

# The essential formula

$$Y = A f(K, L, E, \dots)$$

- Suggests two avenues to growth:
  - More inputs (K, L, etc.).
  - Getting more output from existing inputs (A).



# Economists have long understood link between innovation and growth

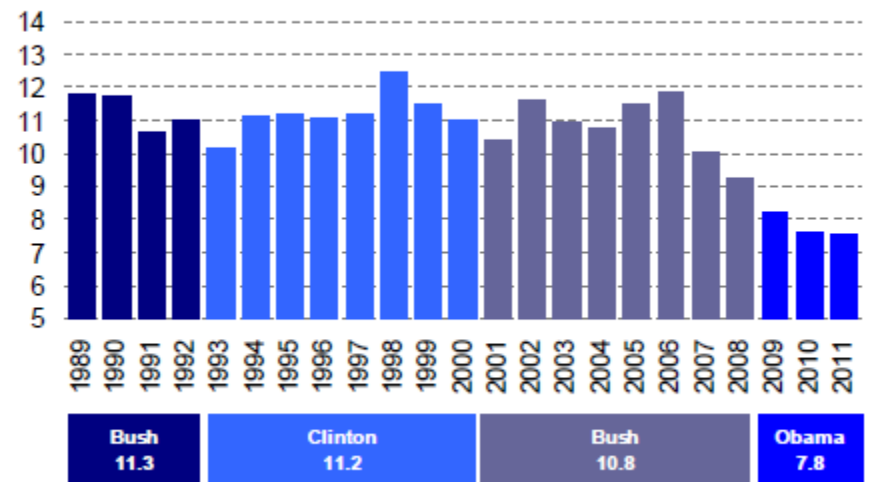
- Productivity growth is likely to be only long-term avenue to growth.
- Pioneering work of Abramowitz and Solow in 1950s:
  - At least 85% of growth can only be explained through innovation.

# Entrepreneurship is an important part of the answer

- Haltiwanger and co-authors look at job creation in U.S.:
  - Once carefully controlled, small firms have little advantage in new job creation.
  - But huge advantage for young firms:
    - Essentially all growth from firms <3 years old.
  - Though declining in recent years..
- Criscuolo et al. found similar impact of young firms.
  - Young firms (5 yrs. or younger) created more jobs.
    - Through entry of start-ups and growth of firms < 3 years old.

## Startup Jobs Rate

U.S. jobs in new U.S. companies per capita (1000)



Source: Tim Kane, based on Business Dynamics Statistics, U.S. Census Dept.

Source: Haltiwanger, et al. [2010]; Criscuolo et al. [2014].

# Entrepreneurship is an important part of the answer (2)

- Acs and Audretsch [1988] look at 100s of key innovations in second half of 20<sup>th</sup> century:
  - Small firms contribute disproportionate share of major innovations.
  - Contribution was greatest in immature industries which were relatively unconcentrated.
  - Consistent with models of technological competition (Reinganum [1989]).

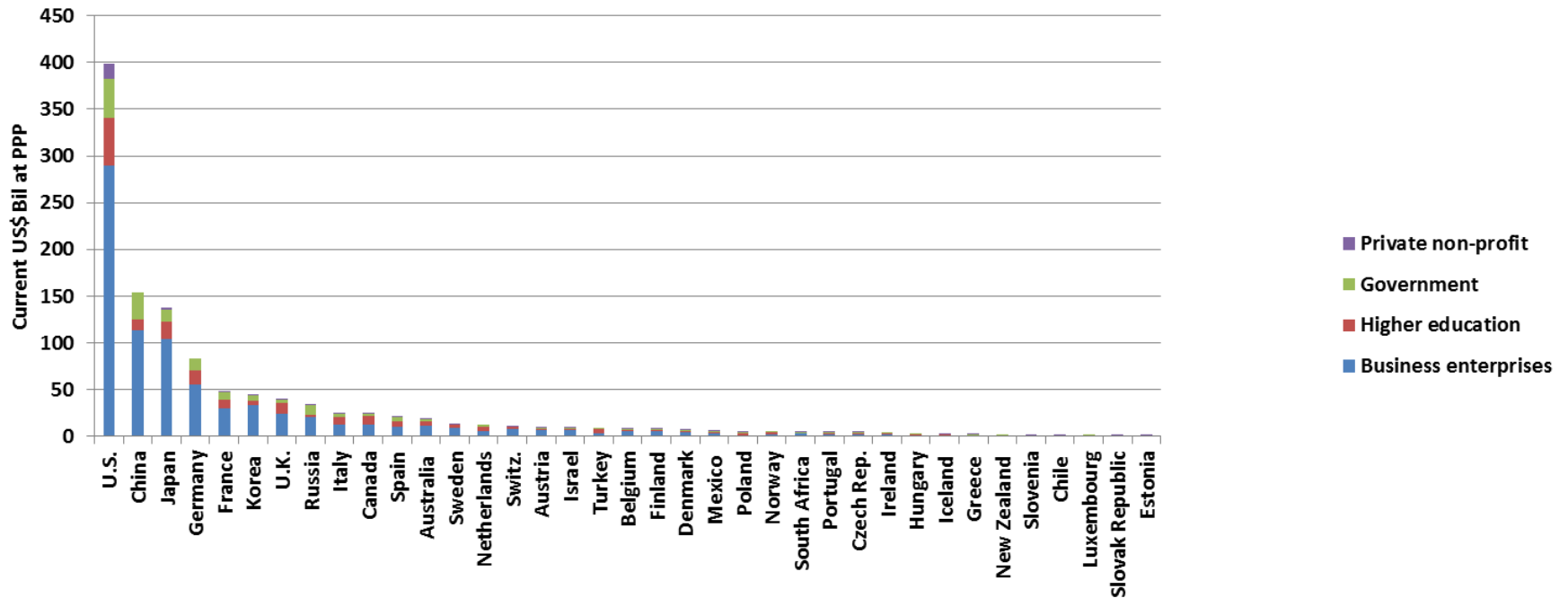
# Hence, desperate need for “green shoots”



# Two primary avenues to innovation

- Corporate R&D lab:
  - Dominant since early twentieth century.
- Venture-backed entrepreneurial venture:
  - Emergence since World War II.
- Each has real strengths... but also real strains.

