

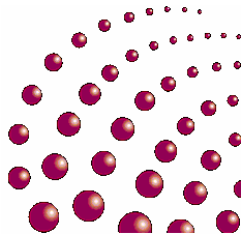
The Communications Sector: Macro-Industry Links

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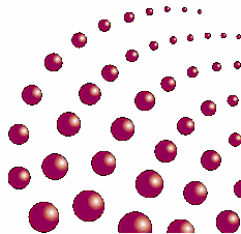
In conclusion ...

- In the last analysis communications/IT is a derived demand. End-user spending is a critical factor in cyclical patterns, but trends in technology will drive the service/equipment mix.
- There is evidence that technological changes in the communications/IT sector have had a *measurable impact* on the economy's *real growth, productivity growth, and rate of investment*.
- The economy will be affected by the *direct impact* of communications/IT industries *and indirectly by industries that intensively utilize communications/IT equipment and services* through the effects on industry sales, productivity, and costs.
- New communications *technologies* will continue to create *structural change* in the communications/IT industries and in equipment and services they provide.

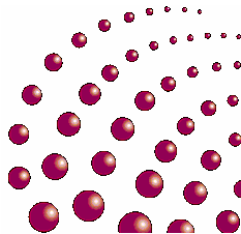


Themes

- Structural Change in the U.S. Economy
- Importance of the Communications/IT sector to the U.S. economy
 - Post-mortems of the 1990's
 - The role of technology in macroeconomic performance
- Outlook for the industry
 - Industry structure and financial impact.
 - Trends in communications technology.
 - Macroeconomic and event risks.

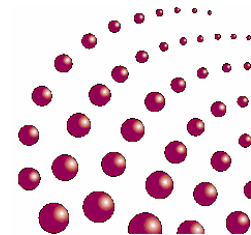


Structural Change in the U.S. Economy



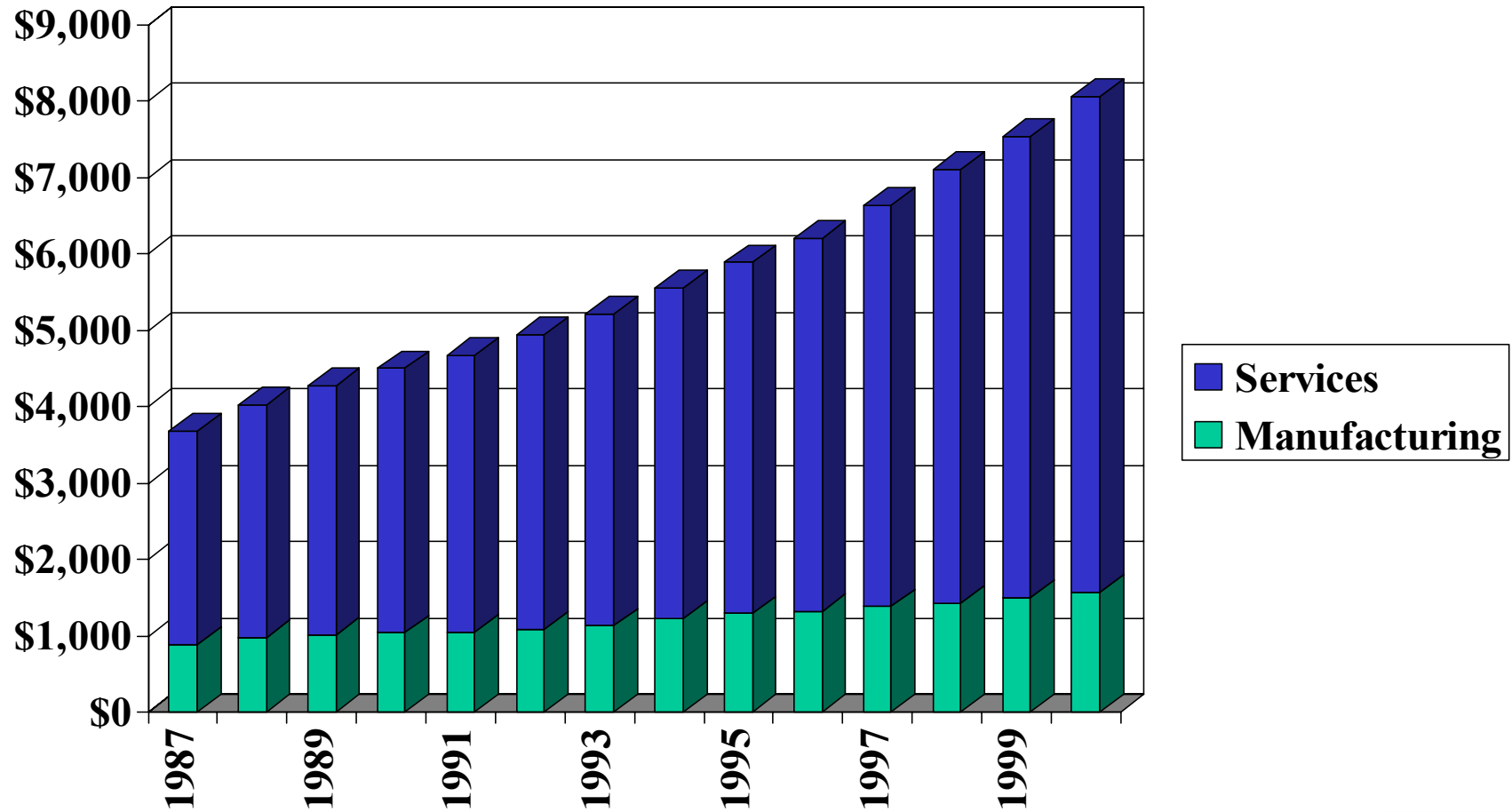
Structural Change in the U.S. Economy

- Shift from manufacturing to services.
 - Impact of import penetration in intermediate goods industries.
 - Implication for communications/IT: Services are more communications-intensive. Expansion of capital deepening investment.
 - Increase in capital/worker and information capital/worker.
- Increases in the productivity growth rate
- Open economy effects
 - Virtuous cycle – fiscal fitness induces capital inflows leading to strong dollar.
 - Communications goods and services a substantial share of imports and exports.

