competitive Position and to Address Global Challenges
 - **Collaboration** among Small and Large Businesses and Universities Contributes to Regional Growth and Job Creation
 - **New Laws, New Institutions, and New Incentives**, are necessary to foster innovation and collaboration

How to Face These Challenges?

“The more demanding the innovation challenges, like poverty, health, or environmental damage, the greater becomes the importance of effective policy” — A. Sterling, University of Sussex, Australian Innovation Report

A Key Theme for Today is the Need for Change

- A desire for different or better outcomes in the innovation space requires:
 - A recognition of the need for change
 - An emphasis on the importance of learning from others, and from experience
 - Learning is necessary to effectively adopt and adapt new principles & programs
- Australia's success today is not a guarantee of success in the future

The Need is for a Dynamic Entrepreneurial Government

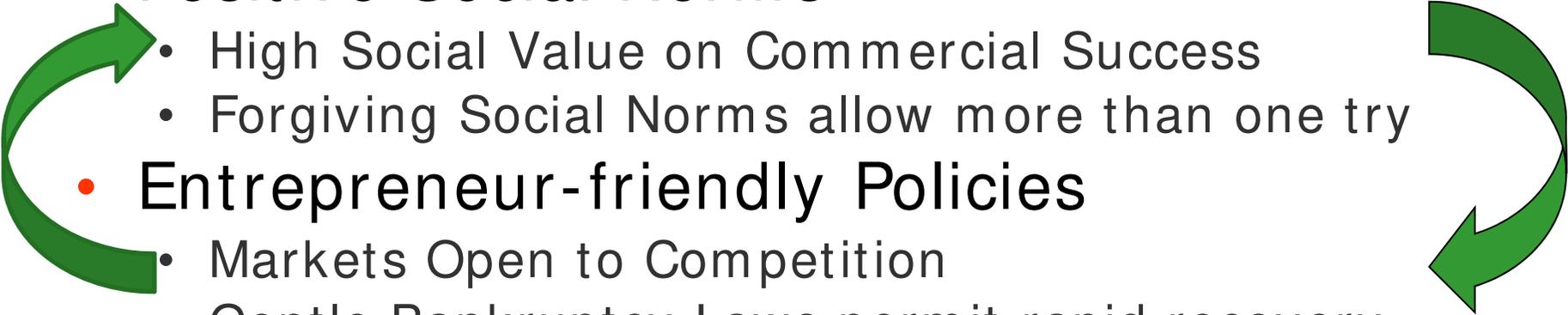
- If Australia is to fully achieve its potential, its government will need a dynamic approach
 - Not just to address problems while they emerge, but to perceive and act on opportunities in advance of competitors and in advance of the market
- Australia has done this before
 - In the wool industry, steelmaking, the Serum Laboratories, and the CSIRO

What Drives Innovation both in the U.S. and Australia?

Attitudes
Risks
Opportunities
Funding

Framework Conditions:

Major U.S. Advantages in Innovation

- Openness to science and innovation
 - Trust in Science & Scientific Institutions
 - Positive Social Norms
 - High Social Value on Commercial Success
 - Forgiving Social Norms allow more than one try
 - Entrepreneur-friendly Policies
 - Markets Open to Competition
 - Gentle Bankruptcy Laws permit rapid recovery
 - Taxes give Prospect of Substantial Rewards
 - Strong Intellectual Property Regime:
 - Encourages Research & Diffusion of Research Results
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U.S. Strengths in Innovation

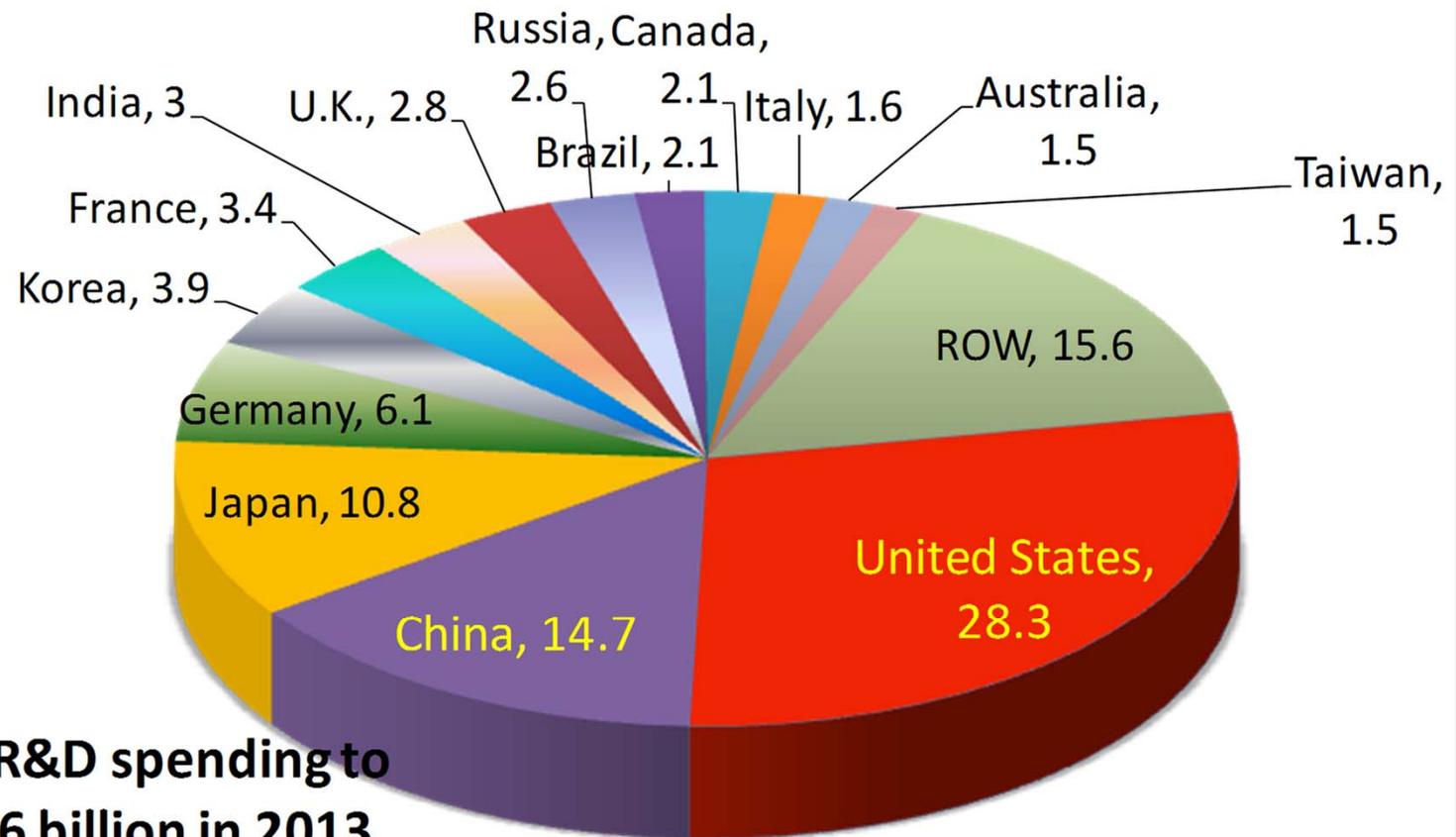
- **Government investments in R&D:** ~ \$150B a year
- **Private investments in R&D:** ~ \$270B a year
- **Research Universities:** some with a culture of innovation
- **Entrepreneurial spirit** and laws to support it
- **Talent:** from the U.S. and from around the world
- **Capital:** Broad, deep, and efficient capital markets with significant angel (\$22.5 Billion*) and venture funding (\$28.4 Billion* *)

