

*Restoring American Competitiveness**

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Overview

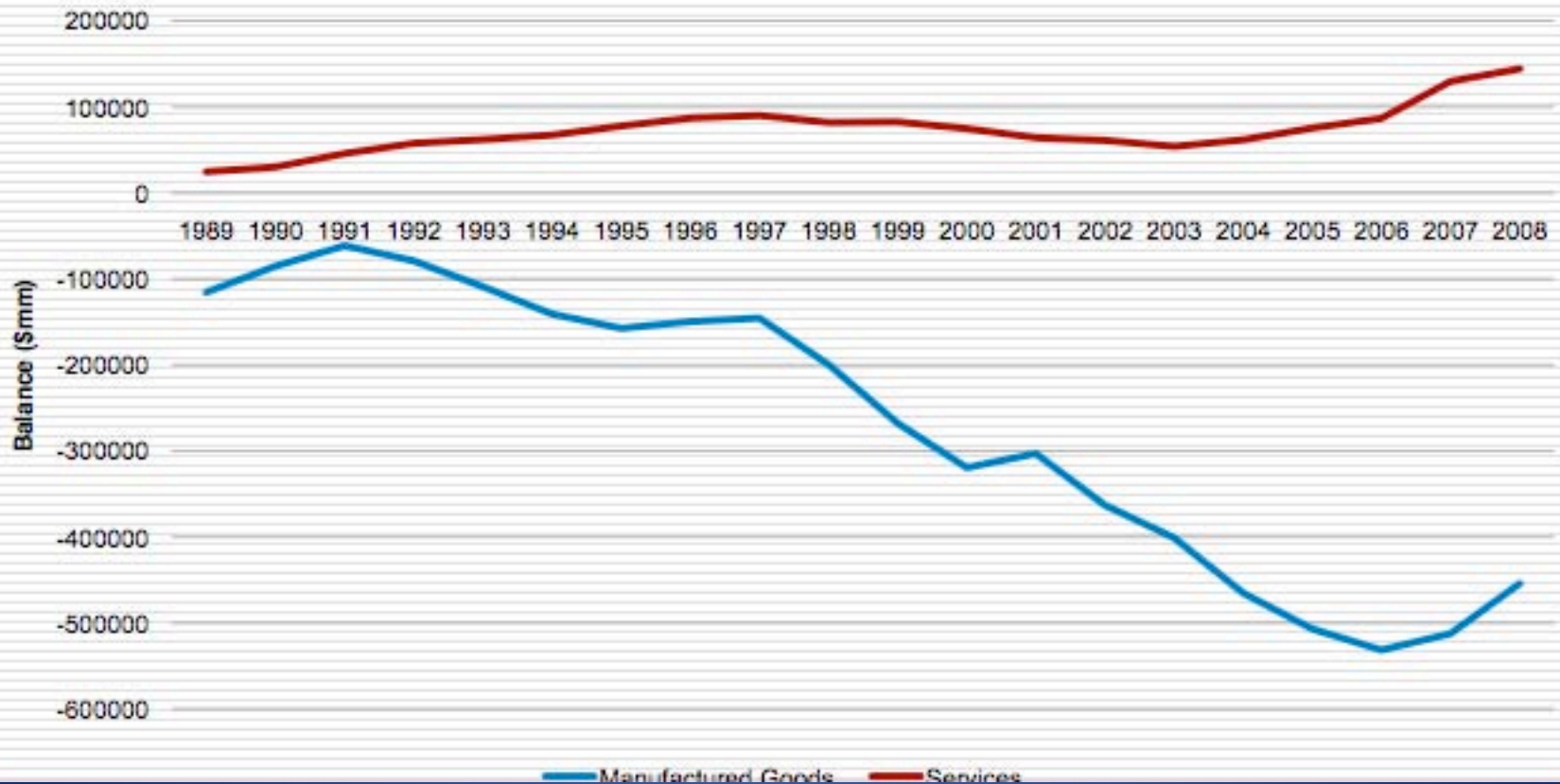
- What's the problem?
- What's the cause?
- What do we do about it?

