

# **Long-Term Global Trends Impacting US Growth**

Particular Effects on Future Prospects  
for US GDP and Employment

Focusing on Expanding Opportunities  
Such as Nanotechnology

# Global Competition Drives Changes

- Many regions of the world have become competitors and customers for technology (including life science)
  - Rapid transportation, instant data access, widespread education, dispersion of know-how, mobility of people limit long-term regional advantages
- Several regions are moving up the food chain from basic materials to manufacturing to design to invention
- Employment shifts will be continuous and ever more rapid for the 21st Century so regions must adapt
  - China may gain some now and lose those later
- Competition causes rapid economic changes
- **Changes will occur more rapidly going forward**

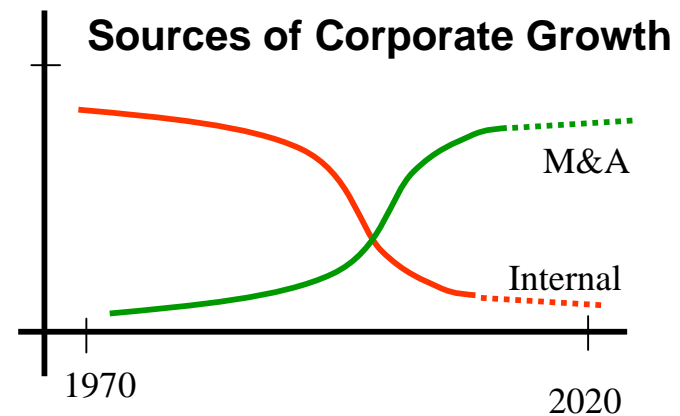
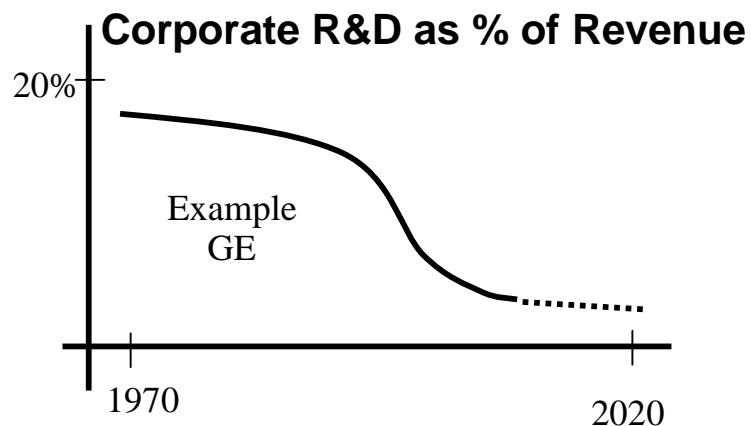
# Large Corporations Are Global

- **Major US companies are global today**
  - Achieve strong bottom line growth
  - Simultaneously reduce US employment
  - Secular shift and not a cyclical trend
- **US no longer has a commanding lead on skilled workers and cost-adjusted productivity**
  - Developing economies are focusing on education
  - Many developing countries produce higher percentages of science and engineering degrees than the US
- **Large US Corporations have been cutting % of revenue spent on research and development**

# Corporate Opportunity Drivers

- Global economic conditions, financial markets, global competition, and accelerating technology itself have altered where and how most advances occur.
- Enterprises no longer produce most revolutionary advances internally but instead acquire companies.