– Sources:

* Jeff Sohl, UNH Center for Venture Research

** 2012 Money Tree Report

Good News: The U.S. has a Large Share of Global R&D



Total global R&D spending to reach \$1,496 billion in 2013

SOURCE: Battelle and R&D Magazine, 2013 Global R&D Funding Forecast (December 2012).

There are some troubling trends
for the U.S.

Our elections, for example

Troubling Trends

- U.S. R&D has been stagnant or declining
 - This recently changed as of December
- Half of U.S. R&D is concentrated in the military and much of that is late stage development
- U.S. universities are key pillars of the U.S. innovation system – funding for state universities has declined by 20% per student over the last decade
- U.S. rates of entrepreneurship are declining, possibly due to rising student debt

Australia also has some challenges...

- R&D expenditure as a % of GDP grew from 1.48% in 2000 to 2.12% in 2013
 - But moved only from 16th to 14th at OECD
- 23 out of 26 OECD countries for businesses collaborating on innovation
- Last out of 30 OECD nations for business – research collaborations
- 81 out of 143 countries on effective returns from research
- Rates poorly on overall competitiveness

Other advanced countries are aggressively reforming their economies

Improving the performance of the innovation system as a whole by:

- Reducing the cost (and red tape) of doing business
- Strengthening linkages between universities and companies
 - Providing incentives for universities to commercialize and cooperate with the private sector
- Providing early stage financing

The Major Risks for the U.S. And Australia?

- **Complacency** about our competitive position
 - Focus on **current consumption** rather than investment for the future
- A **lack of investment in R&D, Universities, and Infrastructure** on the scale of our competitors
- Limited attention to the **composition of the economy**.
 - Can we make what we invent, and create jobs here?
- Failure to provide enough support for the **commercialization** of research and for new opportunities in **manufacturing**



Innovation is how nations grow and compete in the 21st Century

Innovative Small Businesses are a
Competitive Asset

Small Companies Drive High-Technology Innovation

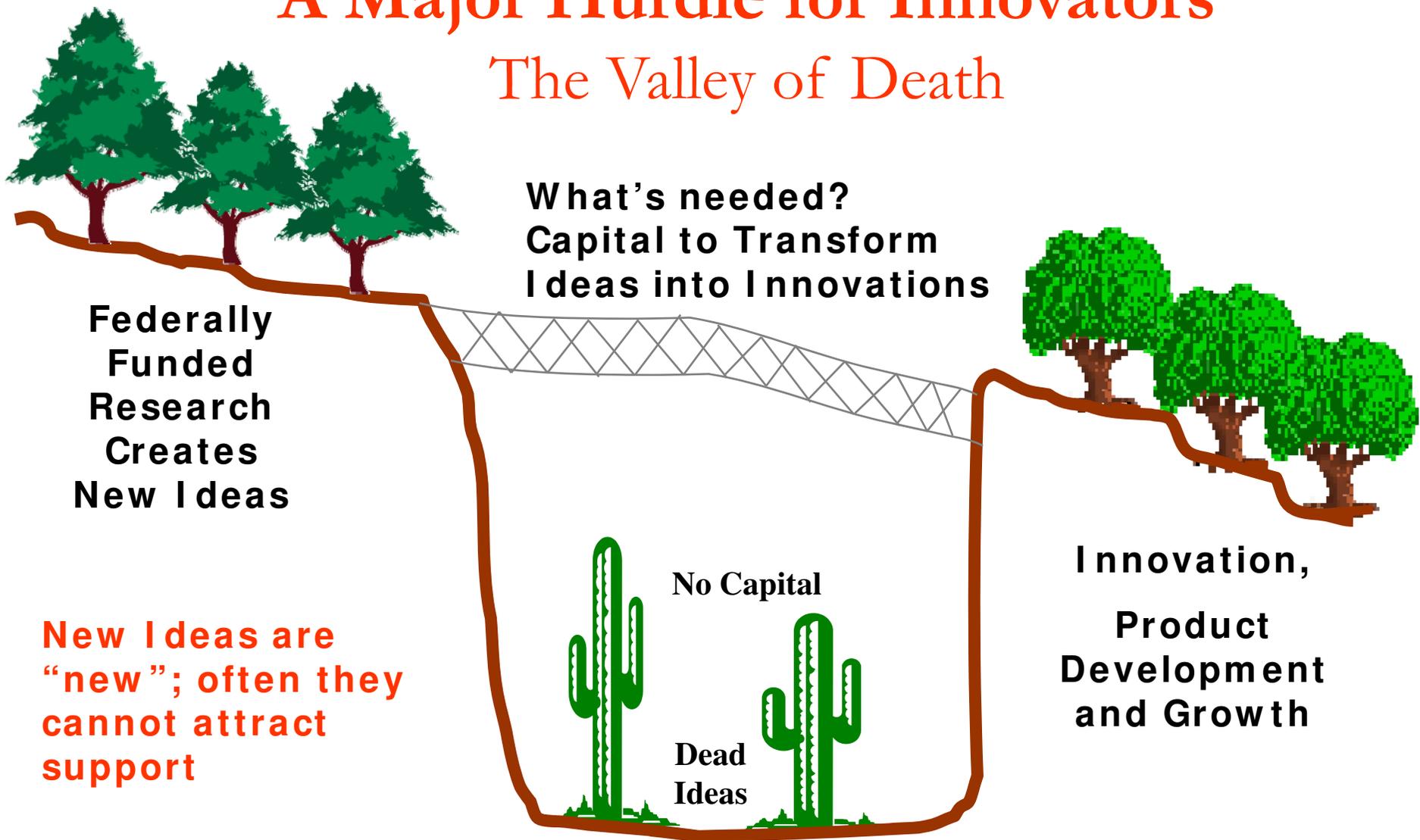
- Small Companies are Key Players in Bringing New Technologies to Market (Audretsch & Acs)
 - Large returns to national economic and strategic capabilities can result from relatively small national investments
 - Innovations—with the right policy support—can become new products and services for the market and provide support for government missions
- But small companies don't have the capital needed to transform ideas into innovations