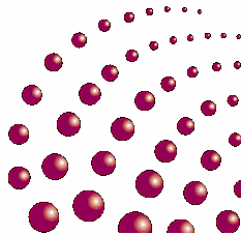


Growth in Services – Share of GDP

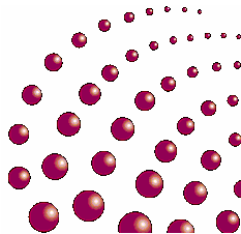
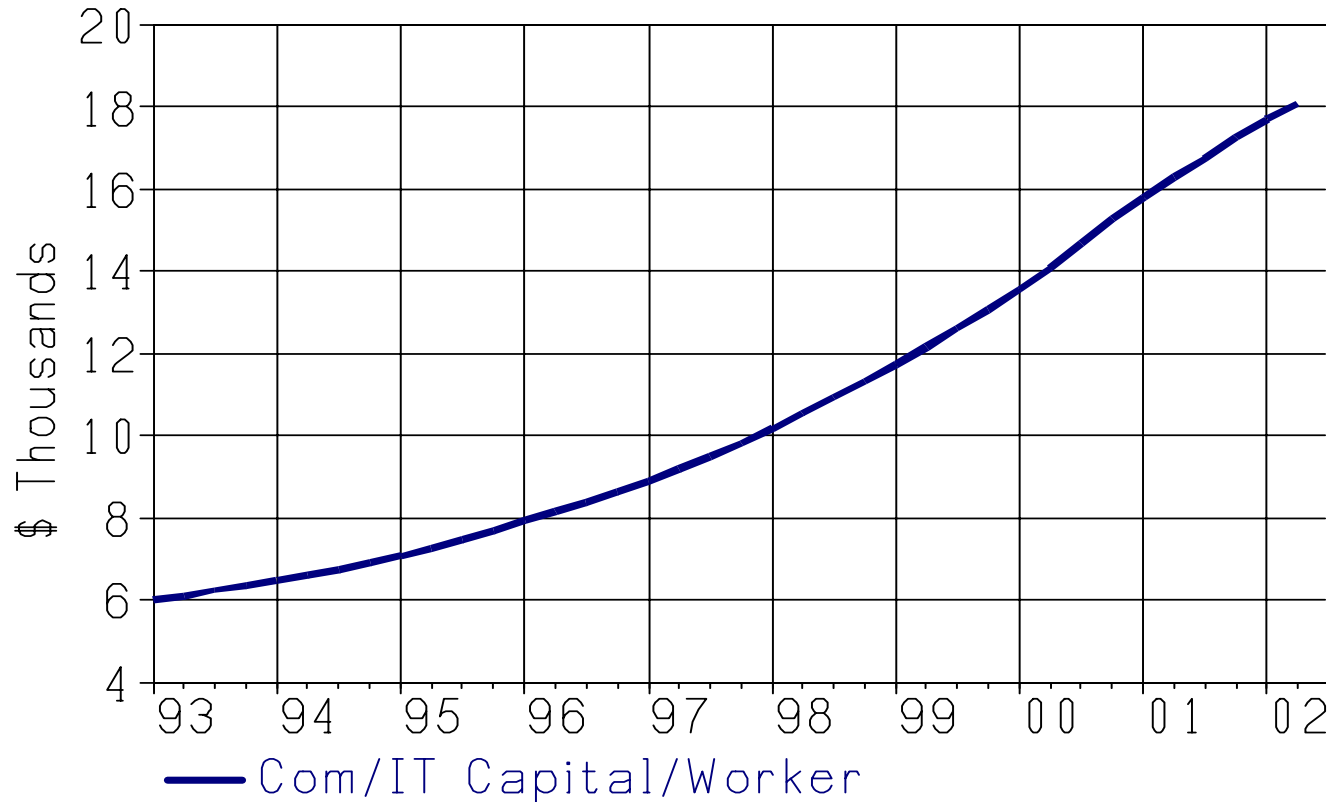
Billions



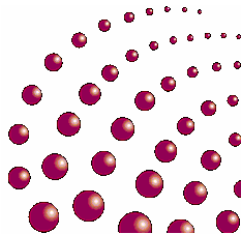
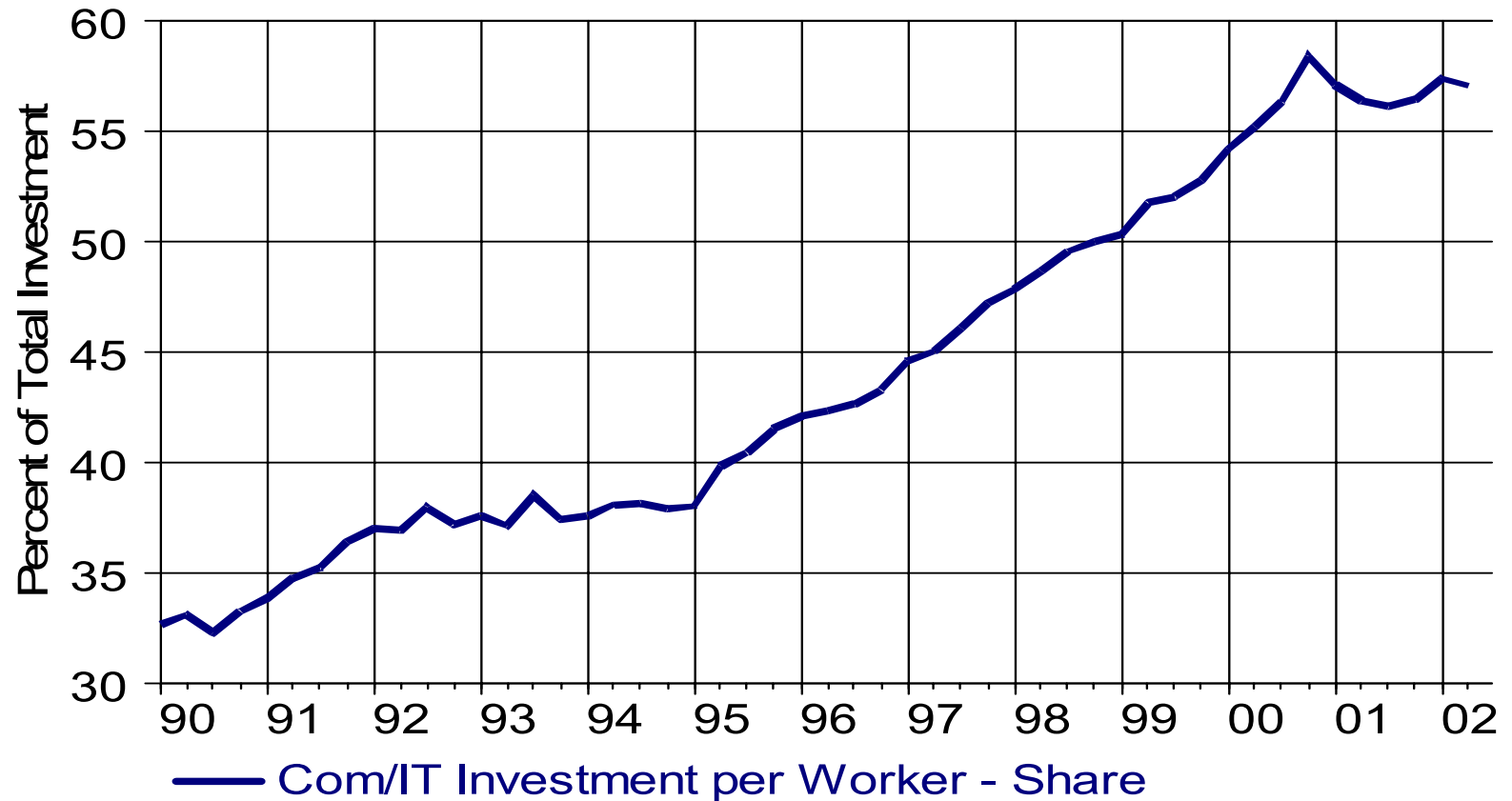
Source: BEA Industry Accounts Data, Current Dollars, 1987-2000



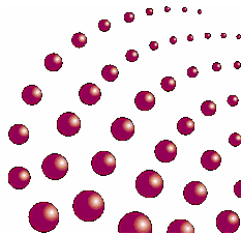
Expansion of Capital Deepening Investment