**Never have conditions for technology and life science startups been as open to entrepreneurs with capital.**

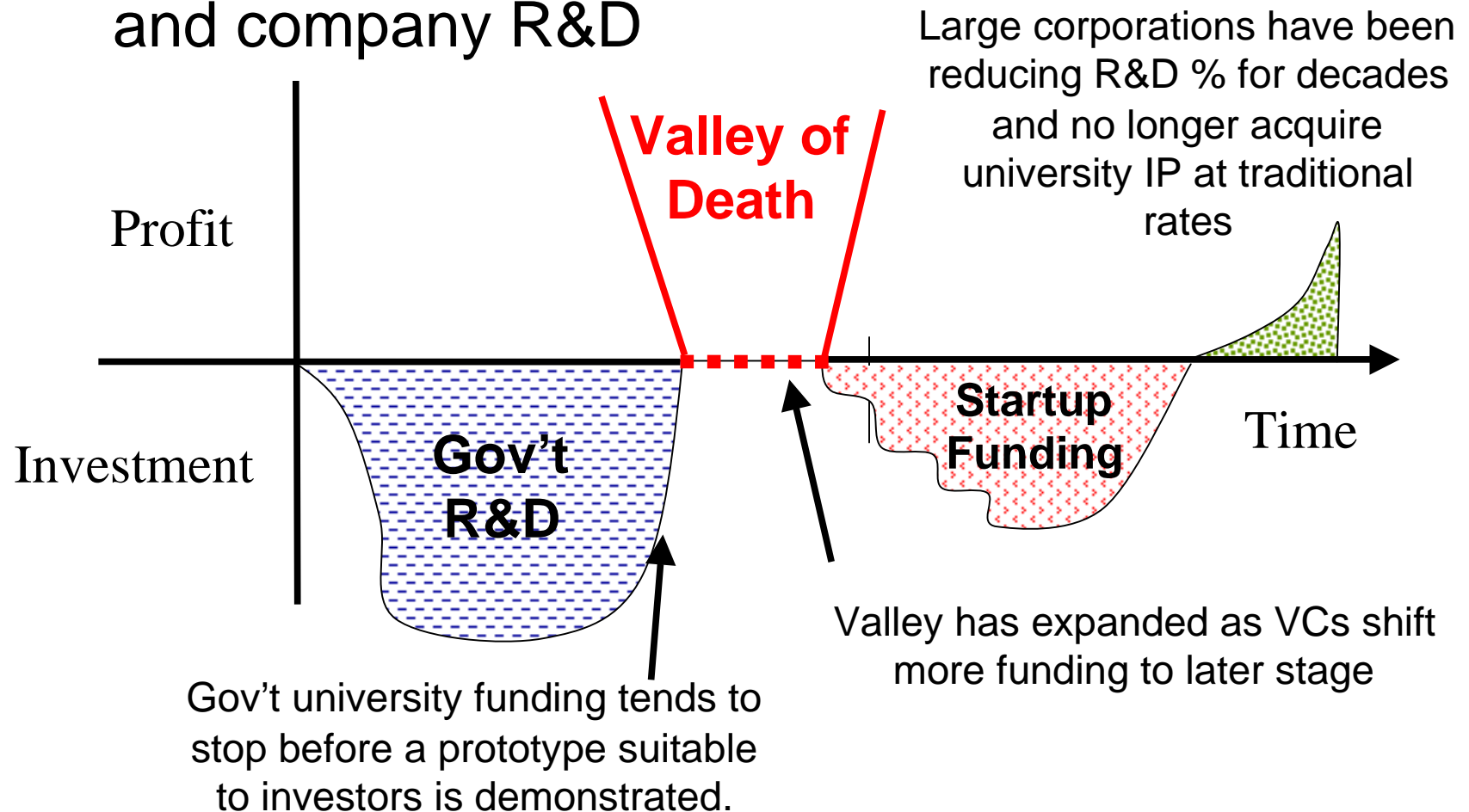


# Startups Create Most Wealth + Jobs

- Majority of new US jobs are provided by startups and emerging companies
- Startups are the major (maybe only) source of incremental high-quality employment
- Most technology & life science startups are created around research from universities and federal labs
- Startups create wealth, personal income, capital spending, employment and tax revenues in US
- New technologies have and will create the greatest opportunities for growth
- **Many (maybe most) startup opportunities with commercial potential from federally funded research are lost**

# Commercialization Gap

- Funding hole between university/lab research and company R&D

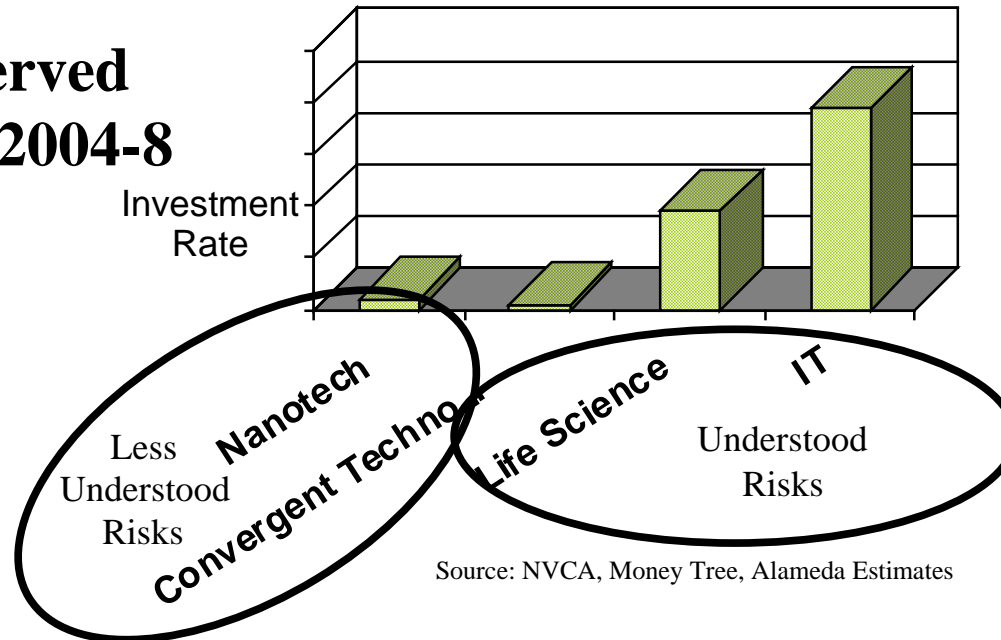


# Sector Issues Impacting Startups

## New Science Sectors are Lifeblood of US Economy

- Venture capital and angels avoiding newer fields
- Less understood risks are no longer acceptable for most investors
- Many shifting to goals of moderate returns with lower risk
- Inevitable result will be eventual US loss of tech leadership