Background

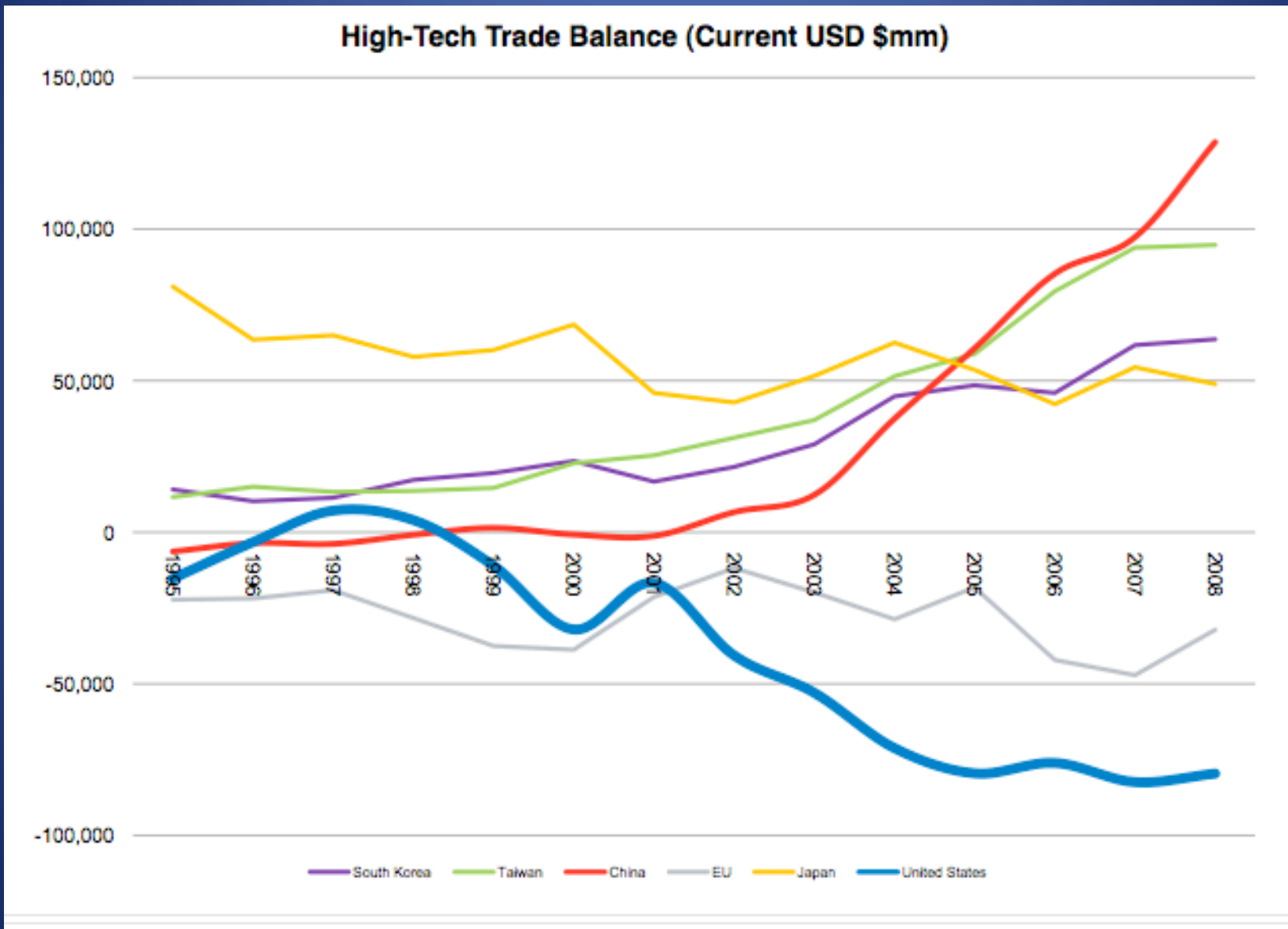
- 1980s: “Competitiveness” Debate
 - Auto industry, electronics industry, manufacturing
 - Japan, MITI, industrial policy
- 1990s: Game Over
 - Japan struggling
 - US economy growing
 - Productivity surging
 - Innovation engine (biotech, internet) humming