# R&D by type and nation



Source: OECD [2012]



# The theoretical rationale

- Creation of a portfolio of projects.
- Synergies between different activities.
  - Strong cooperation between researchers encouraged with flat compensation schemes.
- Ability to adopt a long-term perspective.

# But dark side...

- Motorola has long history of product innovation.
- In late 1980s, introduced reward scheme for researchers based on patent filings...
  - Financial rewards and colored badges.
- Results were 50+ filings on battery latches in late 1990s alone...
  - While missed smart phone transition.



# But substantial questions

- Are firms essentially abandoning pursuit of long-run opportunities?
- Can divisional labs avoid duplication and focus on routine research?
- To what extent can payments be linked to performance while retaining cooperation?



# Georges Doriot's insight

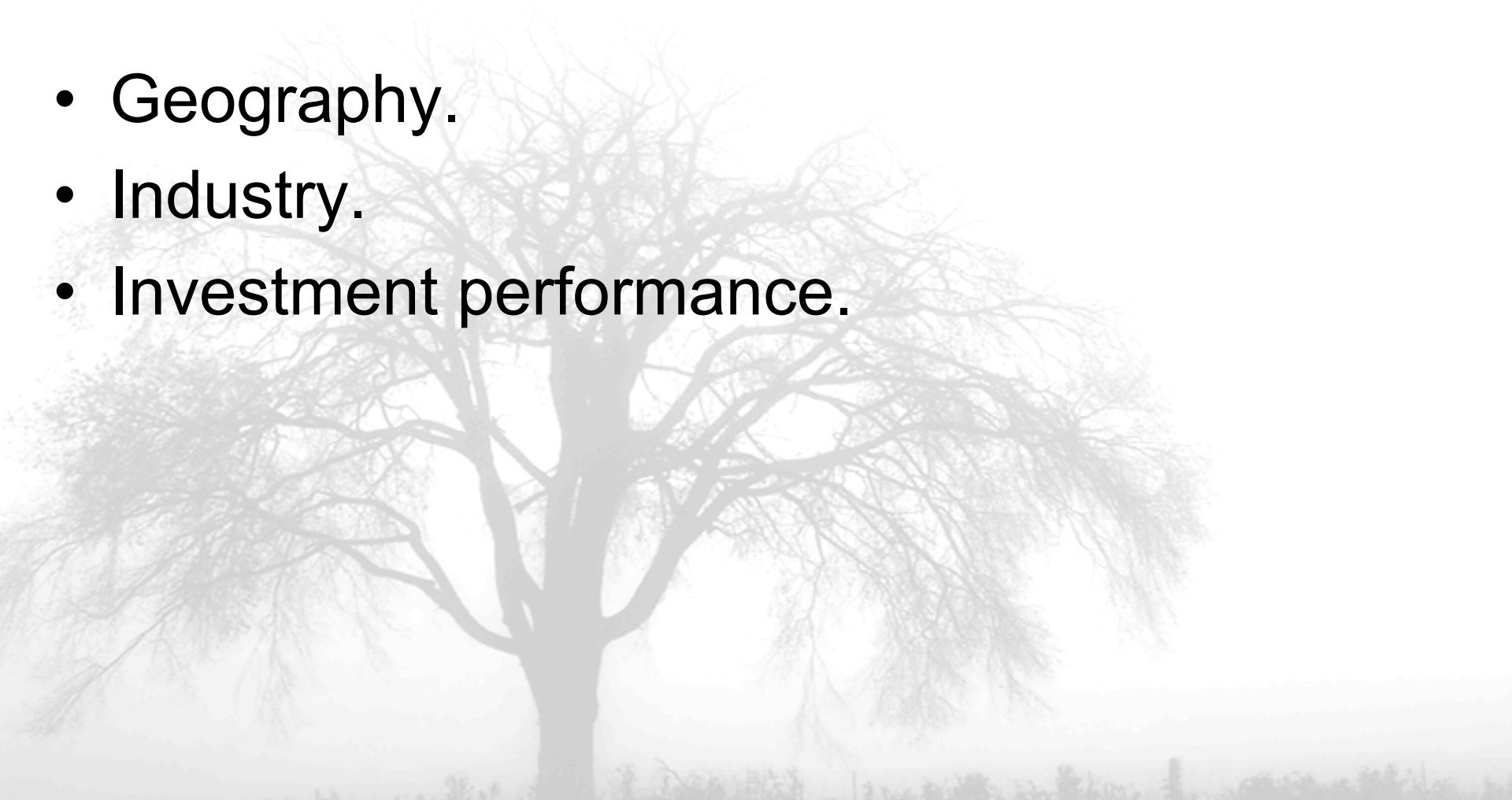
- Worries about dangers of post-War stagnation in U.S.
- Current system did not work well:
  - Limitations of banks, public markets.
- Need for new financial institution playing three roles:
  - Sorting.
  - Governing.
  - Certifying.

