Part I

Industry overview

Industry revenues (US$ million)

Service diffusion (no. subscribers)

Stock market indices

Telecom industries: basic data

Source: FCC

Source: FCC, NCTA, CTIA, Nielsen

Sources: FCC, NCTA, CTIA, own research.
Economics of telecom

- **Economies of scale** (upfront investment, technological change)
- **Economies of scope** (enhanced by digitization and convergence)
- **Network effects and externalities**
- **Coordination, complementarities**
- **Public and merit good aspects**
- **Layered structure** (physical, logical, content)

Recurring policy issues

- **Prevention of abuse of market power**
  - Avoid exploitative pricing practices
  - Prevent unfair competitive strategies
- **Facilitate innovation**
- **Secure the provision of universal service**
  - Availability of basic service to all Americans
  - Affordability of telecommunication services

Part II

**Co-evolution of technology and regulation**

Historical highlights

- **Phases of monopoly and competition**
  - Monopoly by patent (1876-1893/6)
  - Competition (1893/6-1907)
  - Consolidation (1907-1934)
  - Monopoly (1934-1970s)
  - Transition to competition (1970s to present)
  - Competition (1996-present)
- **Telecommunications industry embraced regulation early in 20th century**
- **Very gradual de-regulation process**

Technological basis

- **Switched (or routed) networks; traffic flows along pre-specified paths**
- **Digitalization, storability of information**
- **Multiple technological platforms**
  - PSTN, wireless, cable TV, can provide voice, data, audio, video services ("convergence")
  - Different technology and cost conditions
- **Interactive, retrieval, push services**
- **Continued rapid technological change**

Differentiation

<table>
<thead>
<tr>
<th>Year</th>
<th>Technology</th>
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<tbody>
<tr>
<td>1850</td>
<td>Telephone</td>
</tr>
<tr>
<td>1880</td>
<td>Telephone</td>
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<tr>
<td>1910</td>
<td>Telephone</td>
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<td>1940</td>
<td>Telephone</td>
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<td>1970</td>
<td>Telephone</td>
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<tr>
<td>1990s</td>
<td>Telephone</td>
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Past: monopoly network

<table>
<thead>
<tr>
<th>Past: monopoly network</th>
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<tbody>
<tr>
<td>Local service</td>
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<tr>
<td>State jurisdiction</td>
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</table>

Key policy issues

- Coping with market power of big telephone companies
  - Avoid exploitative pricing practices
  - Prevent unfair competitive strategies
- Secure the provision of universal service
  - Availability of basic service to all Americans
  - Affordability of telephone services

Present: network of networks

<table>
<thead>
<tr>
<th>Present: network of networks</th>
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<tbody>
<tr>
<td>Internet backbone</td>
</tr>
<tr>
<td>Satellites</td>
</tr>
<tr>
<td>Wireless</td>
</tr>
<tr>
<td>LEC A</td>
</tr>
<tr>
<td>Multiple IXCs</td>
</tr>
<tr>
<td>LEC B</td>
</tr>
<tr>
<td>Dedicated line</td>
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<tr>
<td>Firm</td>
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<tr>
<td>Private Line</td>
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</tbody>
</table>

Key policy issues

- Delineation of monopoly and competitive parts of industry
  - Customer premises equipment (1956-1980)
  - Private networks (1959-1976)
  - Value-added/information services (1966-1989)
  - Long distance and international (1968-1984)
  - Mobile communications (1983-present)
  - Local services (late 1980s-present)
- AT&T divestiture (1984-- DOJ, not FCC)
- Maintenance of seamless network

Integration

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<thead>
<tr>
<th>Integration</th>
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<tbody>
<tr>
<td>Time</td>
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<tr>
<td>1980s</td>
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<tr>
<td>PSTN</td>
</tr>
<tr>
<td>Telex</td>
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<tr>
<td>Circuit data</td>
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<tr>
<td>Packet data</td>
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<tr>
<td>Leased lines</td>
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<tr>
<td>LANs</td>
</tr>
<tr>
<td>Conferencing</td>
</tr>
<tr>
<td>Sound &amp; TV</td>
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</tbody>
</table>