The Iceberg Beneath the Surface

US Trade Balance: Manufactured Goods vs. Services

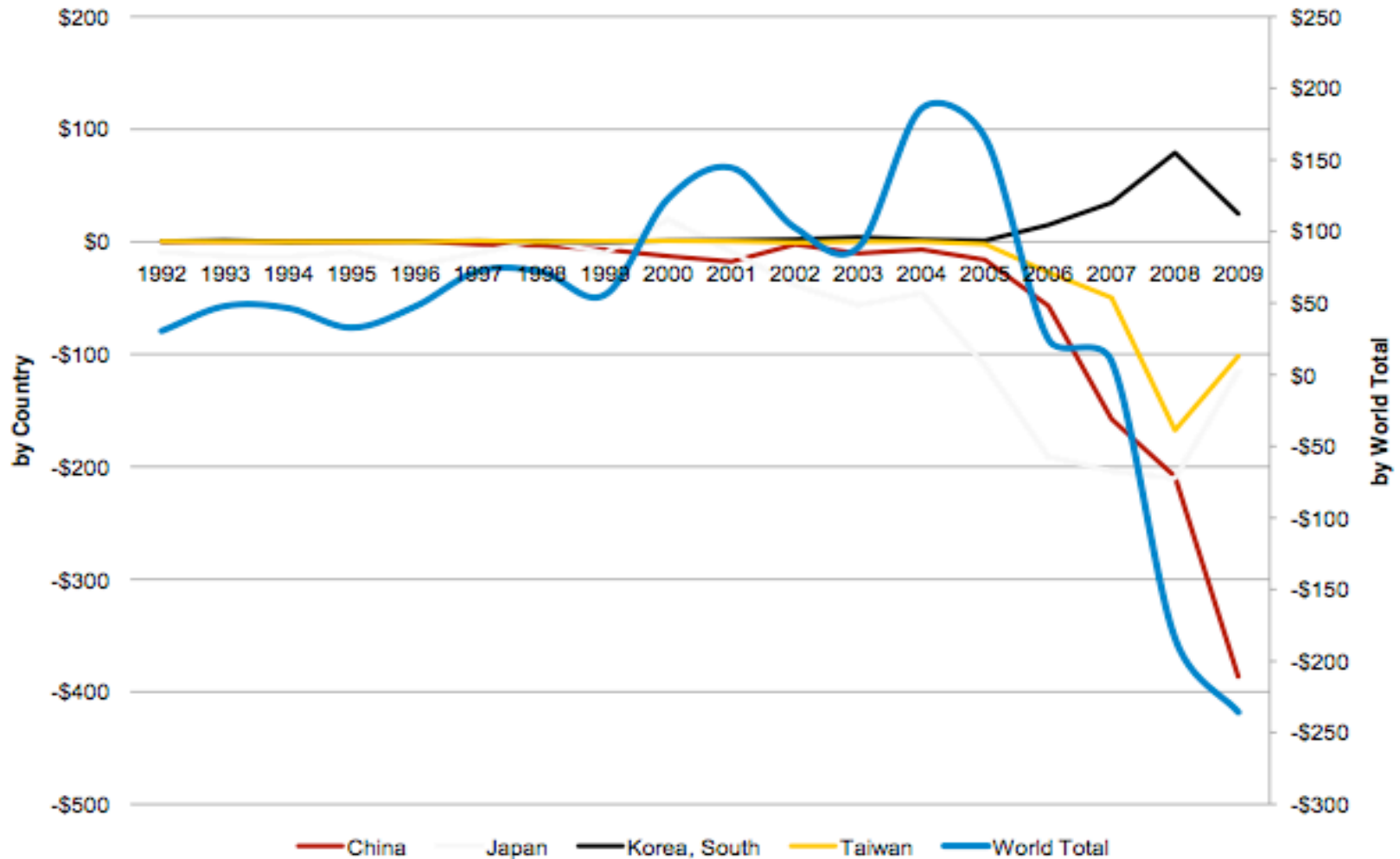


And we are not doing better in high tech!