# And seems to have worked...

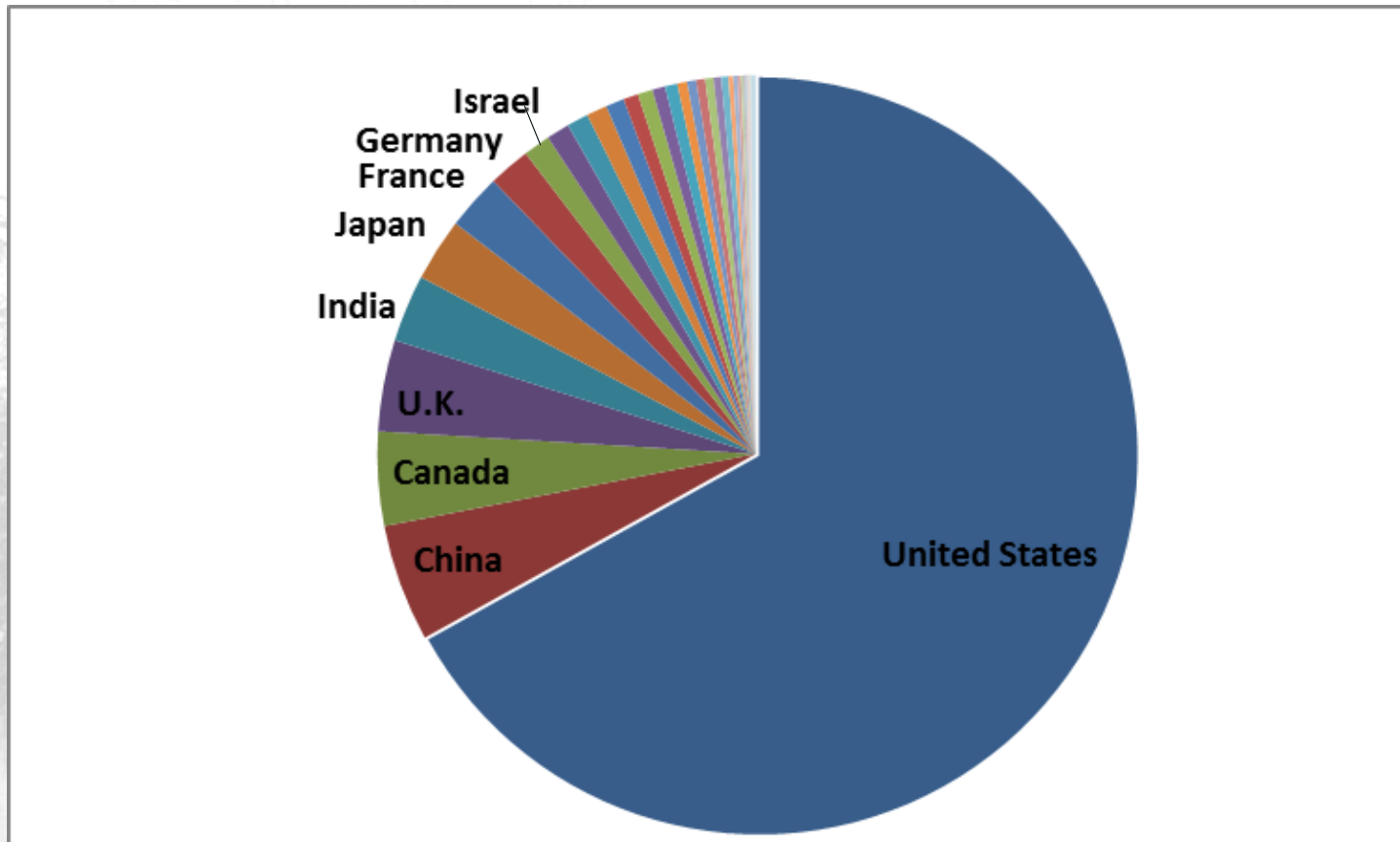
- Kortum and Lerner [2000] look at relationship between venture capital and innovation:
  - Look at evidence across 20 industries, using patenting and other proxies for innovation:
    - Also control for corporate R&D, *etc.*
  - Venture capital appears ~3 to 4 times more powerful than corporate R&D.
  - Even after control for causality concerns.
  - From late 70s to mid-90s, VC was only 3% of corporate R&D, but responsible for ~10%-12% of privately funded innovations.

# But severe limitations...

- Geography.
- Industry.
- Investment performance.



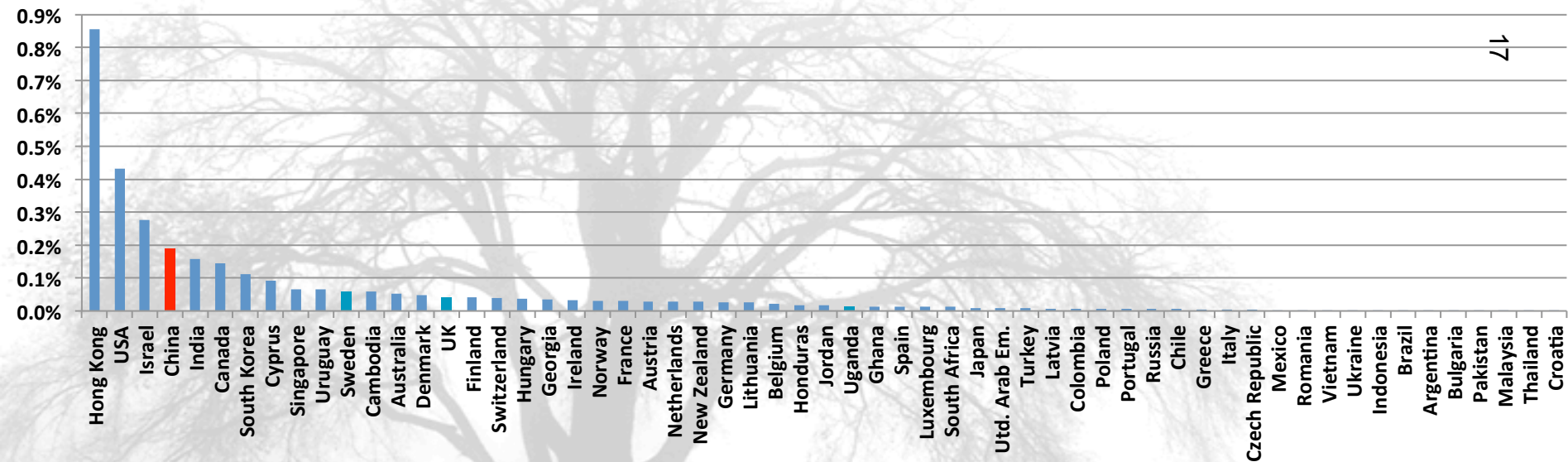
# Venture investments, 2013



Source: ThomsonReuters VentureXpert. Data as of 12/31/13.



