

Moving Beyond the Innovation Shortfall

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The global financial crisis and
the job drought are both
symptoms of a deeper problem

We all agree:

Innovation creates jobs.

New products and services boost
both demand and supply.

So what happened over the past ten
years?

The U.S. economy implicitly
adopted an **innovation-intensive**
strategy during the Internet
Decade (roughly 1998-2007)

Innovation-intensive strategy

Production was shifted to low-wage countries, while U.S.-based companies focused on R&D, design, innovation.

What was supposed to happen

- The U.S., as the leading innovator, would create advanced products and high-wage jobs.
- In return, the rest of the world would supply the U.S. with low-priced goods and services, using low-skilled labor.

Best-case examples

Apple= “Designed by Apple in California, Assembled in China”

Google=Generated enormous profits running innovative software on commodity hardware, mostly imported

These companies were unusual

Looking back, the **Internet Decade** (1998-2007) was **much weaker** than we realized, with much less innovation.

A Decade of Surprisingly Weak Innovation

- The innovation-intensive strategy turned out to be riskier than expected
- From biotech to artificial intelligence, potentially-powerful innovations fell short of promise.
- Over the decade, the global economy became unbalanced, leading to massive trade deficits and a debt build-up in the U.S—followed by the financial crisis.

1998: The Dawn of a Great Era of Innovation?

In 1998 alone:

- **Cancer Treatments:** Scientists reported several big breakthroughs, including cutting off blood supply to tumors
- **Cloning:** After the cloning of Dolly the sheep was announced in 1997, the cloning of humans for medical-research purposes suddenly seemed plausible.
- **Fuel-cell-powered cars:** In January 1998, of that year GM Chairman John Smith promised a production-ready fuel-cell car by "2004 or sooner."
- **Gene Therapy:** Researchers were ready to insert "replacement" genes into patients with illnesses such as cystic fibrosis.

1998, continued

- **Biotech and new drugs** Many scientists and pharma companies believed that biotechnology was about to speed discovery of new drugs and improve drug production.
- **Miniaturized silicon-based machines (MEMS):** That year venture capitalists began pouring billions into MEMS startups, "the next semiconductor revolution."
- **Satellite-based Internet:** Big money backed Teledesic, a space-based Internet service intended to have 800-plus satellites in low orbit for fast response and quick downloads.
- **Speech technology:** IBM and others pushed improved speech recognition as a "killer app," allowing people to interact naturally with computers.
- **Tissue engineering:** Artificial tissues and organs seemed imminent when the FDA approved Apligraf, a skin substitute from living cells.

“Awash in Technology”

From the 2001 *Economic Report of the President*:

“Why, then, is the U.S. economy awash in technology? The evidence suggests that the combination of increased, competition-driven demand for technology, thriving financial markets, increased public and private R&D, and legal protection have created a uniquely favorable climate for entrepreneurship in the technology sector”

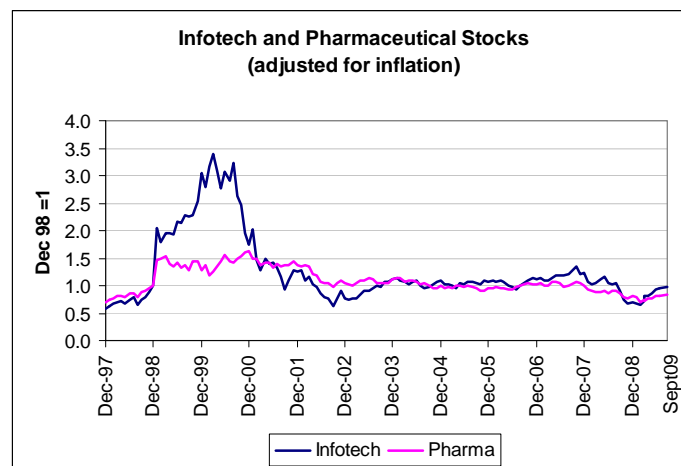
A Decade of Technological Disappointments

- **Cancer Treatments:** Tackling cancer was far trickier than expected. There were some successes, like Avastin, but many more failures.
- **Cloning:** No human cloning. And while over 20 animal species have been cloned, businesses to clone livestock or pets have not taken off.
- **Fuel-cell-powered cars:** No production-ready fuel-cell vehicles, and the Obama Administration has chopped research funding
- **Gene Therapy:** An experimental gene therapy treatment killed a patient in 1999, and research slowed down dramatically. No gene therapies have been approved by the FDA for sale.

Disappointments, continued

- **Biotech and new drugs** Despite the 2003 sequencing of the human genome, successful drug discovery was much harder than envisioned. (Recent bankruptcy of Decode Genetics)
- **Miniaturized silicon-based machines (MEMS):** Mass production of micromachines was far more complicated than expected.
- **Satellite-based Internet:** Teledesic never got off the ground as low-orbit broadband systems turned out to be far too costly.
- **Speech technology:** Despite more powerful computers, few people use speech for Web browsing or creating documents.
- **Tissue engineering:** Artificial organs turned out to be far more difficult than expected. Organogenesis, Apligraf's maker, filed for bankruptcy protection in 2002.