Snapshot of Solar Cells

Census: Solar Cells US Balance (\$mm)



Erosion of US Manufacturing Capabilities

Gone

- Fabless chips
- Compact fluorescent lighting
- LCDs, TVs, mobile computers
- Lithium ion, lithium polymer, and NiMH batteries
- Crystalline and polycrystalline silicon solar cells
- Personal computers, low end servers, consumer networking gear
- Advanced composites used in consumer applications, advanced ceramics
- IC packaging

At Risk

- Flash memory
- LEDs for solid state lighting
- Next generation “electronic paper”
- Thin-film solar cells
- Blade servers, mid-range servers
- Optical communication components
- Core network equipment
- Carbon composite components for aerospace and wind energy

Why This Matters?

- Source of high wage jobs (direct effect)
- Linkage between R&D and manufacturing
- Industrial commons as a platform for future innovation

Three Myths

Myth 1: US should focus on high wage “knowledge work” instead of manufacturing

- Reality: complex manufacturing *is* knowledge work

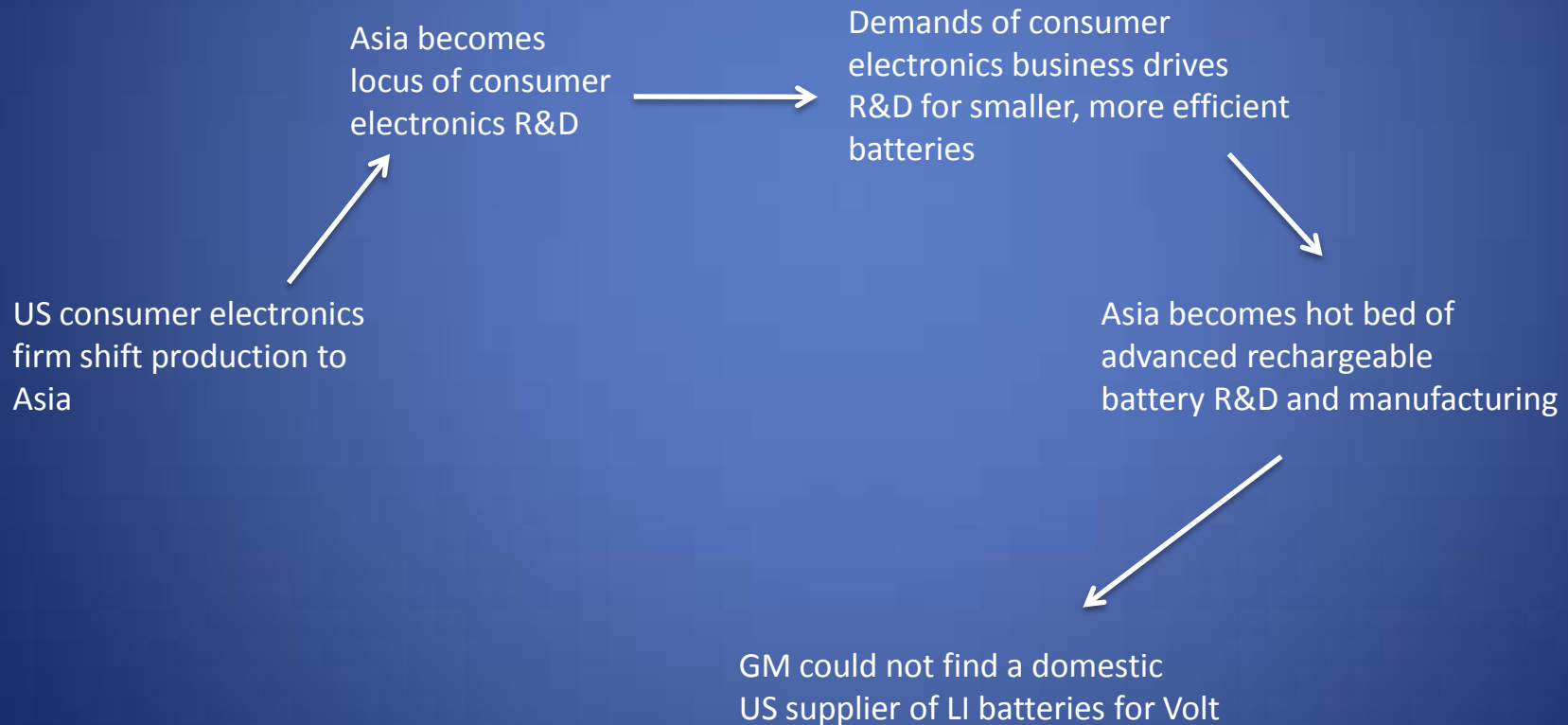
Myth 2: US should focus on “innovation” not manufacturing