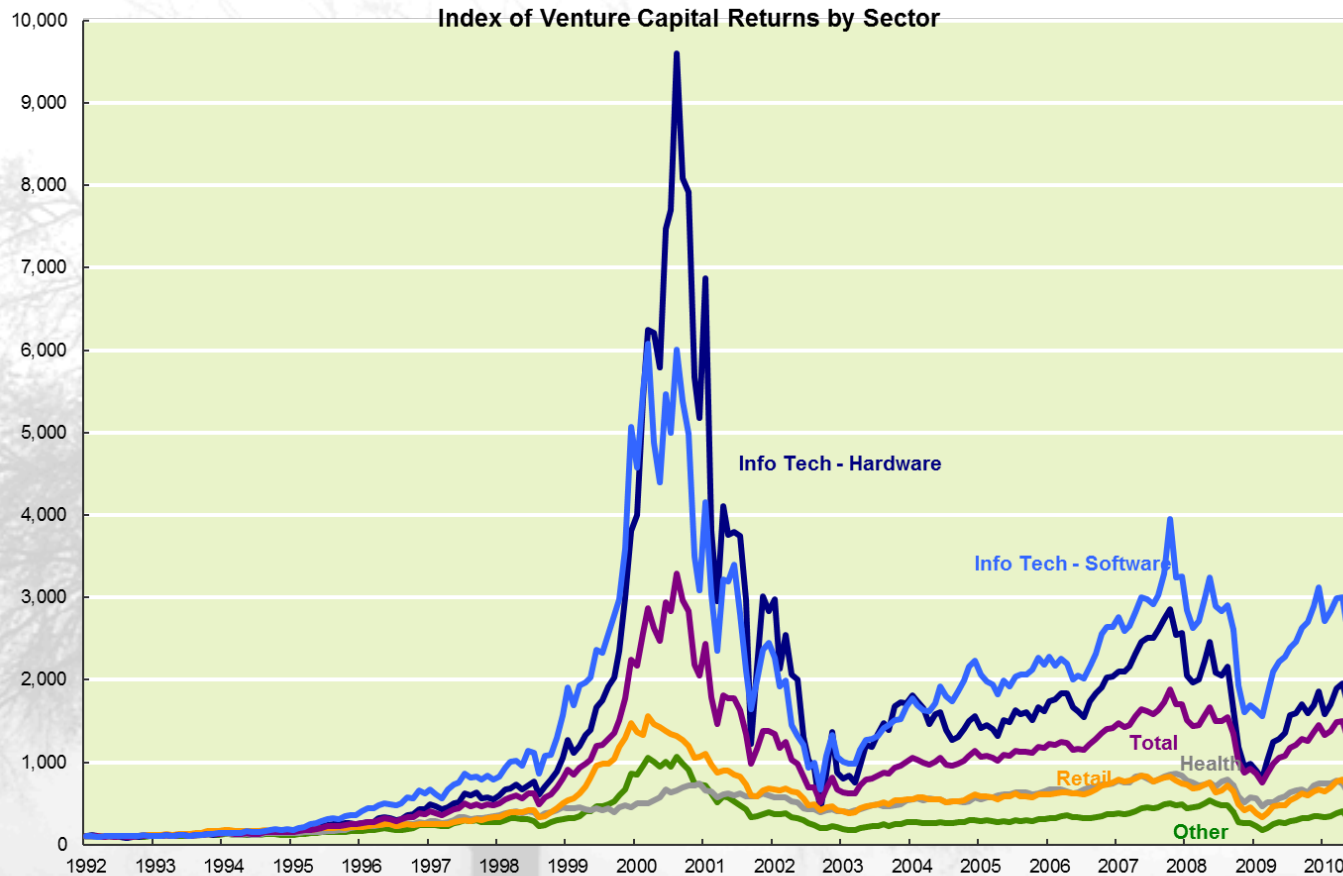
# Venture investments as a share of GDP, 2012



Sources: EVCA, LAVCA, VentureXpert

Source: Various national and regional venture capital associations [2012]