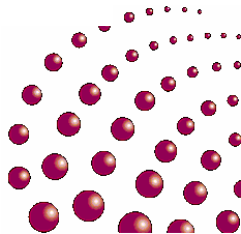
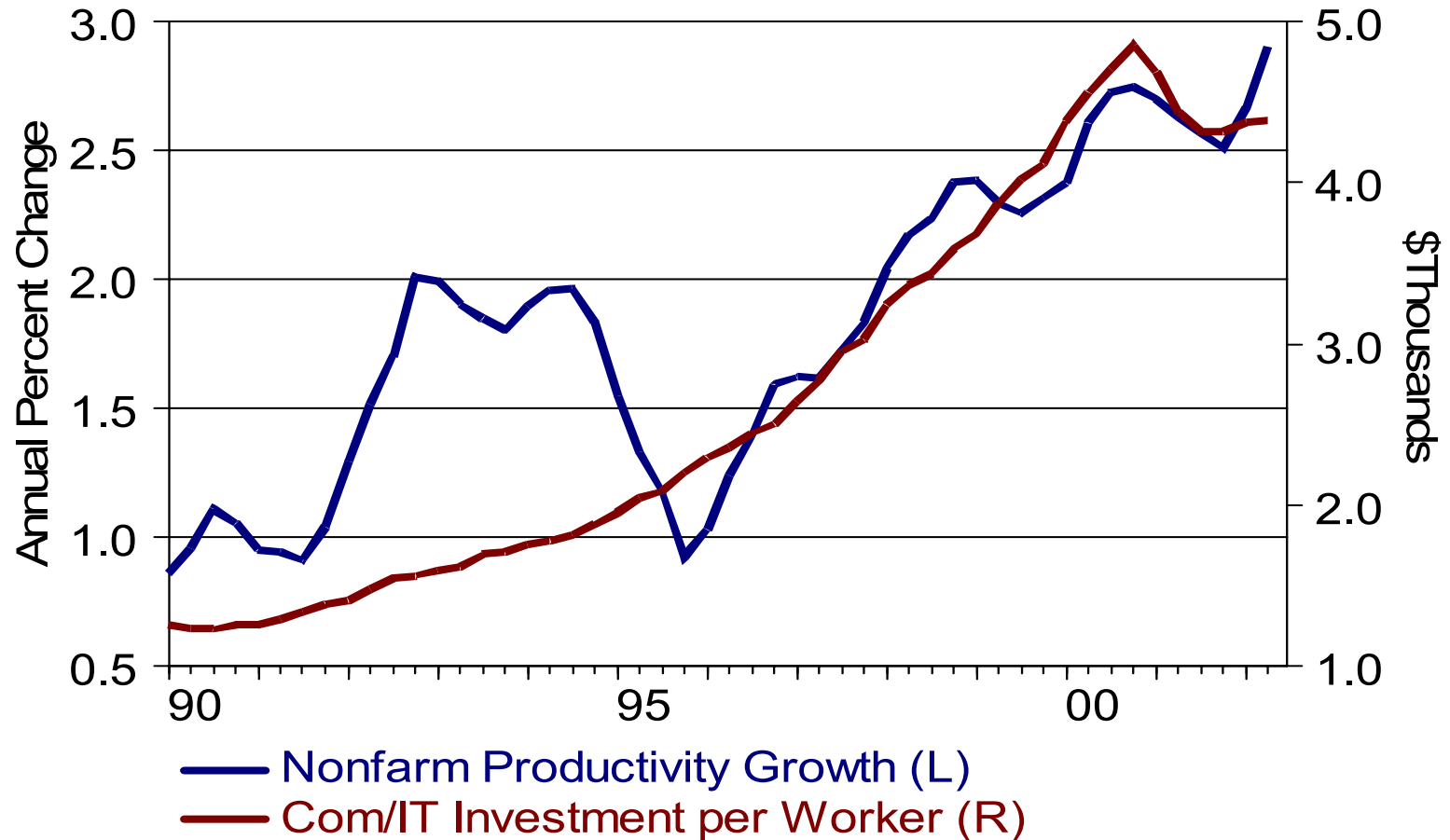
Importance of Com/IT Investment



The Communications Sector – Importance in the U.S. Economy



Increases in Productivity Growth



Increases in Productivity Growth

IT Intensity and Productivity Growth

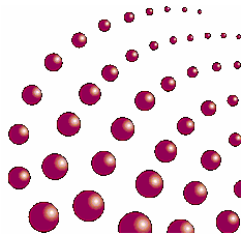
Average Annual Productivity Growth - 1987-99

Number of

Industries 1987-95 1995-99 Change

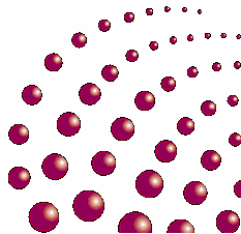
IT-Producing Industries	2	8.53	12.22	3.69
IT-Intensive Industries	26	1.18	3.16	1.99
Other Industries	29	1.87	2.30	0.43

Source: Stiroh (2002)



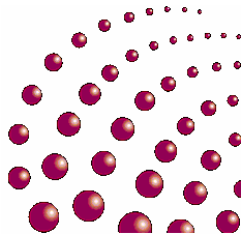
Structural Change in the U.S. Economy

- Consequences
 - Greater productivity growth. Higher living standards.
 - Lower inflation and real interest rates.
 - Greater incentives for real investment in plant and equipment and human capital.
- What is difficult to measure
 - Industry output in key services (e.g., health care).
 - The effect of communications as an enabling technology for labor market flexibility.
 - Network effects.

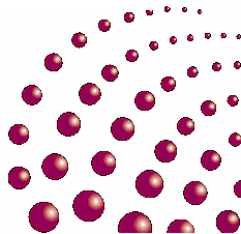
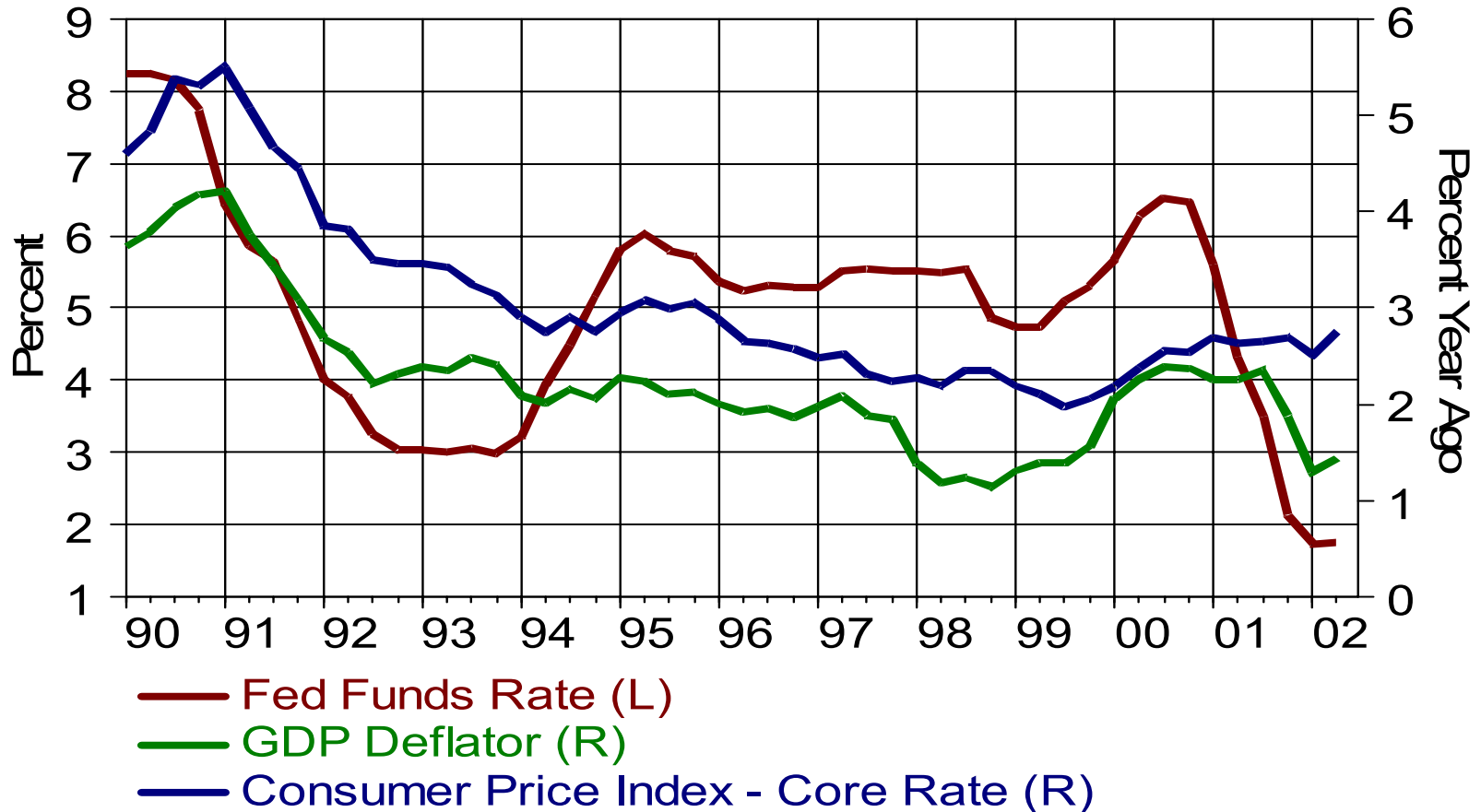


A 1990's Post-Game Show

- **THE INTERNET CHANGES EVERYTHING!**
The E-communications surprise – sociology meets technology and economics
- Telecommunications Act of 1996.
- The Y2K Effect.
- Dot.com mania
- Interest rates do affect liquidity and real investment –
Are we all Keynesians now?