The Myth of Perfect Markets

- Strong U.S. Myth: “If it is a good idea, the market will fund it.”
- Reality:
 - Potential Investors have less than perfect knowledge, especially about innovative new ideas
 - “Asymmetric Information” leads to suboptimal investments
 - George Akerlof, Michael Spence and Joseph Stiglitz received the Nobel Prize in 2001, “for their analyses of markets with asymmetric information“

A Major Hurdle for Innovators

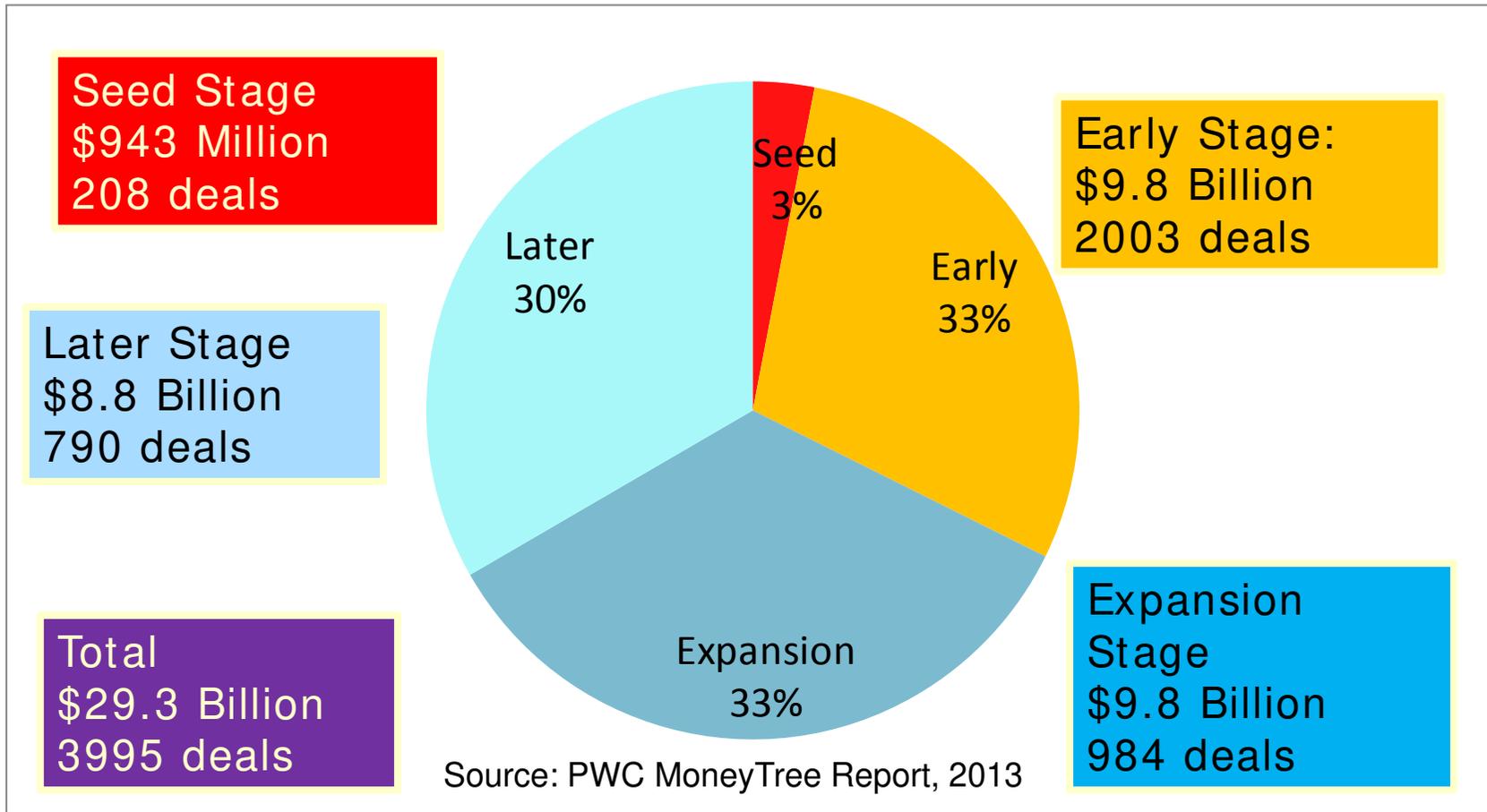
The Valley of Death



The Myth of Perfect Venture Capital Markets

- Myth: “U.S. VC Markets are broad & deep, and are the major source of funding for innovative start-ups”
- **Reality: Venture Capitalists have**
 - Limited information on new firms
 - Prone to herding tendencies
 - VC investments have moved towards later, less risky stages of technology development
 - Limited (and declining) investments in the seed stage of investment