# And differences by sector



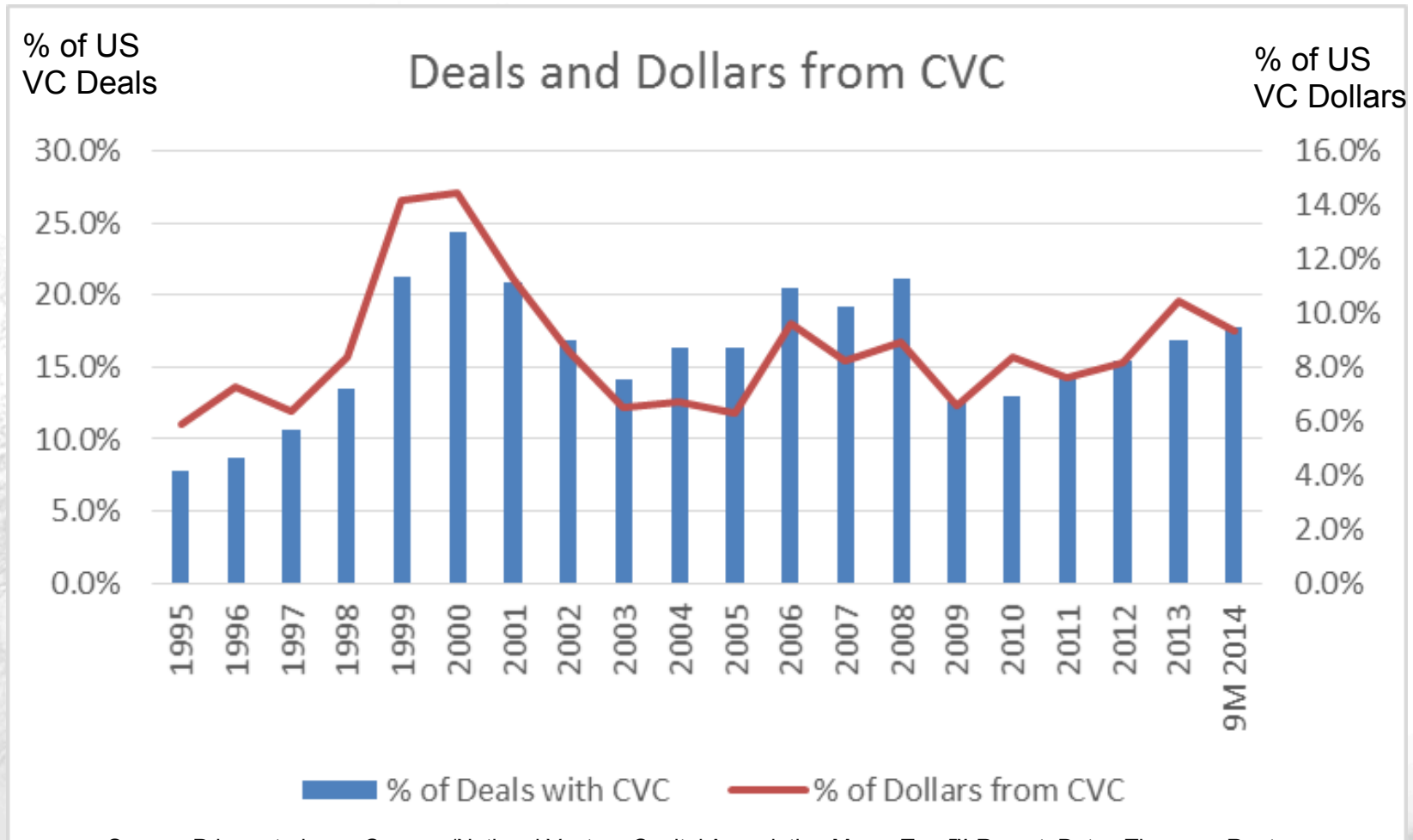
All sectors normalized so January 1, 1992=100.

Source: Sand Hill Econometrics [2011]

# Is there a middle ground?

- Combining corporate R&D with venture model.
- Potential benefits:
  - Speed of response.
  - Leveraging outside funds.
  - Ability to abandon projects.
    - Active alliance strategy is another hybrid model.

# Return of corporate venturing

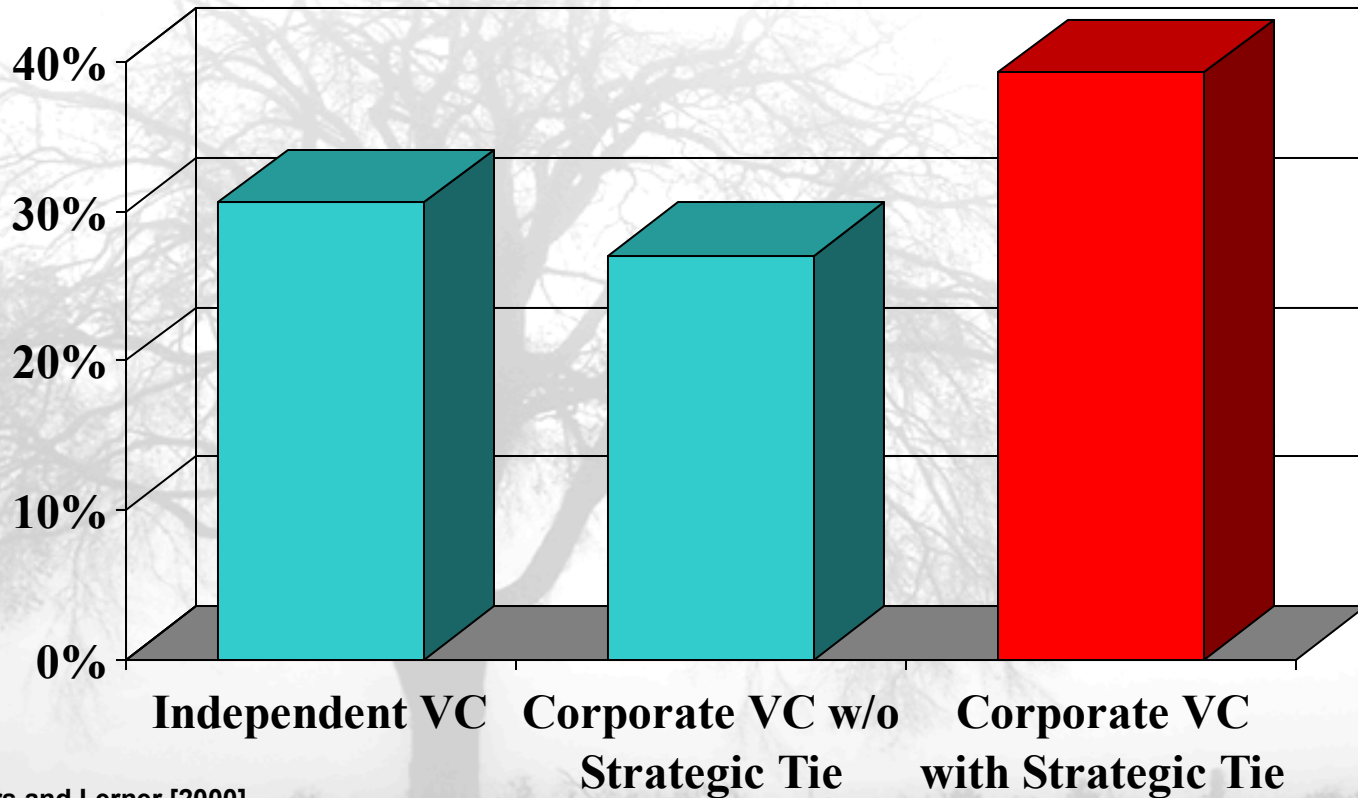


Source: PricewaterhouseCoopers/National Venture Capital Association MoneyTree™ Report, Data: Thomson Reuters