- Reality: developing and scaling up complex manufacturing process is often critical part of innovation

Myth 3: US should focus on industries of the future, not mature manufacturing industries

- Reality: presence in “mature” industries can provide options for future innovation

Why the Chevy Volt Will Use Korean Made Batteries?



Industrial Commons

- The ability of an organization to innovate depends access to skills and capabilities in the “industrial commons”
 - Component suppliers
 - Tool & equipment manufacturers
 - Complementary technology providers
 - Human resources (engineers, scientists, technicians)
 - Institutions (universities, research laboratories)
 - Competitors
 - Customers
- A healthy commons creates a platform for innovation and entrepreneurship
 - Strong “clustering” effects in start-up activity

Industrial Commons

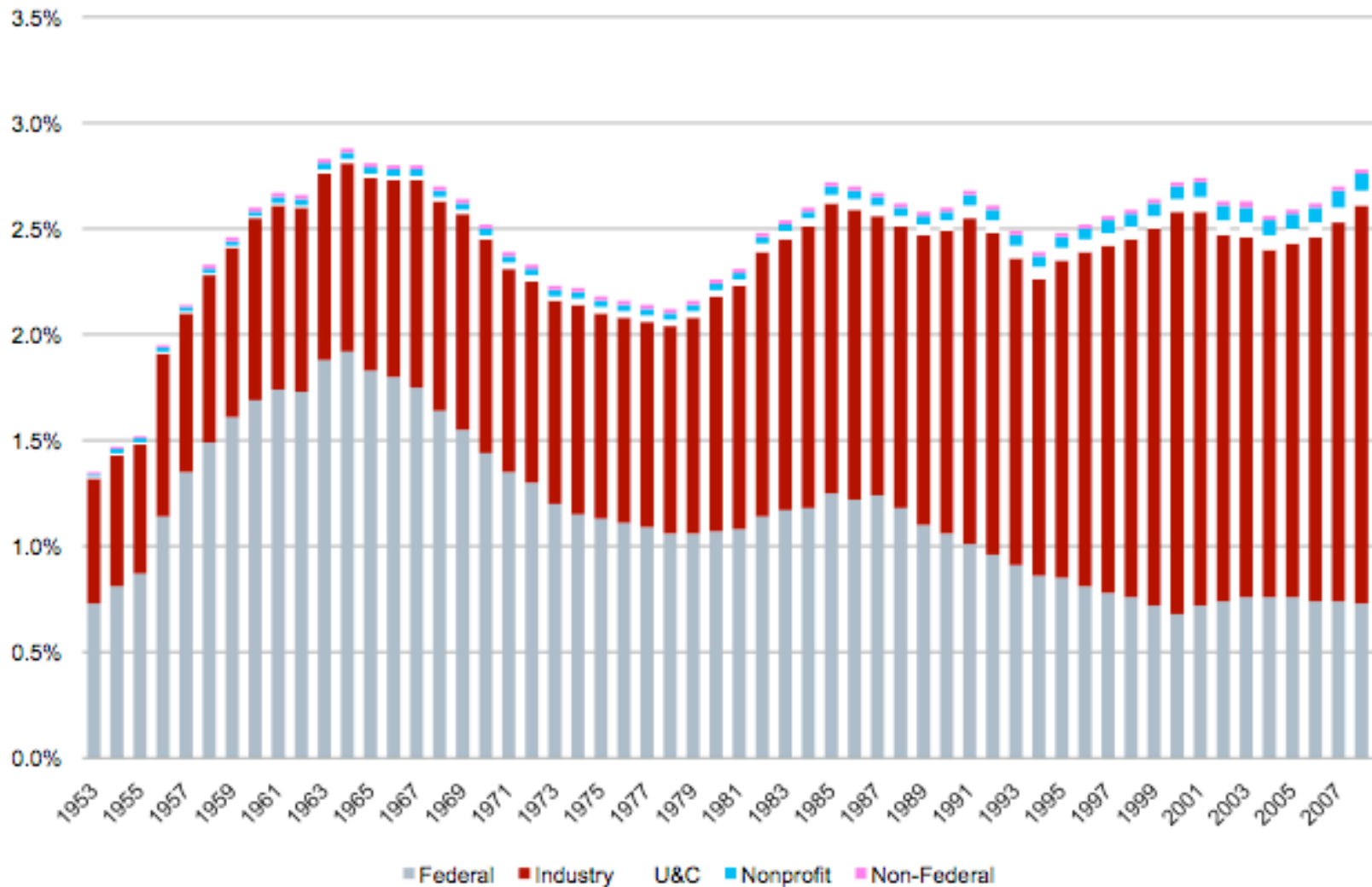
- Often have a local character (geography matters)
 - Life science: Boston, San Francisco, San Diego
 - Design: Northern Italy
 - Mechanical Engineering: Germany
 - Solar panels: China, Taiwan, Korea, Japan
- Virtuous cycles and vicious circles (network externalities)
 - Hard to establish and hard to rebuild
 - Small decisions build cumulatively