VC Investments in 2013

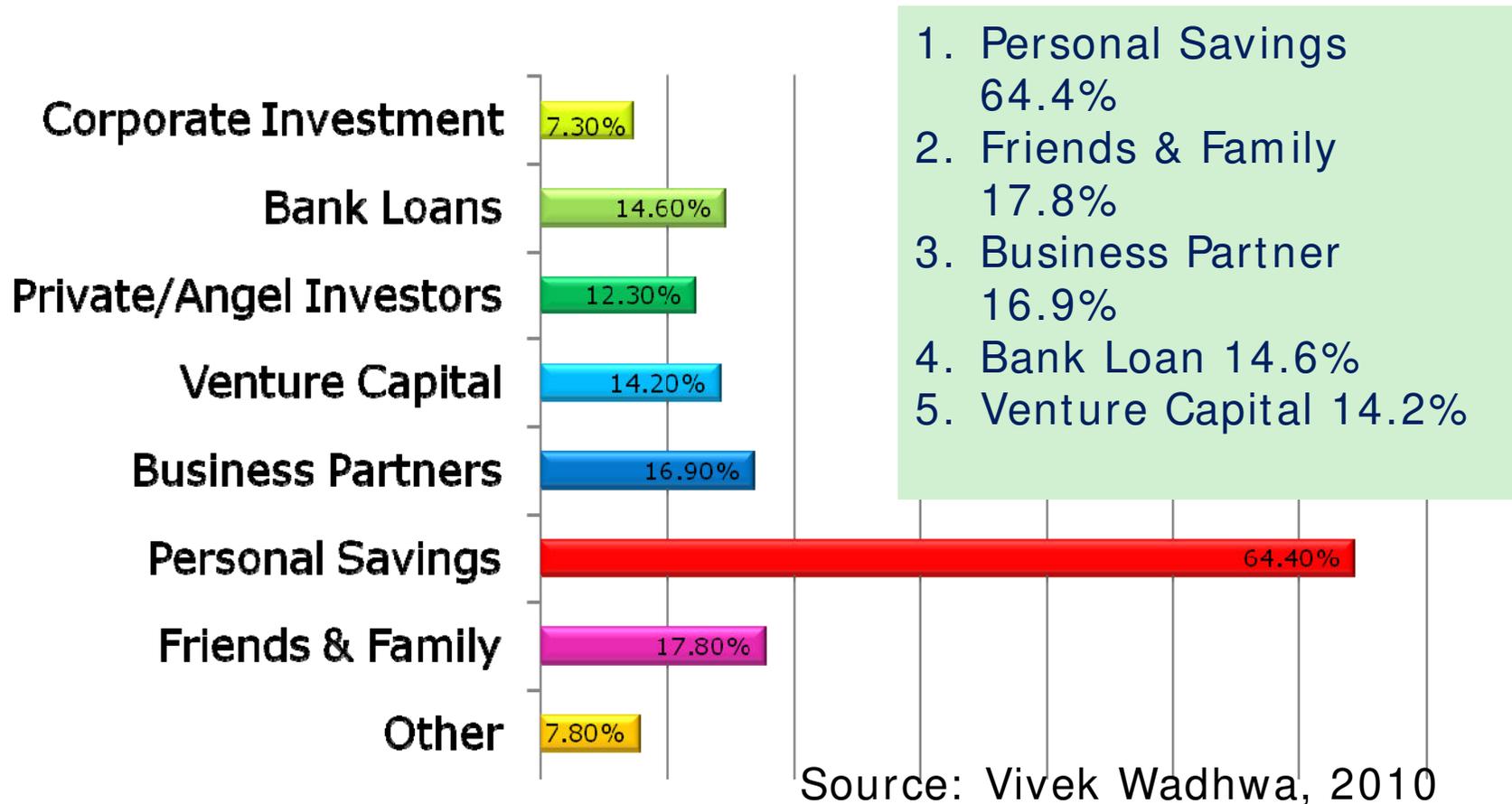


The Venture Capital Oversell

- Investment in Public VC Funds involves Substantial Risk of Loss
- High skew in returns on VC Investments
 - Many investments fail completely
 - Most just give back the invested funds
 - A handful give a return greater than 1,000 percent!
 - Source: John H. Cochrane, “The Risk and Return of Venture Capital,” *Journal of Financial Economics*, 75(1):3-52, 2005.
- Most Important: Many companies live and grow without Venture Funding

Sources of Funding for U.S. Startups

Personal Funds are the Norm



How Do Innovative Small Firms Cross the Valley of Death?