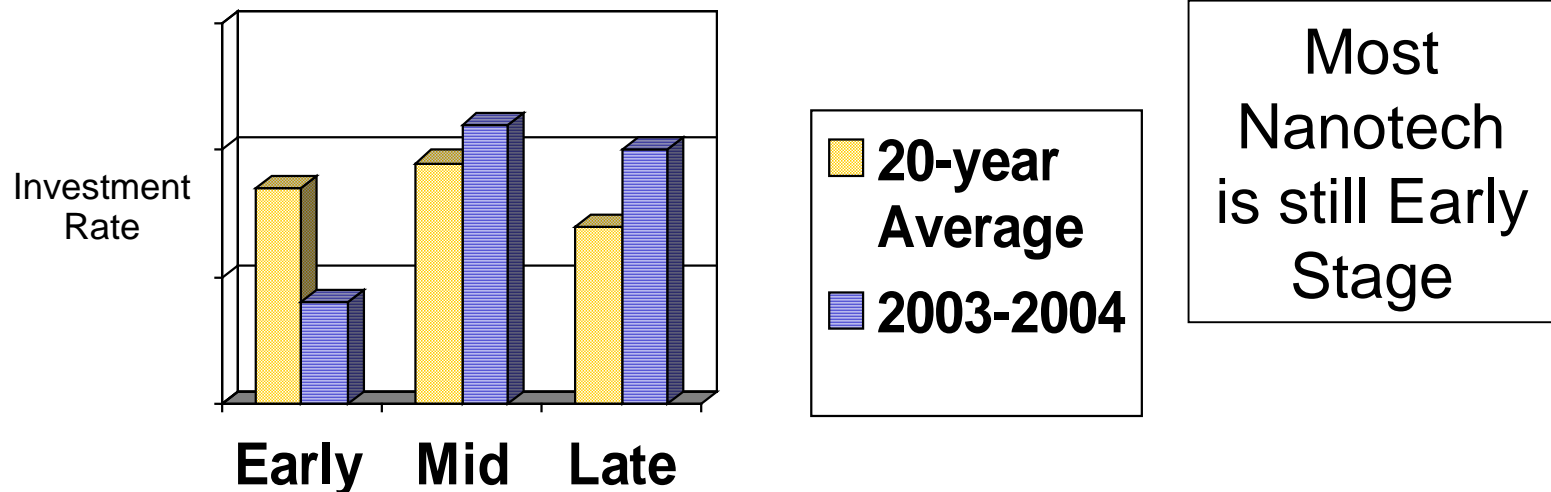
### Underserved Sectors 2004-8



# Stage Issues Impacting Startups

- Regulations and limited flexibility driving shift
- Near all time low for early stage
- Technology risks are avoided by most
- Most venture funds working on large existing portfolio
- Venture fund investors (LPs) avoid volatility

## Funding % by Stage of Investment



Source: Pricewaterhouse Coopers, adjusted for mature series A rounds

# US Lead for Invention Threatened

- US has had a cultural advantage for most scientific paradigm shifts - so far
- Good science and engineering education starts in elementary school and continues
  - tight US education financing and cultural issues limit primary and secondary science education
- Many top foreign minds have immigrated to work in science and engineering in US - now some leave
- Some developing countries are promoting science and engineering education far more than US
- Many developing countries are promoting domestic research and development with R&D incentives
  - Also luring back émigrés with US degrees

# Issue - US Losing Skilled Jobs

- **US has been losing jobs for decades - and may do so indefinitely - but that can be acceptable overall**
  - Initial losses were for unskilled jobs i.e. textiles
  - Semi-skilled job losses soon followed i.e. automobiles
  - Skilled jobs are now going offshore i.e. software
- **Lost jobs can never be regained by US or anywhere**
- **US historically creates better and more higher-skill jobs**
  - Able to rapidly adapt to new technology and new work environments
  - More mobile in relocating to other parts of US for employment
  - Open to immigration of the best and brightest
  - Nanotechnology applications have potential as large US employment options for decades to come.
    - Example: Nano-biology for medical devices and nano-medicine