# Natural skepticism about hybrids...



# But real success: Probability of going public



Source: Gompers and Lerner [2000]

# Other evidence

- Corporate vs. independent venture backed firms:
  - Corporates have 47% more patents.
    - No difference in citation rates.
  - Corporate-backed IPOs do better in five years after.
    - Chemmanur, et al. [2011].

# Why a government role?

- Increasing returns to scale
  - Much easier to do 100<sup>th</sup> deal than the first:
    - Knowledge and expectations of entrepreneurs.
    - Familiarity of intermediaries.
    - Sharing of information among peers.
    - Comfort level of institutional investors.
- Economists term these “externalities.”
- In these cases, government can frequently play a catalytic role.



# Illustrations from history

- In the U.S.:
  - Critical role of SBIC program.
  - Established in 1958.
  - Many early VC firms started as SBIC awardees, then opted out.
  - Building critical “infrastructure”: Lawyers, data providers, *etc.*
- Similar insights from Israel, Singapore, *etc.*
  - Suggests that some of funding should be directed to growing industries!

# But two fundamental problems

- Incompetence:
  - Often, relatively little familiarity with worlds of entrepreneurship and venture capital.
  - Many well-intentioned efforts are poorly executed.
- “Capture”:
  - Public efforts can be directed to well-connected parties, who seek to benefit themselves.



# The labor fund fund initiative

- Canadian government introduces tax credits in effort to boost industry.
  - Differentiated in terms of capital sources, investment managers, and practices.
- Consequences:
  - Surge in fundraising by inexperienced funds:
    - 10X increase in funds.
    - Intensifies overheating of the market.
  - Among established funds, many exit to U.S. investing.

# The stimulus cleantech initiative

- U.S. government sought to encourage cleantech firms as part of 2009 Recovery Act.
- Large grants by DOE to a few firms, totaling at least several billion:
  - Equal to or exceeding venture activity in segment.
- Non-transparent process for awards:
  - Many firms and VCs hired lobbyists to get access.
  - Many awardees or venture backers of firms proved to be donors.
- Many venture backers held off investing until it was clear who would get awards.

# Three key principles

- Making sure “table is set.”
- Catalyzing outside funding.
- Long-run perspective.

# 1. “Table setting”

- Ensuring *high potential* entrepreneurship is attractive:
  - Tax regime:
    - Studies suggest critical role of capital gains vs. income effective tax rate differential.
  - Easing formal and informal sanctions on involvement in failed ventures.
    - Singapore’s Phoenix award.
  - Easing barriers to technology transfer.
  - Entrepreneurship education for students and professionals alike.

# Legal and financial environment

- Large literature demonstrates correlation between financial development and legal quality indices:
  - Legal enforcement.
  - Minority shareholder protection.
  - ***Intellectual property a particularly crucial area in U.S. context.***
- Stock market development
  - Availability of 2<sup>nd</sup> tier markets.
  - Listing and disclosure requirements.



# Taxation

- Capital gains taxation
  - Supply-side effect limited when LPs tax-exempt
  - Demand-side effect can be substantial
    - US rate reduction in 80s & 90s increased VC (Gompers and Lerner 1998)
    - Differential between income and capital gain tax matters in European data (Da Rin et al. 2006)