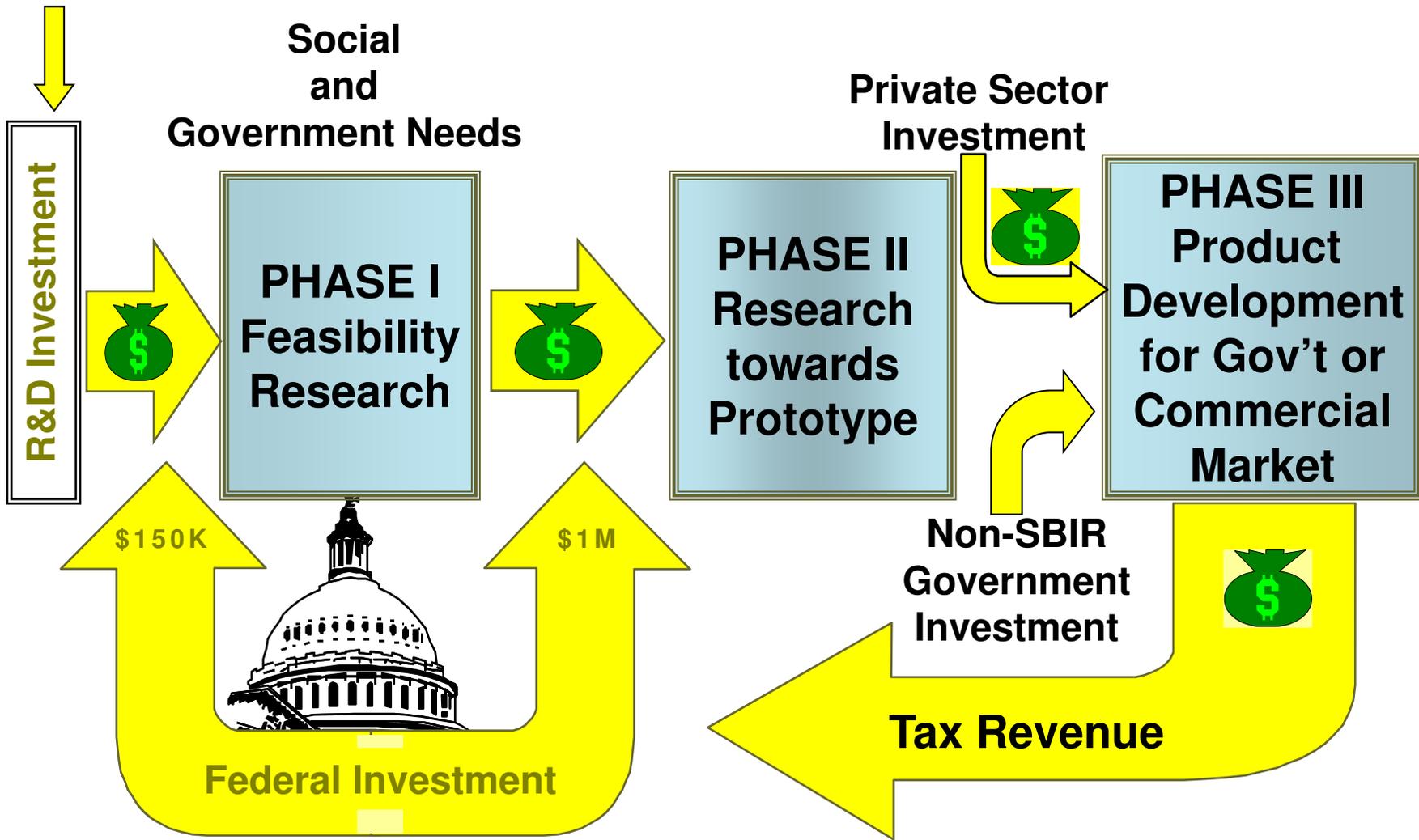
One Proven Path is the Small Business
Innovation Research (SBIR) Program

What is SBIR?

- **Competitive:** Competitively awarded support for technological innovation
- **Phased:** Uses up to **three-phased awards** from federal research funds to address government mission needs.
- **Early Stage:** “SBIR provides funding for some of the best early-stage innovation ideas -- ideas that, however promising, are still too high risk for private investors, including venture capital firms.” Roland Tibbetts

The SBIR “Open Innovation” Model

\$141 billion



SBIR's Best Practice Features

- **Focus on Valley of Death:** Funds Proof of Concept and Prototype: “The first money is the hardest”
- **Decentralized & Flexible:** Each Government Department or Agency uses its funds to support research by small companies to meet its unique mission needs
- **Competitive:** 20% success rate
- **No Program Capture:** One-third of participants are new to the program every year

More Best Practice Features

- **Stable Program and Budget:** Long reauthorizations give stability as does sizeable 2.7% allocation of Agency R&D budgets for small business awards & contracts
- **Large Scale:** Largest U.S. Innovation Partnership Program: Currently a ~ \$2.5 billion per year
- **Portfolio Effect:** Substantial sums invested in new companies over a long period increase success



*After nearly 20 years of operation,
The Congress asked the National Academies:*

How well is SBIR Working Overall?

Comprehensive NRC Study of SBIR

Unprecedented Large Scale Original Field Research

- Methodology Report: Peer reviewed study on how to do the study
- Surveys: Over 7000 Projects Surveyed
 - Phase I Award Survey targeted 3000 firms
 - Survey on Phase II Awards (1992-2002) involved over 4000 firms
 - Program Manager Survey
 - Technical Manager Surveys (TPOCs and COTRs)
- Case Studies
 - Approximately 100 case studies conducted
 - Case Study selection reflects program diversity
- Surveys & Case Studies were developed in consultation with Agencies & SBIR users

Following a Comprehensive Assessment,
The National Academies found that :

“The SBIR program is
sound in concept and
effective in practice.”

Academies Research Reveals SBIR Impact on Firm Formation and Growth

- **Company Creation:** 20% of responding companies said they were founded as a result of a prospective SBIR award (25% at Defense)
- **Research Initiation:** SBIR awards played a key role in the decision to pursue a research project (70% claimed as cause)
- **Company Growth:** Significant part of firm growth resulted from award
- **Partnering:** SBIR funding is often used to bring in Academic Consultants & to partner with other firms

Why do Entrepreneurs like SBIR?

- Additional Research Funds
- No dilution of ownership
- No repayment required
- Grant recipients retain rights to IP developed using SBIR funds
- No Royalties owed to Government
- Certification of Quality attracts private investments

Why do Universities Like SBIR?

- SBIR links the University with Industry and helps Spin-outs
 - **Lowers Risk:** Faculty do not have to give up University post to apply
 - **Lowers Overhead:** Don't need to have a company to apply
 - 15 to 20% success rates—comparable to other grants
- SBIR Innovation Awards Directly Cause Researchers to create New Firms
- New firms help grow the region and provide returns on R&D investments

Why do Government Agencies like SBIR?