No Stock Gains in Innovative Sectors



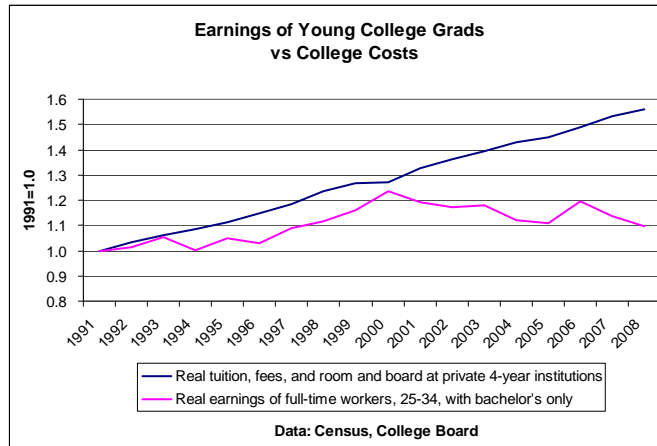
Weak Real Income Gains for Labor Inputs to Innovation

Earnings by Education, 1998-2007

change in real mean earnings, 1998-2007
full-time workers

PhD	-2.5%
Professional degree	-2.1%
Bachelors (only)	0.7%
HS Diploma (only)	1.8%

Data: Census Bureau



Weak Employment Gains in Innovative Industries

Job Growth in Innovative Industries

	change 1998-2007 (thousands of jobs)
Semiconductors and electronic components	-202
Telecommunications	-137
Computer and peripheral equipment	-136
Communications equipment	-109
Electronic instruments	-66
Data processing, hosting and related services	-15
Internet publishing and broadcasting and web search portals	19
Software publishers	40
Pharmaceuticals and medicines	48
Scientific research and development services	116
Computer systems design services	203
Custom computer programming services	210
Total	-29

Data: BLS

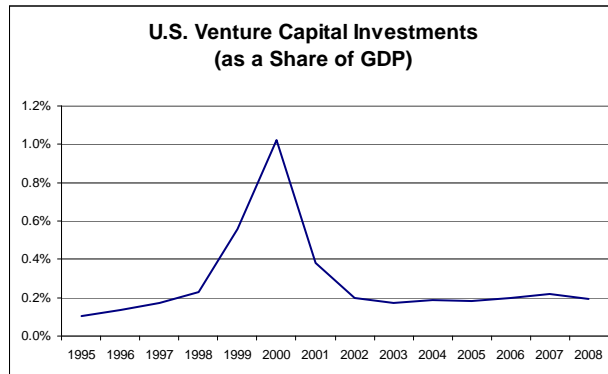
U.S. Trade in Innovative Products Weakens

Advanced Technology Products

trade balance, billions

1998	29.7
2007	-52.7

Includes advanced materials, aerospace, biotech, electronics, information and communications, life sciences, nuclear Technology, opto-electronics



In the short run, the **innovation shortfall** was not noticed.

The excitement of the Internet, a series of apparent breakthroughs such as **the sequencing of the human genome** in 2003, the wonders of the iPod

But gradually **financial innovation**
replaced **technological**
innovation.

Spending on **housing** replaced
investment in **new technologies**

Innovation policy pointed the
wrong way (ITIF study)

Misleading Productivity Growth

Rapid reported productivity growth
misled economists and policy-makers
about health of economy

Reported Labor Productivity Growth Rate

	1978-88	1988-98	1998-07
Manufacturing	2.5%	3.5%	3.8%
Nonfarm Business	1.3%	1.7%	2.8%

1978-88 figure for manufacturing uses old SIC definition

But...

- Manufacturing productivity and output statistics do not correct for offshoring. In actuality, far less productivity growth than people realize.
- Economy-wide productivity growth figures distorted by trade as well—in particular, our underestimates of real import growth.
- See businessweek.com/go/09/growth for a longer explanation. See also recent globalization and measurement conference

The Bottom Line

- The existing technology and business-know in the U.S. flowed to the developing world.
- The U.S. did not create enough successful innovations to generate new jobs.
- Without successful innovations, even highly-educated scientists and engineers look expensive.
- Employment of scientists and engineers down 6.3% over the last year, as companies offshore R&D.

The Big Dilemma

- Innovation is the best and perhaps the only way to generate high-wage job growth in the U.S.
- But...successful innovation is fundamentally unpredictable.
- You can't prove that any particular investment in innovation will pay off in jobs (Pfizer and New London)

The Good News

- Innovation has been a disappointment rather than a failure. Progress in tissue engineering, MEMS, speech technology.
- Biotech is ripe; more than 25 years since first biotech drug. Could come any day.
- Infotech—media is ripe, so is broadband
- Innovation can surprise on the upside, as well as the downside

Strategies

- Two strategies for innovation-driven job growth: Leader or fast follower.
- Leader = invest in a wide range of cutting-edge areas, hope that one will catch fire.
- Fast follower = wait to see which innovations pan out, and leap on board. Need to maintain local capabilities.
- Combine with low-risk job creation strategies.

Faith in the future