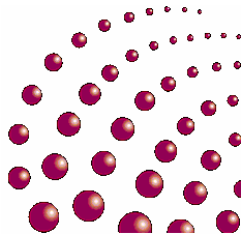


Chasing Inflation?



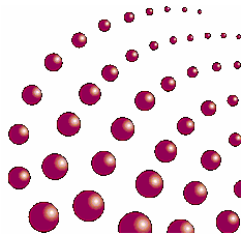
Behind U.S. Communications Growth

- It's about *internetworking*!
 - Increasing information, volumes of electronic communications and transactions in enterprise and in consumer markets.
 - Complementarities with suppliers, reducing lead times in production and cost reductions in inventory management.
- Deregulation and increased competition.
- New technologies and infrastructure investment and the expansion of private networks.
- Expanded wireless demand and capacity.



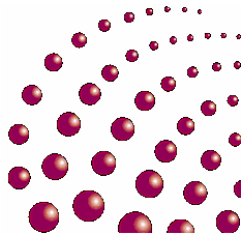
The Smoking Gun – What We Think We Learned

- Productivity growth followed on the heels of investment in technology but not necessarily overnight.
- The current economy is structurally more competitive than the oligopolistic economy of administered pricing and markups.
 - Technology lowers entry barriers and leads to more competition and deflationary price pressures on supply side.
 - Lower search costs create deflationary price pressures on demand side.
 - Lower search costs and more competitive labor markets reduce labor market frictions.



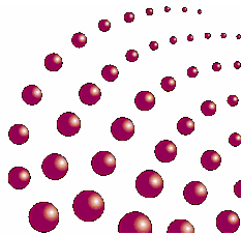
Outlook for Communications/IT

*The Near-Term View:
What's Wrong With Telecom and When
Will Capital Expenditures Come Back?*

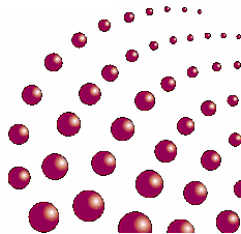
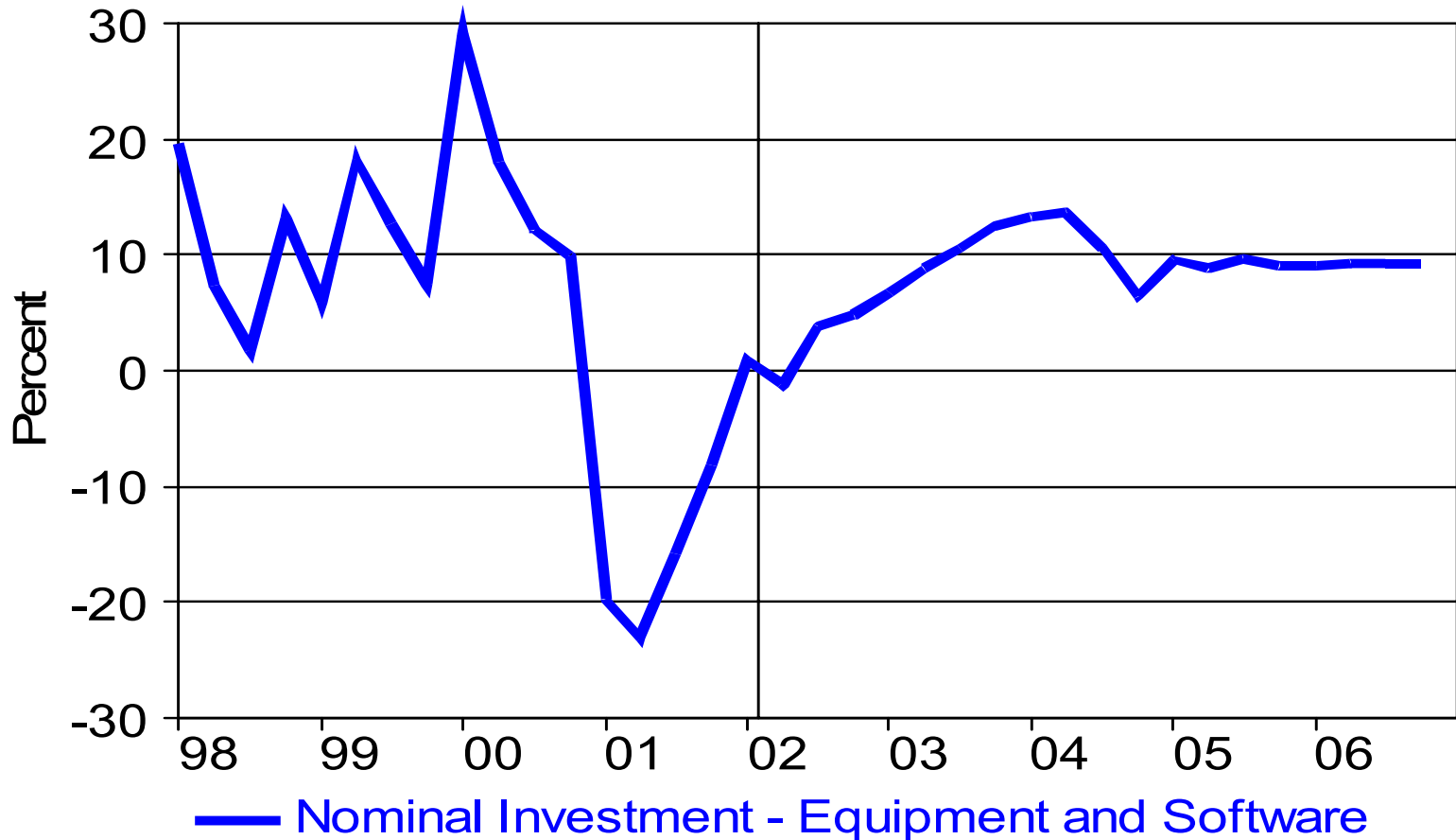


“It’s The Economy, Stupid”

- The demand for telecommunications services is, after all, a derived demand and coincident with the economy. The growth in end-user demand shows up in key indicators none of which are very good right now.
 - Slow, declining access line growth
 - Reduced traffic volumes relative to capacity
 - Lower average revenues per line, per user
- The aggregate economy has a direct effect on service provider financials. Capital expenditures will lag the recovery but it might take longer this time because of the buildup of the capital stock in the late 1990’s.

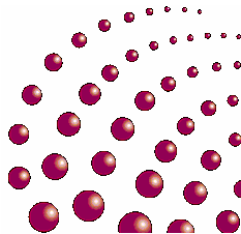


Growth in Nominal Capital Spending



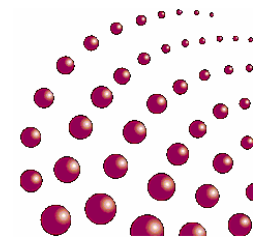
Sources of Concern: Why a Slow Recovery

- Cyclical pressures on carrier revenues.
- Large capital stock (capacity) from the late 1990's.
- Competition, price reductions and pressure on margins.
 - Long distance prices in free fall because entry and competition in LD markets, and because of increasing wireless share of traffic.
 - Local telecom service prices are capped. Carriers are experiencing line losses and traffic leaks to wireless.
 - Wireless competition creates pricing pressure and churn, adversely affecting margins.



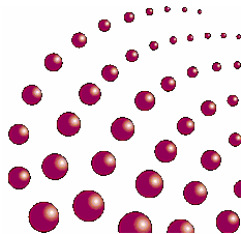
Near Term Strengths and Weaknesses

- Relative Strengths
 - Capital spending by wireless carriers will continue to drive investment in the industry as 3G networks are built out. Wireless LAN spending is picking up.
 - Cable companies continue to invest in broadband communications targeted to the commercial market.
 - PC growth is stronger and higher speeds and greater memory bundles will begin to displace older stock.
 - Networking equipment is cheap and it's a good time to buy. Look for positive but not overly robust growth.



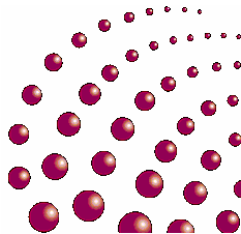
Near Term Strengths and Weaknesses

- Relative Weaknesses
 - Capital spending by wireline carriers will be flat in the near term and based on customer requirements. There is a lot of under-utilized capacity in public and private networks.
 - Large scale CRM and systems will not likely be put in place until profitability stabilizes.
 - Earnings are generally abysmal.