- A low-cost technological probe
 - **Fast:** Enables government to explore more cheaply and quickly ideas that may hold promise
 - **Cost Effective:** Identifies dead-ends before substantial investments are made
- Enhances Competition
 - **Diversifies** the Government Supplier-base
 - **Brings in competition**, low-cost solutions, new approaches to address mission needs
 - **Sole source** procurement for R&D Contractors

SBIR Success takes Many Forms

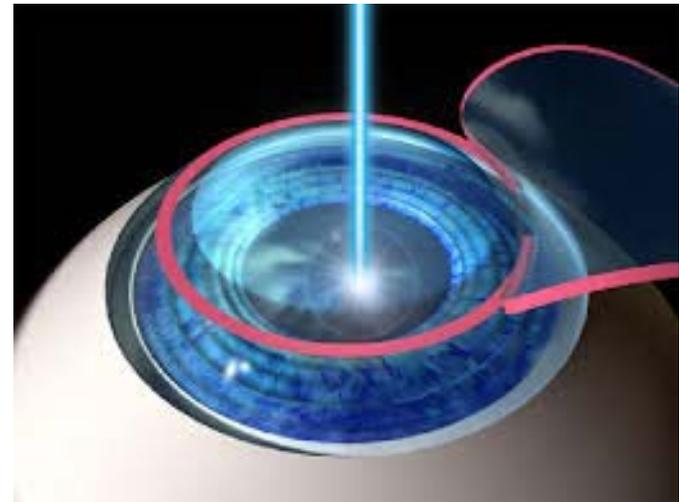
- **Employment Success**
 - SBIR helps new Start-ups grow, creating the high quality jobs of the future
- **Innovation Success**
 - New products, patents, licenses, and publications
- **Government Mission Success**
 - Acquisition and Procurement
 - NASA uses SBIR-funded Lithium-ion batteries to power the Mars Rover
 - DOD uses SBIR developed armor to shield against IEDs
- **NASDAQ Success**
 - SBIR investments contributed to the success of companies like Qualcomm, ATMI, Martek, Luna

SBIR: The Qualcomm Story

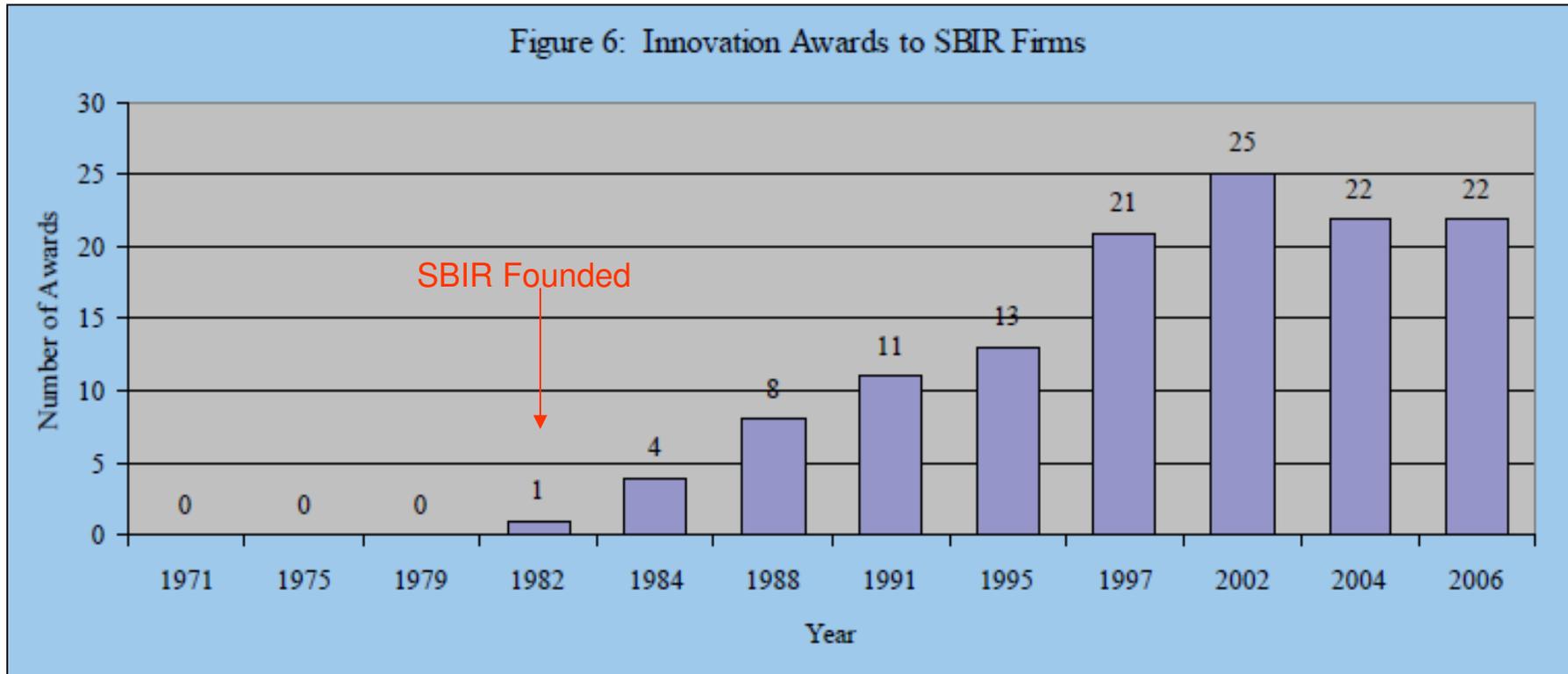
- SBIR program was an important source of start up funding for Qualcomm.
 - Qualcomm was awarded 10 SBIR awards (7 Phase I and 3 Phase II) between 1987 to 1990 from the Department of Defense for a total of \$1,317,360.
- “Getting the grants translated into *stamps of approval* that allowed Qualcomm to pursue other sources of private capital.”
 - Irwin Jacobs, Founder of Qualcomm—Congressional Testimony February 2011
- Today, Qualcomm employs over 17,500 people and has a market value of \$120 Billion.