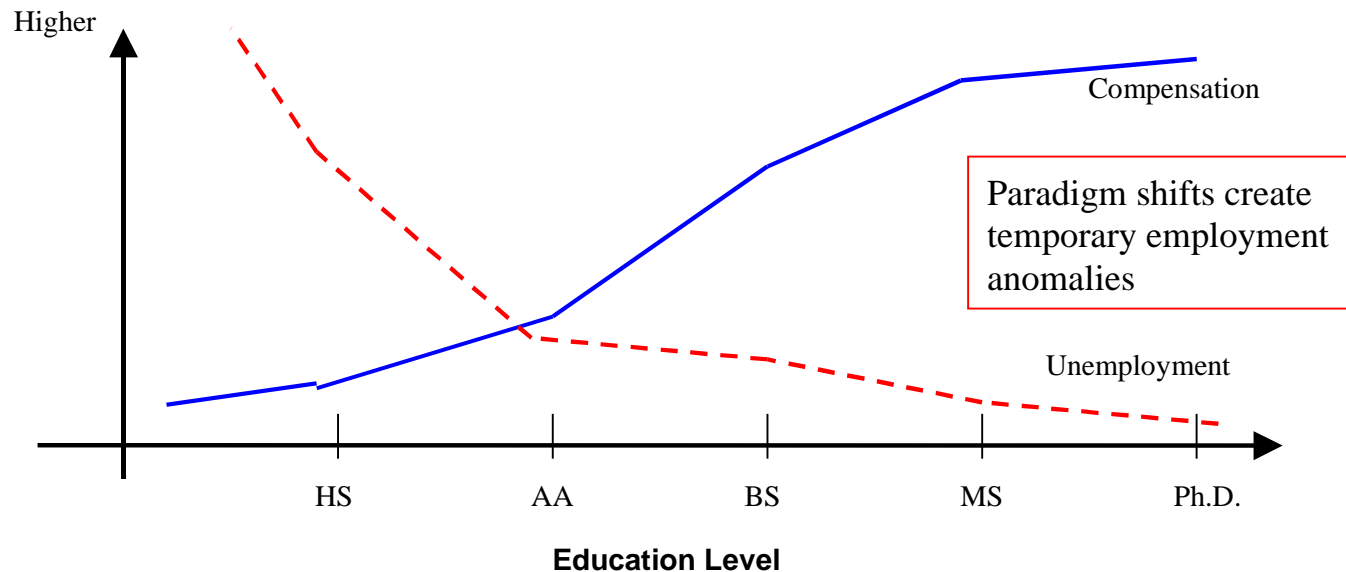
## Issue: > 5 Million US Jobs at Risk

- **Each major technology shift opens possibility for different global regions to take the lead**
  - New technologies and new worker skills open the door for any region to move fast and take a lead
  - Once a region takes a lead in a new technology it tends to last for decades
  - Example: semiconductors shifted lead to CA from Eastern US which had lead in electronics / computers
- **Nanotech and other leading edge technologies create a paradigm shift**
  - **Potential to shift tech leadership among countries such as China now, India soon and others later**

# Education Impacts Employment

- Nanotech and other newer fields require higher levels of education
- Unemployment levels generally rise as education level declines
- Compensation rises with education level
- Nanotech will exacerbate educational requirements

## Education Impacts on Employment and Compensation



Data from US Census Bureau, National Science Foundation, Center for Economic Development, Department of Commerce, Bureau of Economic Statistics, National Institute of Standards and Technology, Helfrich interpolations

# **Factors that Can Improve US Outlook**

- Higher-skilled US workforce in sciences and engineering including crossing disciplines
- Flexible workers open to career changes, re-education and relocation
- Flexible employers willing to subsidize worker re-education, career change and relocation
- Increases in large company research and development
- Government incentives for science education, technology startups, investment and flexibility
- Combined public-private programs to bring suitable federally funded research to commercial viability

# General Recommendations

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## **Optimize US for Growth and Employment**

- Promote spin outs from universities and research centers
- Enhance science education at primary, secondary and community college levels
  - Provide incentives for increased interaction with industry
  - Create financial and prestige incentives for teachers with advanced science degrees
- Develop re-education programs for professionals that are unemployed and underemployed
- Create programs to encourage company research and development located in US
- Provide wider range of incentives that promote technology based startups and improve success rate

# **Improve Invention-to-Commercialization**

## **Leading in invention is no longer sufficient**

- Provide tax credits to investors in startups with extra credits to spinouts of federal R&D
- Enhance SBIR/STTR programs with focus on bringing technology to market
  - Allow majority venture ownership by syndicates of firms
- Create special programs for seed/early stage startups through tax exemption on gains from early investments
- Phase in many federal and state regulations as revenue/assets increase for small companies public companies (such as Sarbanes-Oxley).
- Create trial programs for commercialization of federally funded research using In-Q-Tel as a model and provide ample funding to expand trials that work.