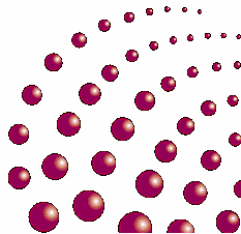
Collateral Damage from the Recession

- Slower Internet development and slower competition
 - CLEC retreat and retrenchment.
 - Less innovation in content and delivery.
 - CLEC fallout slows ventures with ISPs and reduces the intensity of local competition.
 - DSL growth may retard somewhat despite the penetration of cable modem service. Satellite and fixed wireless services have potential in more rural areas.



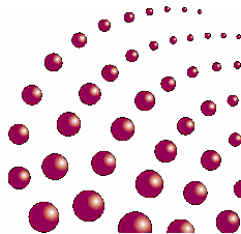
Outlook for Communications/IT

*The Longer Run:
DRI•WEFA Assumptions and Aggregates*



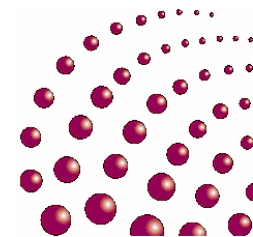
DRI•WEFA Framework for Financial Markets

- Economic Structure
 - Sales, Cash Flow, Margin
- Financial Structure
 - Debt, Interest Coverage, Liquidity
- Event Risk Analysis
 - Input dependence
 - Technological vulnerability
 - Public Policy Exposure
 - Competitive Intensity
 - Macroeconomic Conditions



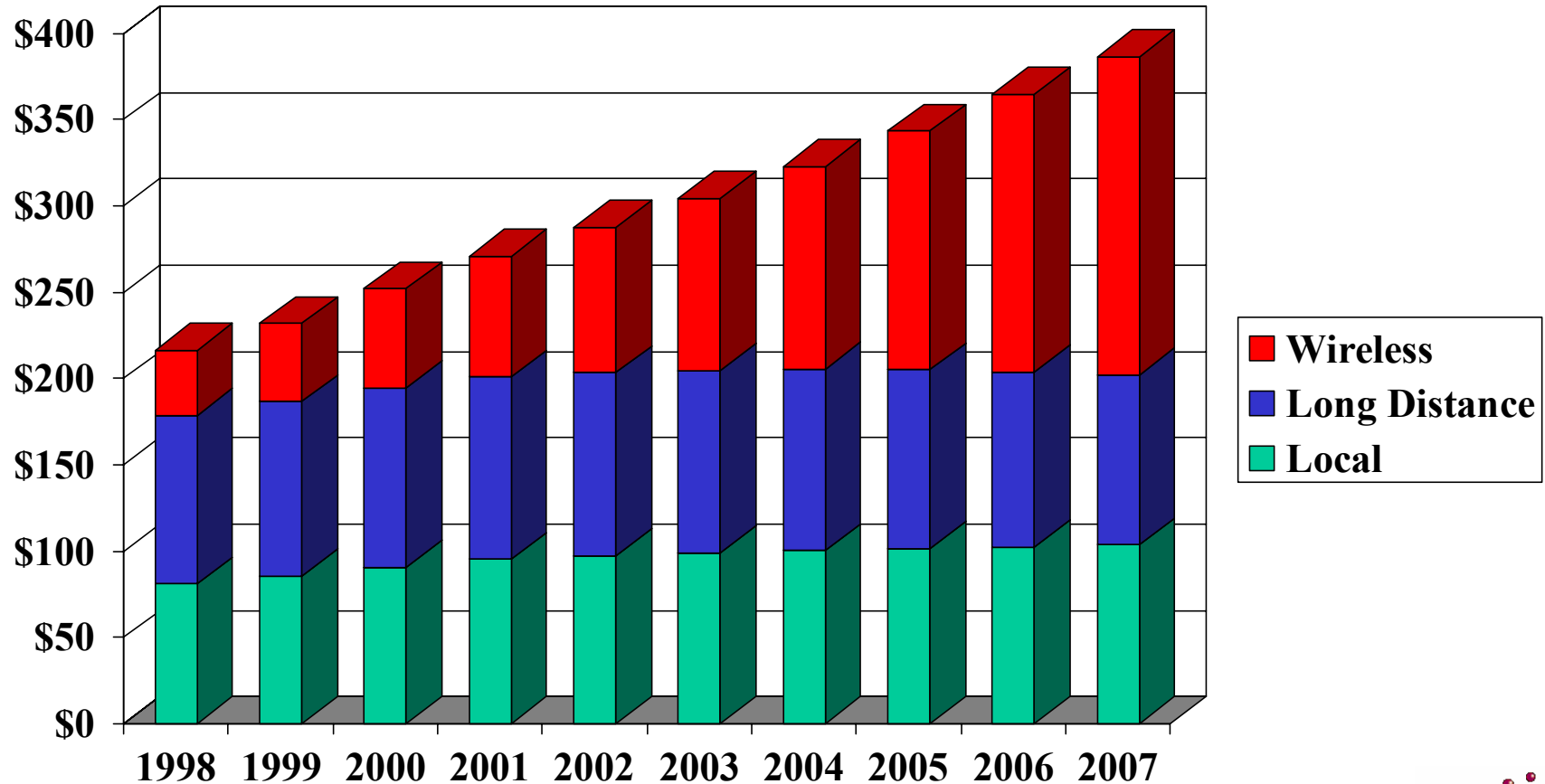
Industry Structure

- Entry by RBOCs and continuing mobile usage will further erode pricing r in long distance service.
- Weaker growth in CLEC penetration and increased line and traffic losses to mobile services will lead to flat revenue growth in local exchange markets.
- With no consolidation among mobile carriers, usage bundles may reflect marginal changes (e.g, peak/off-peak, incentives for same network usage), but will not raise ARPU for voice services.
- Growth in consumer applications, enterprise adoption and complementary uses of 802.11 LANs will drive data services growth in mobile communications and help high-speed development.