SBIR: The Lasik Story

- Technology originally developed through several NASA and DOD SBIR contracts for laser guided docking of space vehicles to satellites.
- This technology is today used to track eye movements to accurately guide laser pulses to reshape the cornea.
- Inducted in 2013 to the SBIR Hall of Fame



“The SBIR program has become a key force in the innovation economy of the United States”



- SBIR now accounts for nearly a quarter of all ‘U.S. R&D 100’ winners, an annual list of top 100 innovations
 - Source: Block and Keller, “Where do innovations come from?” ITIF July, 2008

SBIR is Increasingly being Adopted Around the World

--Recognized as Best Practice--

- **Finland** has adopted a 3-Phase SBIR type Program
- **Sweden** has created a small but successful SBIR type program
- **Russia** has adopted an SBIR program
- **UK** SIRI program is similar in concept; now being upgraded
- **The Netherlands** government adopted SBIR, following a pilot program
- **Japan, Korea, & Taiwan** have adopted the SBIR concept
- **India** has launched an SBIR Initiative for the biotechnology sector
- **Singapore** implemented a similar program
- **The Czech Republic** has a pilot SBIR program underway
- **The EASME** has adopted the SBIR model
 - Most had consultations with us.

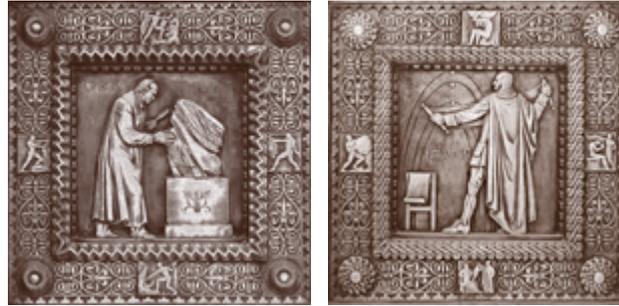
Can Australia Use an SBIR Program?

- If funding is easy and Entrepreneurs can easily access government markets there is no need...
- If not, then SBIR offers away to fund new ideas to meet societal challenges from health to energy to security with new ideas generated by Australian researchers and entrepreneurs
- SBIR has a key advantage—it works!

Learning Good Practice from Others is key

- “It is not the strongest of the species that survive, nor the most intelligent, but the ones most responsive to change” -
-- Charles Darwin

Thank You

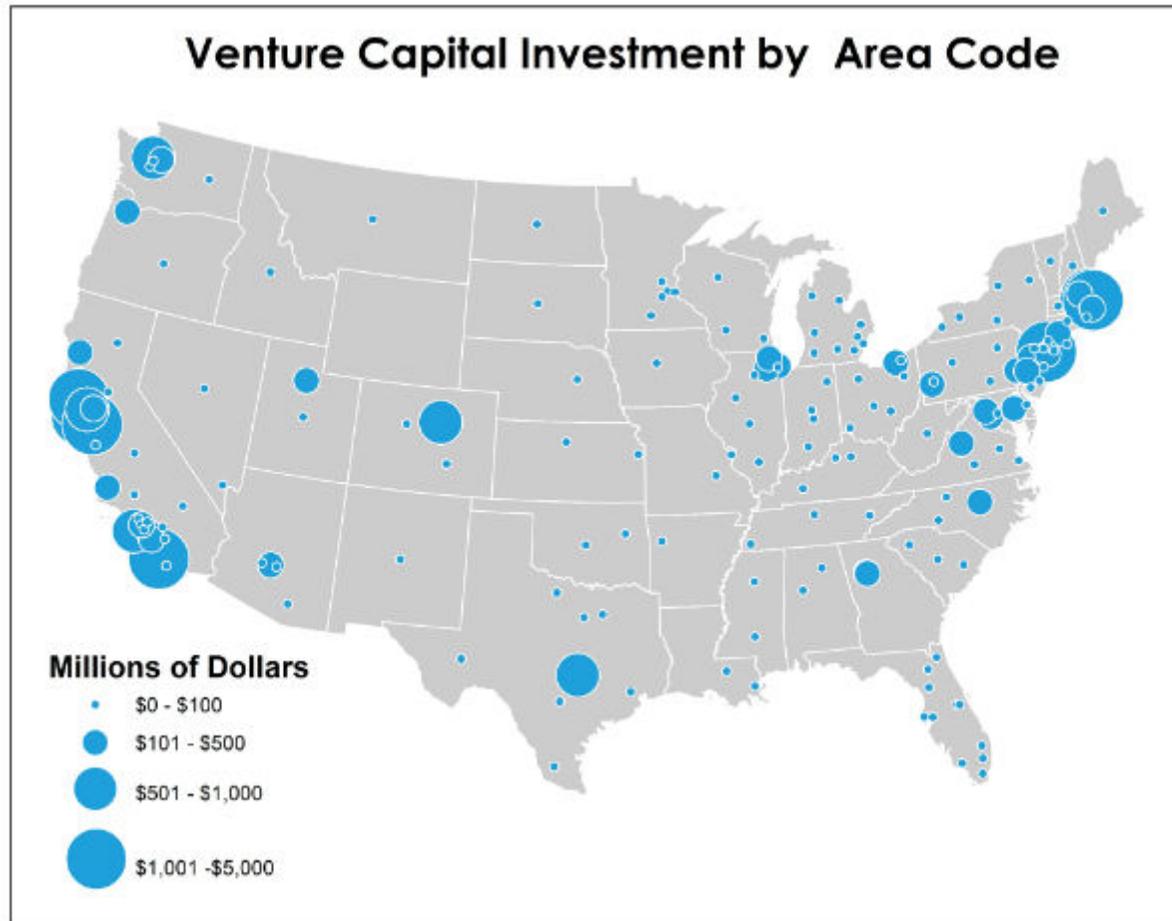


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The New NSF Innovation-Corps Training for Entrepreneurship

