

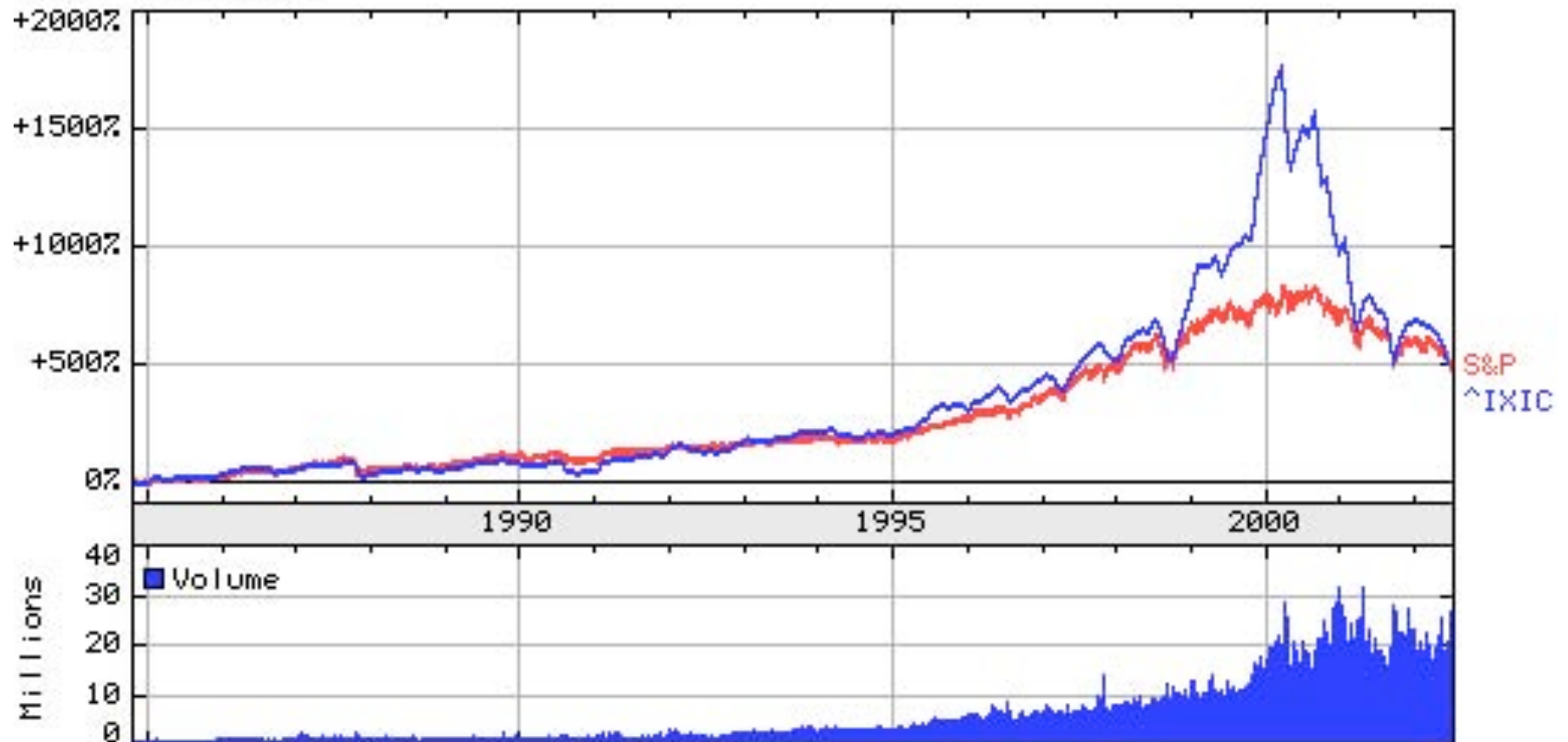
Microeconomics of Information Technology: An Overview

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A Long, Strange Trip

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Forces in the network economy

- What happened?
- Where is it going?
- What are lessons for policy and business?

What happened?

- Combinatorial innovation
 - Set of component technologies that can be combined and recombined to create new innovations
 - 1800: Interchangeable parts
 - 1900: Gasoline engine
 - 1960: Integrated circuits
 - 1995: Internet
 - Often takes years, or decades to play itself out



But this time...

- Component parts are all bits!
 - Protocols: TCP/IP, HTTP, CGI, SSP
 - Languages: HTML, XML, Java
- Software can be combined to make...
 - Web pages, intranets, chat rooms, auctions, exchanges, streaming audio/video, search engines...
 - Note: no time-to-manufacture, no inventory problems, no delivery problems
 - Bits can be shipped around the world in seconds, and innovators can work in parallel

Results

- Very rapid period of innovation
 - Processes that normally take decades were compressed into a few years
- Intensely competitive environment
 - Open technologies encourage capitalist entrepreneurs in rush to enter
 - Low cost to enter and to compete
 - Difficult to gain long-term competitive advantage
- Outcomes
 - Excess capacity: great time for consumers, tough time for companies

Financial speculation

- Financial speculation has surrounded all major innovations
 - Past: railroad, automobile, radio
 - Current: computer, telecom, Internet
- Particularly difficult to compete when technology exhibits increasing returns to scale
 - Larger the scale of operation, lower the unit costs
 - Often due to high fixed costs, low marginal cost
 - In such markets, only the biggest can survive, so there is rush to be biggest

Railroads



- Expensive to lay track, cheap to operate
 - In 1880s fixed costs were 2/3 of total cost
 - Larger railroads had lower average cost, so everyone wanted to be largest
- Implications
 - Only the largest could survive
 - Easy to start a price war since no floor on prices
 - Easy for industry to over invest
 - Bankruptcy gives you a cost advantage!

Outcome

- Railroads 1880-1900
 - More miles of track laid in 1880s than any other period in US history
 - More miles in bankruptcy in 1890s than in any other period
- Telecommunications 1995-2000
 - Huge investment in capacity
 - Dramatic improvements in technology
 - Productivity soared (8% per year)
 - Profits collapsed...



What about IT?

- 3 big investment booms
 - 1996: telecom deregulation
 - 1998-99: Y2K and euro conversion
 - 1999-00: dot com bubble
- Result: a lot of underutilized IT capacity
 - Will take a while to work its way through the system
 - Work practices, shopping practices, change much more slowly than technology...

Where is the economy going?

- Learning how to use IT capital effectively
 - Particularly in small and medium-sized enterprises
- Effects on aggregate productivity are clear, but impact on profitability is trickier due to lack of entry barriers
- Experimentation is critical
 - Henry Ford and mass production c 1912
 - Fine tuned the flow of physical production
 - Now we are concerned with flows of information
 - Competitive advantage will come from firm-specific innovation

Reasons for optimism

- Railroads took decades to recover, what about IT sector?
 - Physical capital: hard to repurpose once it is installed
 - IT capital: can be used for lots of different things after installation
- Compare: a railroad and a disk farm

How to survive...and prosper (maybe)

- Understand the 5 critical forces in the network economy
 - Differentiation of product and prices
 - Intellectual property [not discussed]
 - Switching costs and lock-in
 - Positive feedback and network effects
 - Standards and interconnection

Information Rules