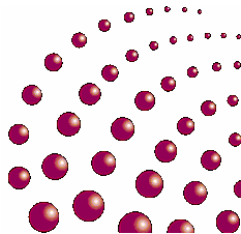


Telecommunications Services

\$ Billions

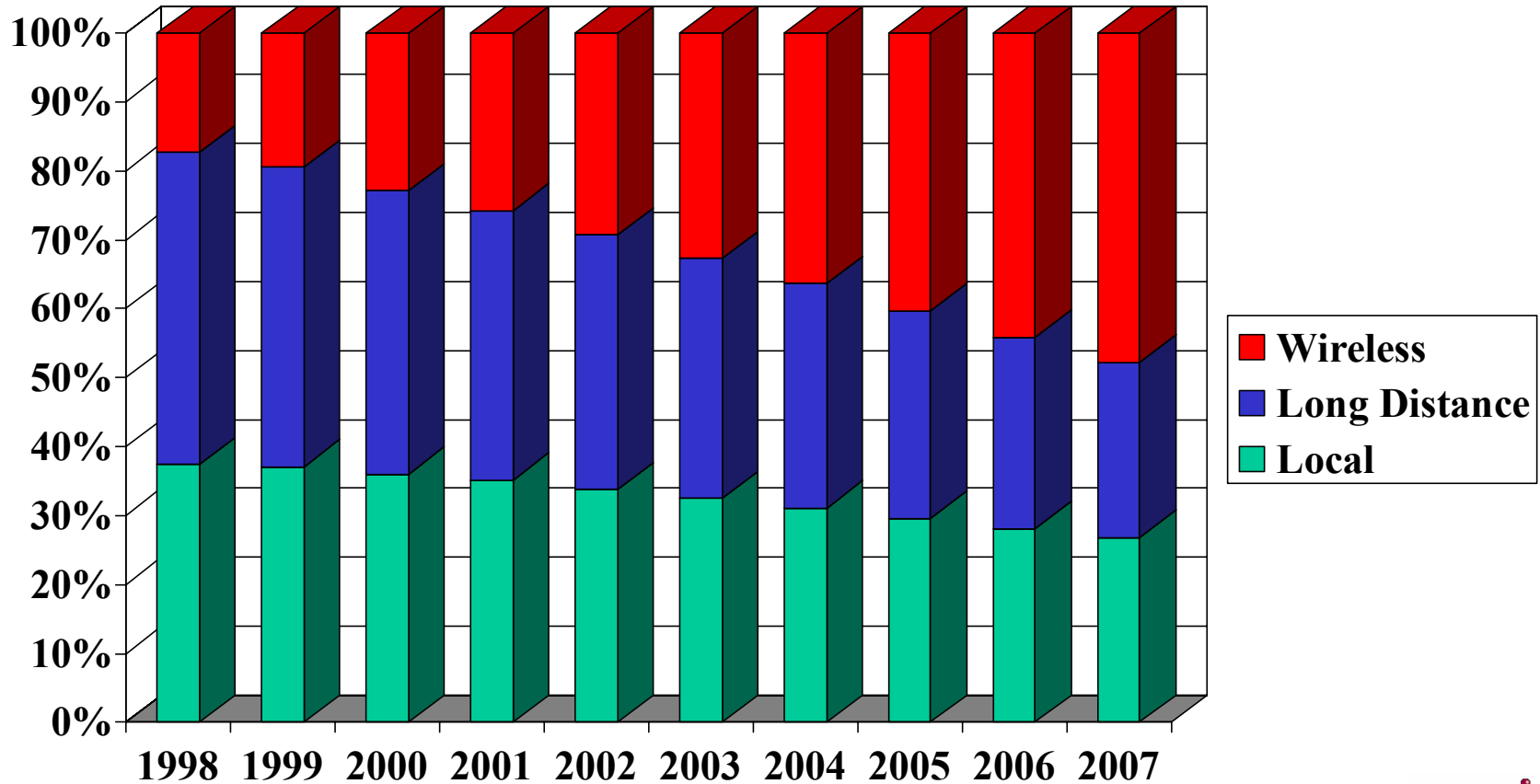


Source: DRI•WEFA

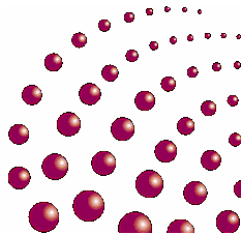


Telecommunications Services

\$ Billions

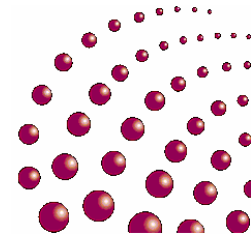


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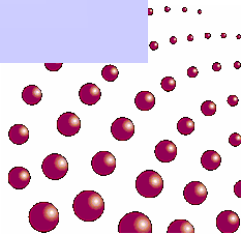
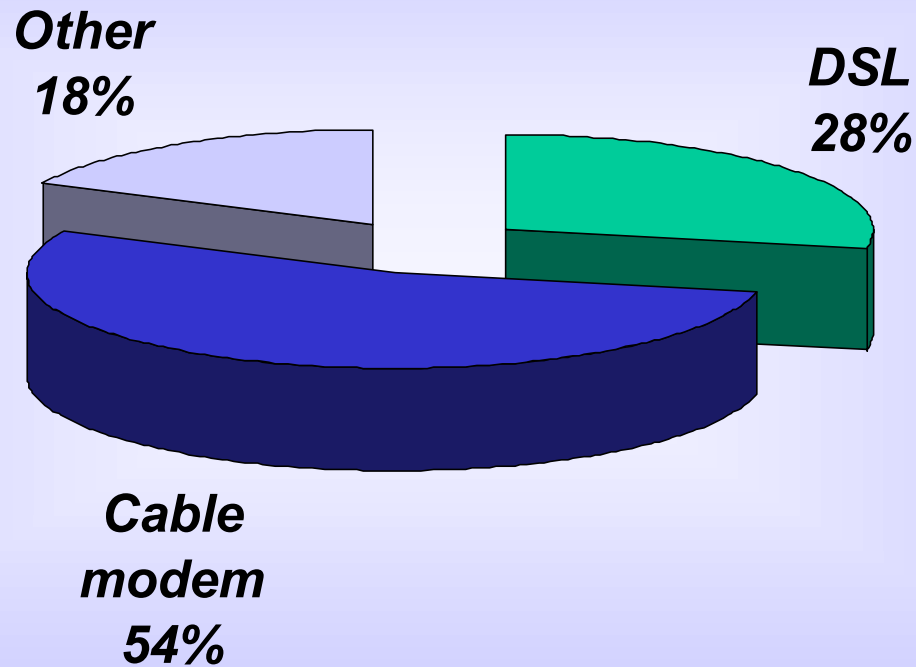


Industry Structure

- *With current technology and regulatory policy, major cable MSOs will continue to lead high-speed development in consumer markets.*
- Major cable MSOs will exploit infrastructure to provide data services in commercial markets. VoIP piggybacking over the forecast horizon will lead to full service competition in local exchange markets.

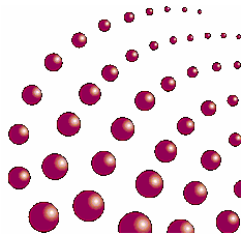


High-Speed Lines – June 2001



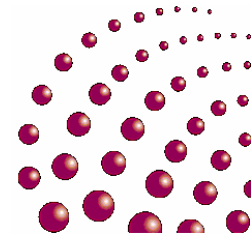
Inputs and Other Dependencies

- Vertical relationships will be central to exploiting network effects.
 - Ventures between major equipment providers and carriers in providing end-to-end enterprise IP based voice, data, and video services.
 - Alliances between carriers, portals, and retail electronic equipment distribution should reinvigorate high-speed services to consumer markets.
- Horizontal relationships are “just around the corner”?
 - Declining prices in long distance and mobile services are not sustainable.
 - Equipment manufacturers have loads of capacity.



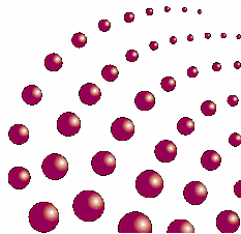
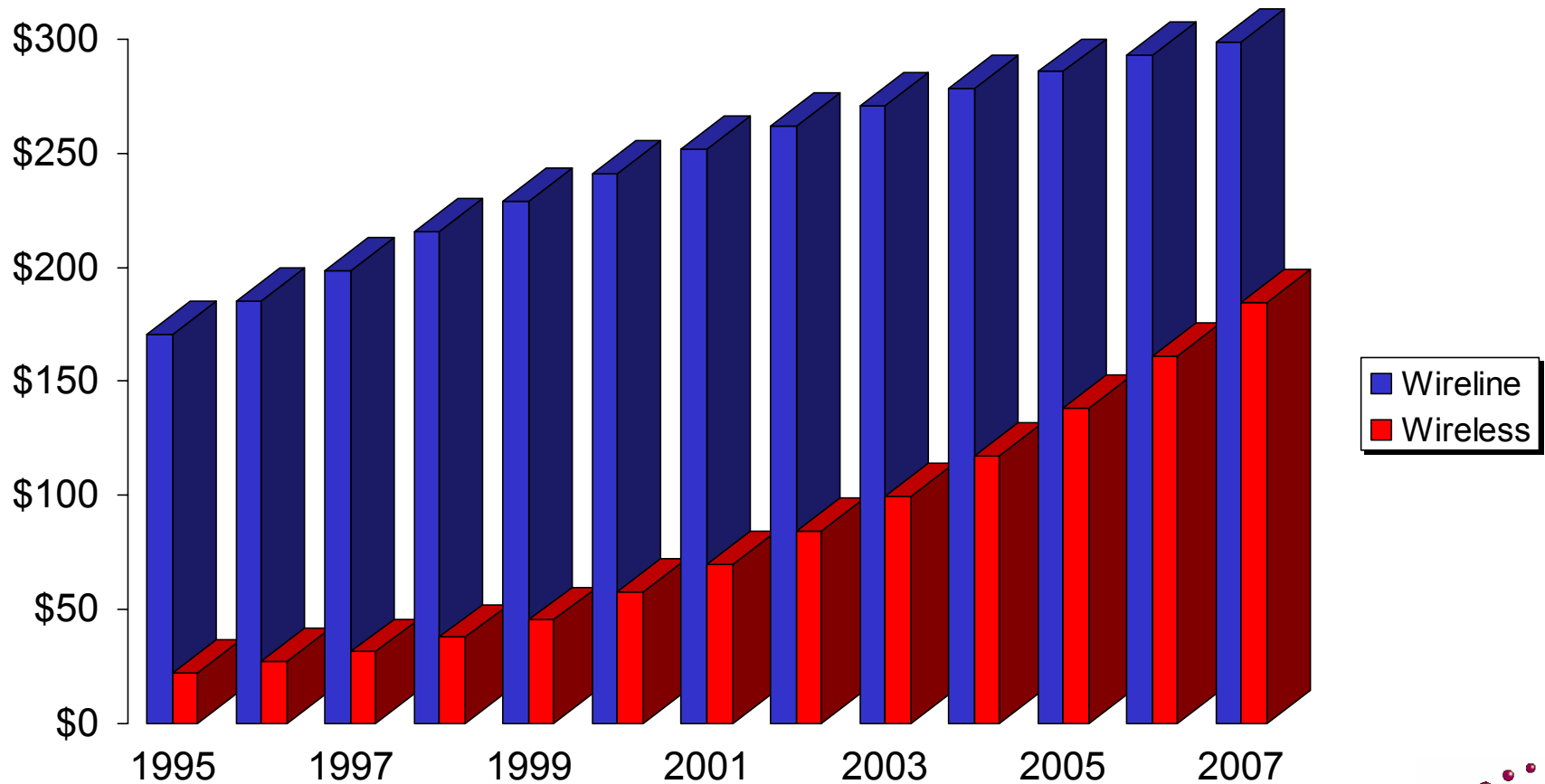
Technology Trends/Risks