- The I-Corps program provides entrepreneurship training:
 - It pairs federally funded scientists and engineers with business mentors, pushing them to discover a demand-driven path from the lab to the market
 - Heavy interaction with potential buyers before finalizing the product
 - An NSF initiative now adopted by Energy (ARPA-E), NIH, and CDC

VC investments are increasingly concentrated



Source:
Richard Florida,
July 2013

There's More to the Story

- Significant differences in operations across the eleven agencies with SBIR programs
 - The key programs are DoD, NIH, NASA, DoE, and NSF
 - Methods of operation vary, e.g. selection process
 - Phasing and award size are different
 - Nature of the awards (contracts vs. grants)
 - Procurement or no procurement
 - Follow-on awards
 - Role of phase 1 vs. phase 2
 - Role of multiple award winners
 - Certification effects, matching funds, contractual arrangements
- Best practice features of the various programs are worth knowing – 25 years of experience!

The U.S. Has a Strong Track Record in Entrepreneurship

But there are troubling trends

Declines in U.S. Entrepreneurship

- The WSJ reports that the share of people under age 30 who own private businesses has reached a 24 year low.*
 - This underscores both financial challenges and a lower tolerance for risk among young Americans.
- Investments in private companies are down as well.
 - 3.6% of households headed by adults under 30 own stakes in private companies vs. 10.6% in 1989 and 6.1% in 2010. * *

* WSJ, 1-2-15, “Endangered Species: Young U.S. Entrepreneurs”

* * WSJ, 1-27-15, “How Student Debt Harms the Economy”

Mortgaging the Future: Long Term Impact of Student Debt

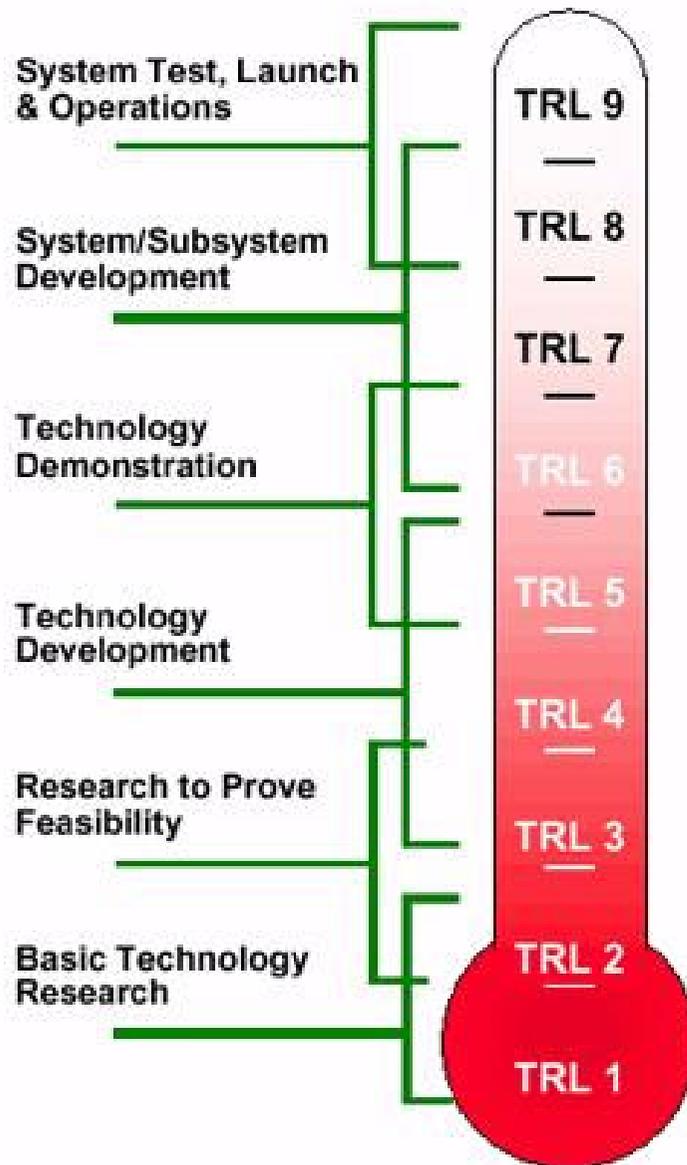
- High tuition is a major impediment to a quality education, and thus to the upward mobility of U.S. students
- But high tuition also means high debt
 - 70% of recent graduates (40 million people) are now borrowers
 - In 2014 the average borrower left with \$33,000 in debt
- Education debt now exceeds credit cards, auto loans, and refinancing at \$1.3 trillion in 2013.

Mortgaging the Future:

Long Term Impact of Student Debt

- The impact of the debt is far reaching, delaying marriage and child bearing
 - About a third of the borrowers report postponing purchases of homes and cars
- Student debt also seems to be a contributor to the drop in entrepreneurial activity by younger people – Mitch Daniels* notes that:
 - 26% of those that left school debt free have started a business
 - Of those with debt of \$40,000 or more, only 16% have started a business

* former Head of OMB (Office of Management and Budget, Ex-governor of Indiana, and current President of Purdue University)



Technology Readiness Levels

The Innovation Challenge

Innovation is the currency of global competition
and national strength in the 21st Century
It is also a key driver of Human Welfare

SBIR: Congressional Objectives

- Stimulate technological innovation
- Meet Federal research and development needs.
- Increase private-sector commercialization of innovations derived from Federal R&D funding.
- Support participation in innovation and entrepreneurship by socially and economically disadvantaged persons.

The Importance of the Innovation Ecosystem

- Number and Sectoral Focus of Firms
- Specialized Infrastructure such as Parks, Incubators, and Accelerators
- Professional Services by local firms in areas such as Accounting, Tax, Intellectual Property, Marketing, Product Development and Effective TTO's
- Sources of Risk Capital: Public Grants, Local Angels, and even Venture Capital!