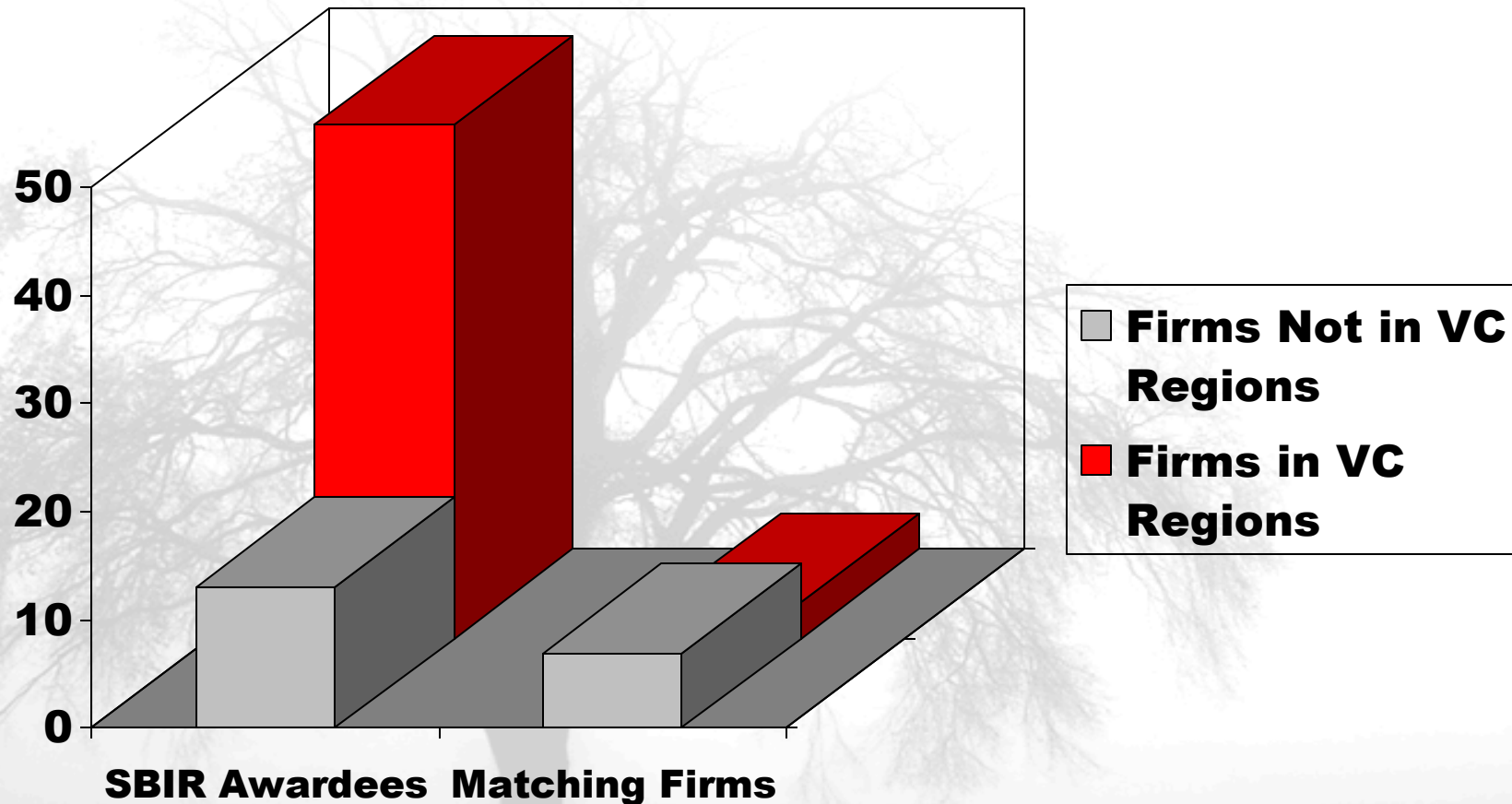
# Labor mobility

- Affects decision to start-up and ability to hire and fire employees:
  - Countries with high employment protection have less VC
  - Countries that replace protection with insurance have more VC
    - Bozkaya & Kerr (2011)
- Examples within US:
  - States that have loose enforcement of non-competes
    - more start-ups
    - attract more star innovators
      - Marx, Singh & Fleming (2011), Stuart & Sorenson (2003)
  - Positive impact of immigrant entrepreneurs.

## 2. Catalyzing private funding

- Government funds often fail to listen to market's dictates:
  - Temptation to jump into popular areas.
  - Universal temptation to “share the wealth”:
    - Spreading funds out.
- Facilitating private funding most appropriate way to ensure.

# Ill-considered pressures for geographic “fairness”



# Matching mechanisms key

- Matching funds...
  - Often with cap on government returns.
    - E.g., Israel Yozma, NZ Venture Investment Fund
- Loans and quasi-loans:
  - E.g., U.S. SBIC program.
- Loss guarantees:
  - E.g., Israel INBAL program.
- Second and third approaches raise incentive concerns.
- Last may not attract best groups.

# The importance of pension funds

- Long-term source of capital: typically across decades.
- Some corporate (e.g., IBM, Shell) and public pensions (e.g., ATP, Oregon) alike have emerged as savvy investors.
- United States private equity history suggests critical importance.

# The importance of cross-national investment

- Venture capital is fundamentally a global industry.
- International investments transfer not just capital but knowledge.
- Success of Israeli, Singaporean, etc. markets seems driven by role of international groups:
  - Variety of steps can encourage.

# 3. The need for a long-run perspective

- Building an effective entrepreneurial cluster takes many years...
  - Far longer than a typical election cycle.
- Many efforts abandoned prematurely.
- Need to see as part of “legacy building.”



# Key Challenges to CVC

Research has identified six challenges for CVC:

1. Alignment between CVC effort and corporate objectives.
2. Speed of approval process.
3. Creating incentives for CVC staff.
4. Creating an experimental, failure-tolerant mindset.
5. Developing corporate commitment to projects.
6. Systematic knowledge transfer.

# Alignment Between CVC Effort and Corporate Objectives

- Success of the CVC effort is linked to strategic overlap between the corporate parent and the portfolio firm.
- Portfolio companies whose goals are closely linked to the corporate parent's are more likely to IPO, have more patents post-IPO, and a higher stock price.

## Status of Firms in Spring of 1998 (Investments from 1983-1994)

	Corporate VC	Corporate VC and Strategic Fit	IVC Only
IPOs Completed	35.1%	39.3%	30.6%

## Post-IPO innovation (# Patents 4 Years after IPO), 1980-2004

	IPO firms backed by CVCs with strategic fit	IPO firms backed by CVCs without strategic fit
% More Patents Compared to IVC-Backed Firms	52.0	38.6

Source: 2012, Table 10.; Paul A. Gompers and Josh Lerner "The Determinants of Corporate Venture Capital Success," NBER Working Paper 6725 (1998), Table 3, Panel A

# Speed of Approval Process

- Critical that approval process is relatively streamlined and efficient.
  - Many CVCs invest through syndicates; must be able to match IVC pace.
- BUT:
- Many CVC projects must serve multiple departments (finance, engineering, market research).
  - Hence, require multiple and time-consuming approvals.
- A complex and multi-faceted approval process often means investments respond to market hype that already exists.
  - Prices are highest and probable returns are low.
- » Confuses program staff, potential portfolio companies, and potential partners.

Source: Josh Lerner, “Your Next Breakthrough Initiative: The Corporate Venture Capital Fund,” Harvard Business Review, 2014..