Future: distributed network

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Physical layer</td>
</tr>
<tr>
<td>Backbone network</td>
</tr>
<tr>
<td>Other IP networks</td>
</tr>
<tr>
<td>Access</td>
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<tr>
<td>Access</td>
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<tr>
<td>Access</td>
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<tr>
<td>CATV</td>
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<tr>
<td>Special purpose networks</td>
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<tr>
<td>Special purpose networks</td>
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<tr>
<td>Fixed</td>
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<tr>
<td>Mobile</td>
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<tr>
<td>Backbone network</td>
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<tr>
<td>TCP/IP or other protocols</td>
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<tr>
<td>Logical layer</td>
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<tr>
<td>Content, applications layer</td>
</tr>
<tr>
<td>Voice</td>
</tr>
<tr>
<td>E-mail</td>
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<tr>
<td>Content</td>
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<td>Transactions</td>
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<tr>
<td>Games</td>
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Key policy issues
- Facilitation/preservation of competition and maintenance of seamless network
- Regulatory measures
  - Interconnection
  - Unbundling of networks and services
  - Third party access (platforms, application program interfaces, ...)
  - Limited price regulation
  - Universal service support
- Antitrust measures

Constitutional framework
- Free enterprise and the protection of private property (5th & 14th Amendment)
- Federal regulation is rooted in the commerce clause of the constitution
- State regulation is rooted in the police powers of the states
- Federal structure of U.S. government:
  - Interstate and international/issued federal jurisdiction
  - Intrastate issues state jurisdiction

U.S. Supreme Court decisions
- Between 1877 and 1934 gradual shift from a narrow interpretation of a “business affected with a public interest” to a broad endorsement of the power of legislatures to regulate private industry
  - Munn v. Illinois (1877)
  - German Alliance Insurance v. Lewis
  - Tyson & Brother v. Banton (1927)
  - Williams v. Standard Oil Co. (1928)
  - New State Ice Co. v. Liebman (1932)
  - Nebbia v. New York (1934)

Supreme Court decisions ...
- Initially, the Court also attempted to define substantive guidelines for public utility regulation (e.g., standards for valuation of utility plant)
- However, in the Hope case (1944), the Court decided that it is the end result and not the method that needs to be considered in judging whether a regulatory outcome is compatible with the constitution (“end result doctrine”)
- The Court also upheld that regulatory agencies are “creatures of the legislature” and have only the authority vested in them by statute

Obligations and rights
- Obligation to serve on non-discriminatory terms
- Provision of safe and adequate service
- Rates need to be “just and reasonable”
- Public utilities have the right to charge rates that are not confiscatory (i.e., allow them an opportunity to earn a fair return)
- Public utilities enjoy a (limited) exemption from intra-industry competition
- Most public utilities have been granted the right of eminent domain
Statutory framework
- Shared federal and state jurisdiction
- Focus on economic regulation
- The FCC is empowered to:
  - Certify carriers (e.g., Sec. 214 Com Act)
  - Regulate prices (e.g., Sec. 201 205 Com Act)
  - Secure universal service funding
  - Adopt rules to facilitate competition
- Overarching goal: to serve the public interest, convenience and necessity

Part IV

Telecommunications Act of 1996

TC Act 1996: basic vision
- Competition will secure innovation and the NII. Regulation should actively promote competition
- Network of networks concept:
  - Multiple technological platforms have eliminated natural monopoly characteristic
  - Seamless integration desirable to maintain benefits of ubiquitous communications
- Vacated provisions of MFJ agreement

Asymmetric approach

Jurisdiction

<table>
<thead>
<tr>
<th>Type</th>
<th>Examples</th>
<th>Regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Services to ultimate customers</td>
<td>Interstate access &amp; toll intrastate access &amp; toll local service</td>
<td>Federal &amp; State</td>
</tr>
<tr>
<td>Services at wholesale</td>
<td>Interstate state toll and local</td>
<td>Federal &amp; State</td>
</tr>
<tr>
<td>Interconnection &amp; unbundled network elements (UNEs)</td>
<td>Loop elements, central office ports, interoffice transport, tandem, OSS, reciprocal compensation arrangements</td>
<td>Federal &amp; State</td>
</tr>
</tbody>
</table>