- Five trends that will continue to cause seismic shifts in industry structure and investment are:
 - Shift to IP based distribution from circuit switched distribution technology.
 - Shift to data communications from voice.
 - Shift to wireless communications technologies from wireline.
 - Shift to broadband from narrowband communications.
 - Shift from desktop applications to network and Web-based applications



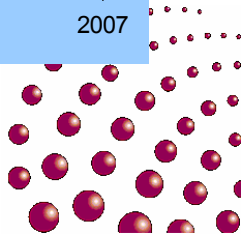
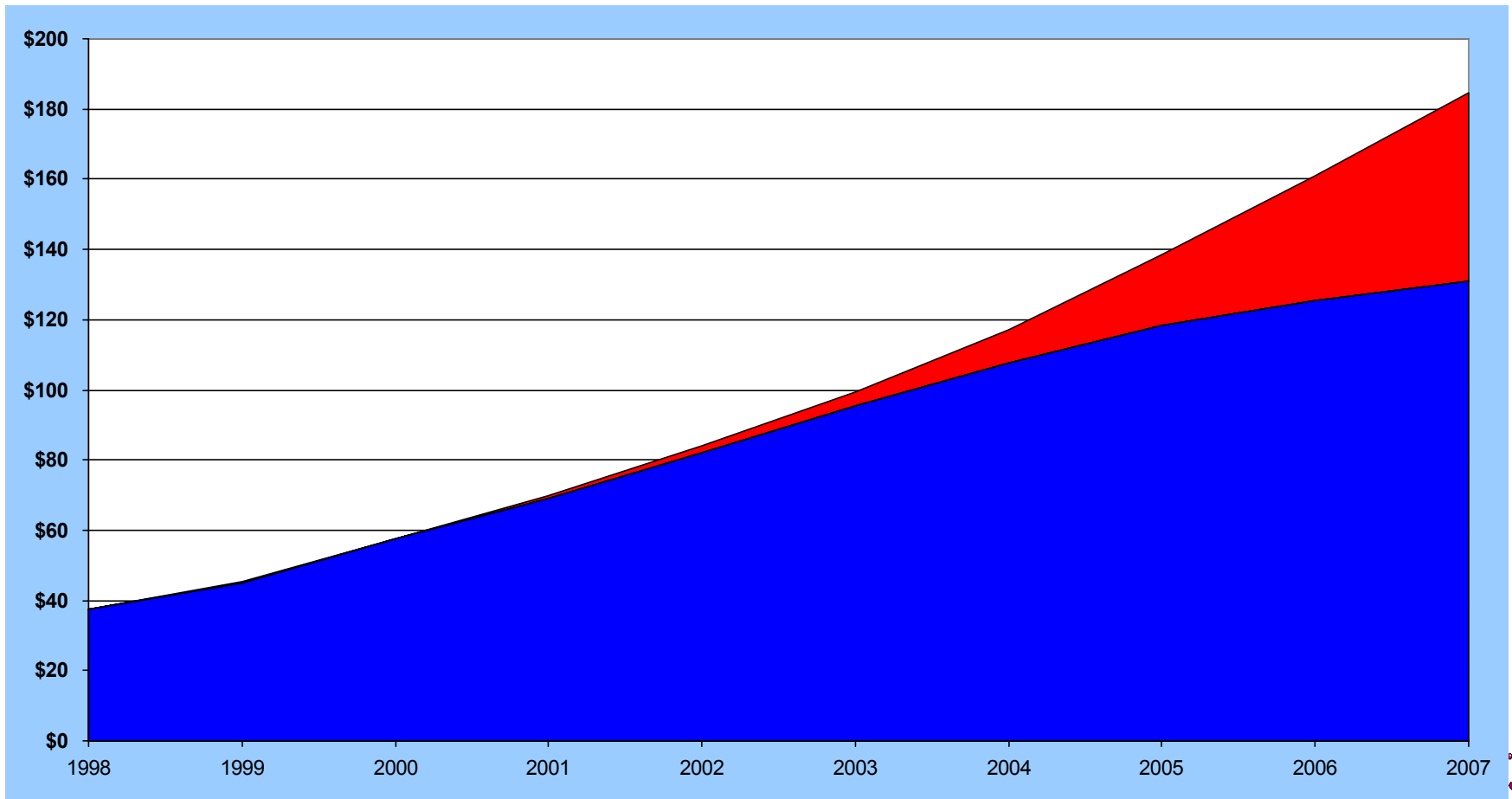
Wireless/Wireline