# Creating Incentives for CVC Staff

- Corporate VC division is usually constrained by company pay bands.
  - Flat rate salaries of CVC versus remuneration systems (“2 and 20”) of IVC.
    - Example: Many investors at Intel Capital left in 2000 when investments produced \$2.3 billion in gains in one quarter, and their compensation--salary and stock options-- did not reflect VC industry norms.
    - Example: Head of German software-maker SAP AG’s VC unit saw a 6,000% return on its first \$25 million fund but earned a flat salary, just as SAP’s 22,000 other employees did.
- Incentive Problem of Pushing *Strategic* Mission of CVCs:
  - Leaders of corporate venturing units receive on average \$304,250 + 164,865 cash bonus per year (based on 2013 survey).
  - Top-ranking financial venture capitalist at a firm managing <\$1 bn received on average \$541,329 + \$868,092 bonus in the 2011-12 period (based on 2012 survey).

In addition:

- IVC receive on average of about 20% of profits (carried interest) while only 5% of CVCs include carried interest.

Source: Ernst & Young, “Global Corporate Venture Capital Survey, 2008, p. 8.; Josh Lerner and Ann Leamon, “Microsoft’s IP Ventures,” Case 9810096 (Boston: Harvard Business School, 2010), p. 3.; Gary Dushnitsky and Zur Shapira, “Entrepreneurial Finance Meets Organizational Reality,” *Strategic Management Journal* 31, 2010, p. 994, 1002, 1005, 1006.; J Therlander Consulting, <http://www.globalcorporateventuring.com/article.php/6966/spotlight-on-compensation>.

# Creating Incentives for CVC Staff (2)

- Compensation disparity between CVC and IVC partners results in:
  - Loss of talent and motivation on CVC teams.
    - Talented CVC investors depart for IVC opportunities.
  - Less risky investments (in terms of syndicate size and funding stage).
    - Lower potential returns (financial or strategic) to the effort.
- CVCs that do not award performance pay tend to exhibit lower levels of success.
  - The CVC–IVC performance differential in exit rates doubles to 20% when CVCs are awarded with high-powered performance pay.
    - Yet difficult to introduce to the corporation.

Source: Ernst & Young, “Global Corporate Venture Capital Survey, 2008, p. 8.; Gary Dushnitsky and Zur Shapira, “Entrepreneurial Finance Meets Organizational Reality,” *Strategic Management Journal* 31, 2010, p. 994, 1002, 1005, 1006.

# Creating an Experimental, Failure-Tolerant Mindset

- Without strong financial incentives, CVC staff may not choose sufficiently risky investments.
  - 33% of IVC investments lose all capital.
  - Also may not terminate underperforming portfolio companies.
    - “Never terminating a CVC investment” does not imply success!
- To reduce risk aversion, create an incentive package linked to results.
  - Empirical Evidence:
    - Increased incentives → more direct involvement in portfolio company (smaller syndicates) and better performance (relative to IVCs).
- **Also, increase autonomy**
  - Emulate independent venture partnerships.
    - Restrict oversight board from micro managing day-to-day operations.
    - Mandate that board commit to rapid response (no longer than 7 days).

Source: Gary Dushnitsky and Zur Shapira, “Entrepreneurial Finance Meets Organizational Reality,” *Strategic Management Journal* 31, 2010, p. 1002, 1005; Paul A. Gompers and Josh Lerner, *The Money of Invention*, Harvard Business School Press, 2001, p. 164.

# Development of Corporate Commitment to Projects

- Historically, CVC seen as fickle.
  - Jumped in at market peaks, then when market sank, abandoned the efforts.
  - Or would abandon efforts when executives shifted (i.e. regarded as “pet projects” of predecessors).
    - Often IVCs and companies were reluctant to work with them.
      - Could you depend on their long-term support?

Source: Paul A. Gompers and Josh Lerner “The Determinants of Corporate Venture Capital Success,” 1998, p. 9.; Josh Lerner, “Your Next Breakthrough Initiative: The Corporate Venture Capital Fund,” Harvard Business Review, 2014.; Ron Siegel, Eric Siegel, and Ian C. MacMillan, “Corporate Venture Capitalists: Autonomy, Obstacles, and Performance, 1988, Table 3 on p. 238, Table 6 on p. 239.

# Systematic Knowledge Transfer

- Difficult but imperative to ensure that knowledge gained from CVC efforts is shared across the firm.
- What can be done right? - In-Q-Tel
  - **Company Background:**
    - Founded in 1999 by CIA to acquire greater access to novel technologies.
    - Made equity investments in young firms that had developed products for private sector.
  - **Challenge:**
    - Hard to imagine how consumer technologies can be adapted to work in intelligence.
  - **Solution - Two Part Structure:**
    - Deal team: GPs and associates (entrepreneurs/graduates) scout deals, perform DD, prepare term sheets, etc.
    - Technology team: Seasoned executives focus on technology evaluation (esp. with respect to the CIA's needs).
  - **Execution:**
    - In-Q-Tel Interface Center: Oversaw fund's efforts to act as junction point between fund's unclassified efforts and CIA's classified work.
    - Problem Set: Interface Center staff provided list of unclassified technology needs (with commercial analogs) acting as cultural convergence point irrespective of geographic location/professional skill set.
  - **Returns:**
    - High level of communication paid off! - Out of 37 start-ups in which In-Q-Tel invested from 2003-12, the organization acquired all but one.

Source: Josh Lerner, "Your Next Breakthrough Initiative: The Corporate Venture Capital Fund," Harvard Business Review, 2014.



# Wrapping up

- Venture capital is a powerful tool, increasingly not just in U.S., but world-wide.
  - Can be powerful driver of growth in China.
- Corporate venturing is an important mechanism in its own right.
- To do right, need...
  - Supportive government policies.
  - Well thought-through corporate initiatives.

# Thank you!

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