Duty of all carriers (Sec. 251(a))
- Telecommunications carriers (TCCs): Any provider of telecommunications services (except aggregators). Treated as common carriers
- Telecommunications services: Offering of service for a fee directly to the public ... regardless of the facilities used
- All TCCs have the duty to:
  - Directly or indirectly interconnect with the facilities of other telecom carriers
  - Not to install equipment complicating access
Duties of all LECs (Sec. 251(b))

- **Local Exchange Carriers (LECs):** Any person engaged in the provision of telephone exchange or access service. Includes both incumbent LECs (e.g., Ameritech, GTE) and newly founded CLECs (e.g., Brooks Fiber, LCI).

- Each LEC has the following duties:
  - **Resale.** The duty not to prohibit and not to impose unreasonable or discriminatory conditions on the resale of its telecom services.
  - **Number portability.** The duty to provide, to the extent technically feasible, number portability.
  - **Dialing parity.** The duty to provide dialing parity to competing providers of telephone exchange service and exchange access, and the duty to permit all such providers to have nondiscriminatory access to telephone numbers, operator services, directory assistance, and directory listing, with no unreasonable delays.
  - **Access to rights of way.** The duty to afford access to the poles, ducts, conduits ... at nondiscriminatory rates consistent with Section 224.
  - **Reciprocal compensation arrangements.** The duty to establish reciprocal compensation arrangements for the transport and termination of telecommunications.

Additional ILEC obligations

- **ILECs** are telecommunications carriers operating at the time of the passing of the FTA 1996.

- **ILEC obligations in addition to general and LEC duties** (Sec. 251(c)):
  - **Duty to negotiate.** The duty to negotiate in good faith interconnection and other agreements in accordance with the procedural rules of Section 252.
  - **Interconnection.** The duty to provide, for the facilities or equipment of any requesting TCC, interconnection with the LEC network:
    - For the transmission and routing of telephone exchange service and exchange access.

ILEC obligations ...  

- **Interconnection (continued):**
  - At any technically feasible point within the carrier's network.
  - At a quality that is at least equal to that provided by the LEC to itself or to any subsidiary, affiliate, or any other party to which the carrier provides interconnection.
  - On rates, terms, and conditions that are just, reasonable, and nondiscriminatory.

- **Unbundled access.** The duty to provide unbundled access in such a way that other carriers can combine the elements to provide telecommunications services. Minimum UNEs include: Network Interface Devices, local loops, local and tandem switches (software), interoffice transmission facilities, signaling and call-related database facilities, operations support systems & information, operator & directory assistance facilities.

Unbundled network elements

- **All ILECs have the duty to provide access to unbundled network elements (UNEs)** (Sec. 251(c)(3))
- **Network elements are “facility or equipment used in provision of telecom service”** (Sec. 3(a)(45))
Interconnection agreements

- Interconnection agreements are typically negotiated
- Have to be approved by PUC
- PUCs arbitrate or mandate agreement if negotiations fail

Typical provisions:
- UNEs and ancillary services
- Provisioning, ordering, maintenance
- Billing, recording, customer data
- Performance measurement and security
- Pricing of services
- Conflict resolution

BOC entry into long distance

- MFJ prohibited BOCs from offering InterLATA long distance services
- Sec. 271 ComAct 1996 allows immediate entry into out-of-region long distance markets (separate subsidiary)
- In-region entry into long distance contingent upon 14-point checklist, presence of competition and public interest test (FCC/DOJ/PUC)

Section 271 applications

- As of 1/15/03 39 applications were filed with the FCC to provide in-region interLATA service
  - 23 were approved, covering 44 states
  - 2 applications were pending
  - 9 were withdrawn voluntarily
  - 5 (including Michigan in 1997) were denied
- Important lever to enforce local competition rules

Facilitation of new entry

- Interstate and international services:
  - Facilities based carriers and resellers have to register at the FCC before they can enter domestic interstate market. Can file tariff voluntarily.
  - For international service, a certificate of convenience and necessity according to Sec. 214 Com Act continues to be necessary
- Intrastate rules differ widely but have become much more relaxed