\$ Billions



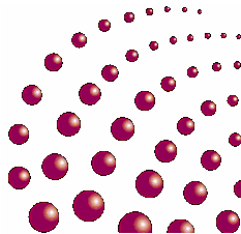
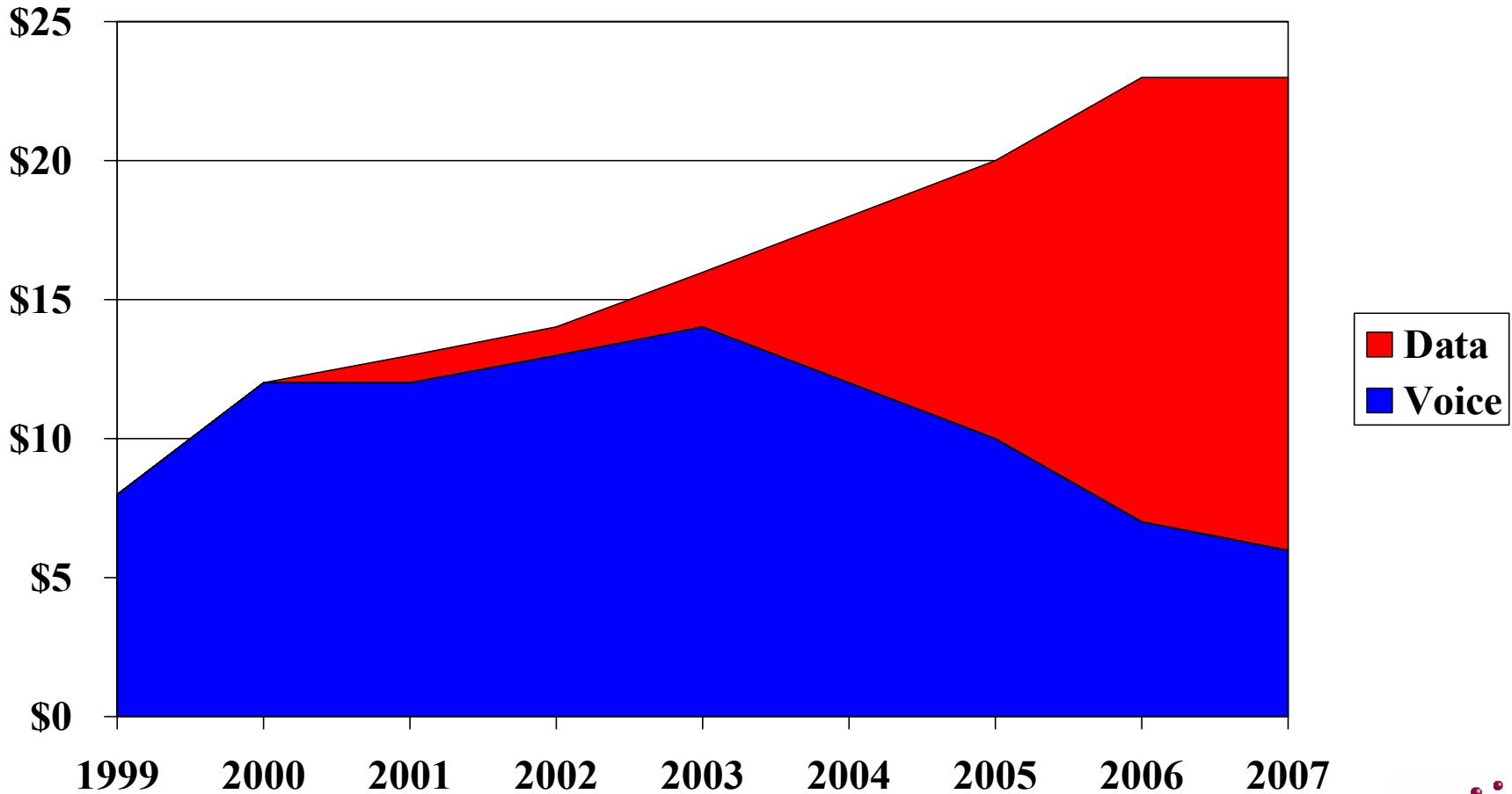
Wireless Revenue Mix

\$ Billions



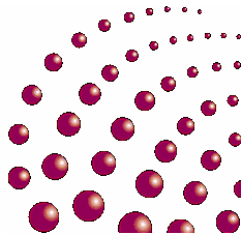
Contributions to Growth in Wireless

\$ Billions



Technology Trends/Risks

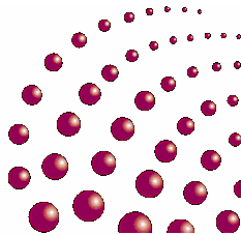
- Risks
 - How long can legacy systems be maintained without substantial new capital investment?
 - Negative effect on carriers who face disruptive new technologies.
 - Potential positive for new capital investment.
 - How long can the current stock of computers and software be maintained?
 - If old capital interacts with Web-based applications, obsolescence might be extended.



Macroeconomic Risks

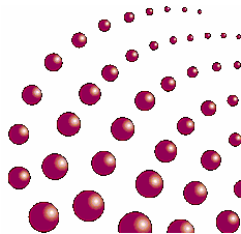
Downside risks

- Confluence of weak economy on revenues, a few more Chapter 11 filings, and unavailable financial capital could slow capital investment even further.
 - Potentially beneficial mergers in wireless markets might otherwise be avoided.
 - Fire sales on network assets in financially distressed companies could affect asset values in the industry.
 - Not a healthy time for raising new capital, IPOs.



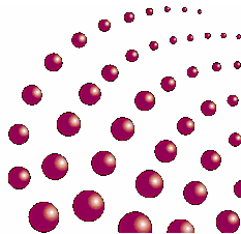
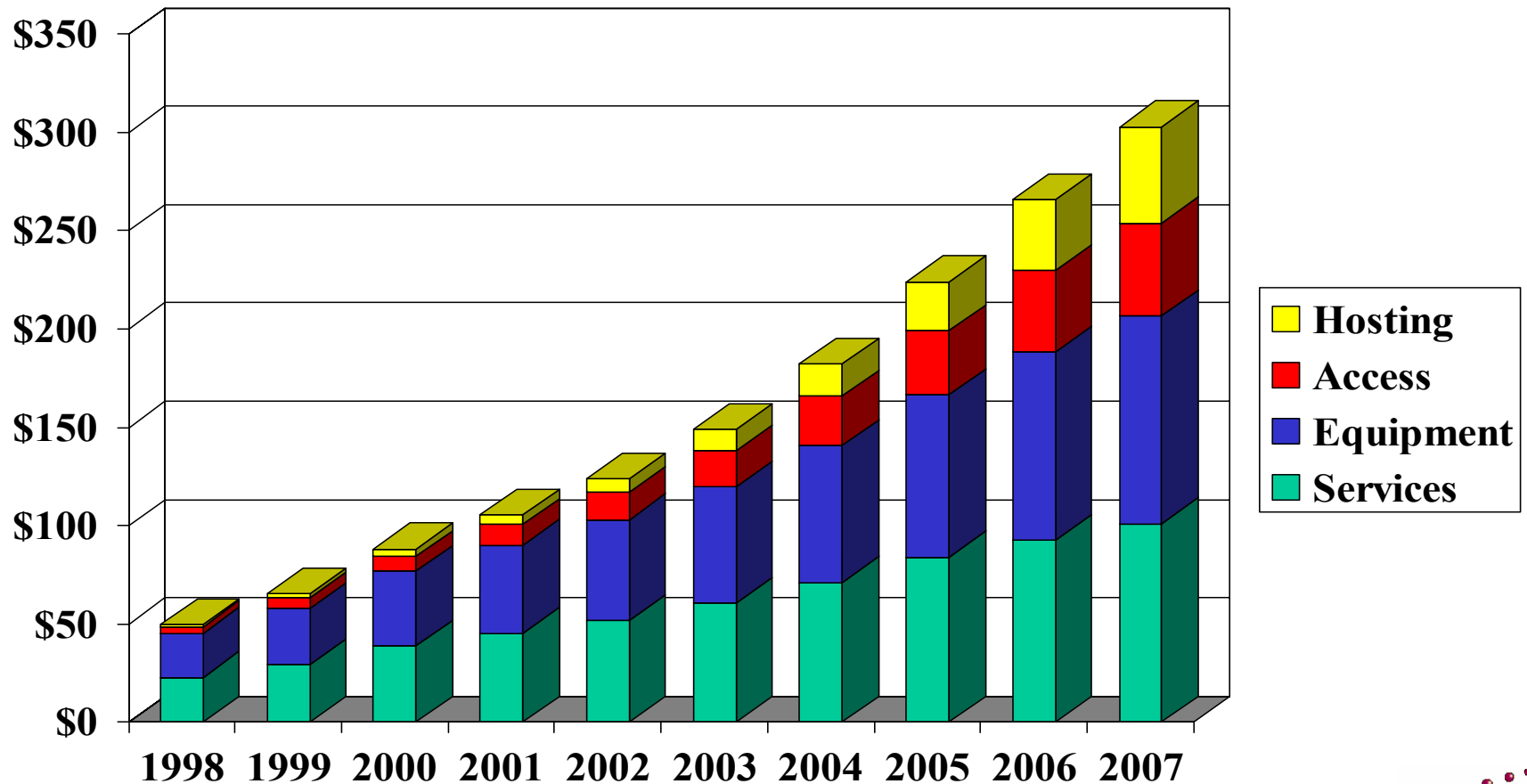
Other Risks

- Public Policy
 - We assume that the FCC will continue current policy until Congress decides otherwise.
 - Slower CLEC development and DSL rollout by ILECs.
 - Asymmetric regulation gives cable greater advantages in high-speed development.
- The Post-9/11 Environment
 - Public sector investment in networking equipment and services will accelerate further.
 - Security will be a key driver of hardware and software investment.



Networking and Web Services

\$ Billions



Bibliography