The Erosion of the US Industrial Commons

- Outsourcing (symptom)
- Shift in corporate R&D away from “R” (symptom)
- Short term management focus
- Capital budgeting processes
- Management attention and skills (more comfort with branding and marketing than technology)
- Corporate governance
- Lagging US investment in “applied” research

Shifting Sources of US R&D

R&D Funding as a % GDP



Shifting Focus of US Corporate Research



The Decline of Industrial Research in the U.S.

Bell Labs, Holmdell, NJ

Buying Rather Than Inventing

HPQ COGS and R&D as % Sales



What can be done?

- Businesses
- Government

Business

- Fundamental challenge: the divergence between interests of US corporations and US economy
 - What's good for GM is no longer necessarily good for America
- In global economy, companies will go wherever they must to achieve *their* interests
 - Costs and benefits for US economy

Management

Message 1: Nurturing and exploiting local industrial commons is in your self-interest.

Message 2: US companies have been squandering a huge opportunity by allowing local commons to erode.

Message 3: You don't have to be an "American" company to contribute to and exploit US industrial commons.

How Management Must Change

- Make technical capabilities a pillar of strategy
 - There are few low tech businesses anymore
- Stop blaming Wall Street for short-term management behavior
 - There is actually quite a bit of “patient” capital
- Recognize the limits of financial tools and metrics
 - Existing tool and metrics tend to drive out long-term investments and capability creation
- Reinvigorate corporate research (internal & external)
 - Creates a growth platform
- Corporate governance
 - Need more scientists and engineers on board (board committees)

Government Policy

- The policy debate has been false dichotomized:
 - Laissez faire free market vs. Japan MITI style industrial policy
- Historically, US has been a complex mixture of free markets and government support of innovation
 - Agricultural experimental stations
 - Support of basic and applied research (post War)
 - Education and training
 - DoD procurement

Policy Implications

- Challenge: make US a fertile place to grow industrial commons
 - Talent
 - Access to technology
 - Flows of people and information
- Focus on creating building blocks through broad basic and applied research
 - DARPA (internet), NIH (human genome project)
 - Product and process technologies
- Pick problems, not solutions
 - Governments do a bad job picking winners
 - Let markets figure out what to commercialize
- Foster communities of innovation
 - Most breakthrough innovations come from integrating across disciplines, fields, and organizations
 - Implications for funding and governance of programs

Conclusion

- Competitive advantage of countries grow and decline over long periods of time.
- It's not too late.
- US starts with a very strong base: best science and engineering institutions in the world.
- Will take concerted action at both the corporate and government levels over long periods of time.