14-point checklist (Sec. 271(c)(2)(B))

- Interconnection (Sec. 251, 252)
- Non-discriminatory access to UNEs
- Non-discriminatory access to rights-of-way owned or controlled by the BOC
- Local transport from the trunk side of a wireline LEC switch unbundled from switching or other services
- Local transport from the trunks side of a wireline LEC switch unbundled from switching or other services
- Local switching unbundled from transport, local loop transmission, or other services
- Non-discriminatory access to 911 and E911 services, directory assistance, and operator call completion
- Interim number portability and later compliance with FCC regulations re number portability
- Non-discriminatory access to services and information that are necessary to allow requesting carriers to implement local dialing parity
- Reciprocal compensation arrangements
- Telecommunications services are available for resale

Cable-telco cross entry

- Elimination of cross-entry barriers between cable TV and telcos
  - Telcos can enter region cable TV under traditional franchising rules, Open Video System (OVS) rules, or via wireless cable
  - Cable companies and telcos can hold up to 10% ownership stake in each other
  - FCC intention to enforce 30% national ownership limit for cable
- Unbundling obligations for cable?
Fostering of competition

- BOCs can only offer competitive services via separate affiliates (Sec. 272).
- FCC has to forbear from enforcing rules that may inhibit competition
- Biannual review of all common carrier regulations
- American Numbering Plan:
  - Area code reform
  - Number management

“Porous” model

Alternative: EU framework

| Services provided over networks (e.g., broadcasting services, electronic banking, e-commerce) | Regulated by other measures at EU and national level |
| Associate services (communications services and access services, e.g., telecom services, CAS) | Regulated under new framework for communications infrastructure and associated services |
| Communications infrastructure (networks and associated facilities, e.g., cable TV networks, APIs) | |

Source: EC, 1999 Communications Review.

Part V

Experience

Status of local competition

- FCC local competition report (2/02)
  - Fixed local competition has evolved slowly
  - CLECs have combined market share of 9%
  - Predominantly serve large and medium businesses and institutional customers
    - CLECs 55% of access lines business
    - ILECs 23% of access lines business
  - Carrier competition dominant
  - 90% of U.S. population two or more LECs
- Most significant competition inter-modal

State of competition

- The stated goal of the TC Act was the introduction of competition into the local markets and the expansion of competition in deregulated areas
- Competition has unfolded much slower than anticipated, with only 9% of all customers served by CLECs
- Points to significant technological and economic barriers to entry
Forms of competition

December 2000

June 2001


CLECs

- Encouraging observations
  - 375 CLECs entered the market
  - Investment in new infrastructure
  - Increased customers and revenues
  - Deployment of broadband services

- Reasons for continued concern
  - Pattern of anticompetitive behavior of ILECs
  - Continued concentration in local market
  - Mergers and acquisitions between ILECs

Fixed voice prices


Mobile

- Until 1994 analog service duopoly
- Initially slow development of digital due to technical fragmentation

Innovative pricing plans

- Self-selection plans (but limited prepaid)
- “Bucket of minutes” plans since 1998 have initiated fierce price competition
- Flat-priced local mobile service plans

Fixed carriers have reacted by introducing flat national calling plans

Cable telephony

- Only 1.5 million customers, i.e., less than 1% (2001)
- Higher penetration in selected cities (e.g., Lincoln, NE >50%)
- Much higher penetration abroad (e.g., UK 15%)

Determinants of competition

- Mature and high-quality existing network
- Technological and cost conditions
- Limited degree of price rebalancing
- Ability of incumbent to retaliate easily
- Profit margins too low given market conditions (real options approach)
- “Bias” of regulatory framework toward resale and co-carrier competition
Industry consolidation

- 7 RBOCs reduced by mergers to 4
  - SBC merged with Pacific Telesis & Ameritech
  - Verizon from Bell Atlantic, NYNEX (and GTE)
  - Bell South
  - Qwest (U.S. West and Qwest)


- Rampant fraud & misrepresentation