

215

An Overview of Telecommunications
in the United States of America

Eli M. Noam

Do not quote without permission of the author.
c Oct. 1988. Columbia Institute for Tele-Information

Columbia Institute for Tele-Information
Graduate School of Business
809 Uris Hall
Columbia University
New York, New York 10027
(212) 854-4222

Table of Contents

I.	History	1
II.	Transformation of Telecommunications Policy	7
III.	Regulatory Structure	9
IV.	The Network System	18
	a. Local Service	
	b. Long-distance Service	
	c. International Carriers	
V.	The Electronics Industry	25
VI.	Competition for Local Service	32
VII.	Value-Added Networks	37
VIII.	ISDN in the United States	42
IX.	International Services	46
X.	Empirical Evidence for the Impact of Deregulation and Divestiture	62
XI.	Impact on the Long-distance Market	66
XII.	Impact on the Equipment Market	69
XIII.	Outlook	71

I. HISTORY

Telecommunications in the United States began in 1836 with Samuel Morse' telegraph. Early attempts by Morse to have the US Congress or the US Post Office take a lead in telegraphy failed, leaving Morse to depend on the backing of private financiers. Within a short time, Morse's invention was joined by other private systems, those of Bain and House, which competed for telegraph service. By 1850 considerable competition existed within the industry and the race began to wire the nation from coast to coast.

Morse was able to merge with the owners of the Bain system after winning a patent infringement suit and consolidated its share of the market. In 1851, the New York and Mississippi Valley Printing Telegraph Company was formed merging with House, becoming the primary competitor to the now Morse-Bain company. These two firms dominated the industry until the Civil War in 1861 by merging with smaller firms and aggressively expanding their construction of lines. The New York and Mississippi Company, now renamed Western Union, was successful at securing protective rights-of-way with Railroad Companies and patents, and also acquired Bain patents, and became the dominant carrier. Western Union enjoyed healthy profits and a strong monopoly position. By 1876, the year of the telephone's introduction, it had 200,000 miles of lines, and 7,500 offices. (Brock, Gerald W., 1981, The Telecommunications Industry. Cambridge: Harvard University Press.) However, its high prices and newer

developments in technology allowed small competitors to enter niche markets and eventually combine to pose a threat to its dominance.

After the introduction of the telephone by Alexander Bell and his backers in 1876, Western Union at first chose to protect its own market rather than enter the new one. It considered the telephone as a complement rather than a competitor since the telephone was then limited to local service while the telegraph was primarily used for distances.

In 1881, Bell Telephone was able to pool important patents by purchasing Western Union rights and a substantial share of Western Electric, the latter's manufacturing operation. When the Bell patents expired in the mid-1890s Bell Telephone positioned itself to maintain its monopoly. This was accomplished by several means: vertical integration; development of interexchange long distance service; aggressive pricing strategies; acquisition of substantial competitors; acquisition of additional patents, especially in the area of customer equipment, making interconnection by alternative technology difficult; and in particular by preventing interconnection of rival local networks into Bell local networks and into the Bell (AT&T) long distance system.

By 1897 there were some 500,000 telephones in service across the United States, 80% of them by Bell Telephone. (Garnett, Robert W., 1985, The Telephone Enterprise. Baltimore: The Johns Hopkins University Press.) Independent competitors entered those

areas not serviced by Bell Telephone, especially rural ones or those suffering from high prices. In some cases, several systems -- a Bell and independents -- competed side by side with no interconnection. As the number of independents grew, they began to form regional agreements to provide service among themselves.

By 1907, the total number of telephones in the United States had grown to 6 million, and total investment in plant by Bell Telephone was over \$500 million. (Garnett, 1985) After a time, the entire independent telephone industry was nearly equal in size to Bell Telephone; robust competition existed not only in the provision of local service but also in the manufacturing of switching and customer equipment. The one main difference between the two segments, however, was interconnection. While the Bell Telephone system was fully interconnected on a national level through its long distance network, the independents operated on a fairly limited regional scale.

Despite its advantage in size over its nearest individual competitor, by 1907, Bell Telephone began to feel pressure from its competition. Its eroding market share led to less favorable support from the financial markets. Theodore Vail -- brought back by Wall Street financiers under the leadership of J.P. Morgan for a second tour as President of AT&T (as the entire company became known) -- devised a three-prong strategy to increase the market strength of his firm. It consisted of: aggressive mergers with telegraph companies and independent telephone companies; embracing of regulation in order to avoid anti-trust suits; and

increasing the amount of research and patents to acquire a technological hold. (Brock, 1981)

The Vail strategy took effect as competition in the industry was at its peak. Eventually, many independents chose to sell to AT&T because they could not survive direct competition. As the industry's growth rate stabilized, Bell's interconnected system and control of large urban areas gave it a noticeable edge over its competitors. Backed by Morgan, AT&T was also able to acquire a majority share of Western Union.

As AT&T grew rapidly during this period, independent companies remained which eventually brought anti-trust complaints against AT&T. As the number of suits mounted, AT&T chose in 1913 to negotiate a unilateral agreement with the US Justice Department, known as the Kingsbury Commitment. In it, AT&T sold off its share of Western Union, thus exiting from telegraphy. Second, it guaranteed existing independent telephone companies access to its long distance network. And third, it agreed not to expand by acquiring telephone competitors or their territories.

The Kingsbury Commitment did not confine AT&T's operations to those markets related to telephone service. Therefore, from 1913 to 1934, AT&T was able to strengthen its research activities and enter new industries such as commercial radio and sound movie technology.

By 1934, AT&T owned 80% of all telephones in the United States and operated the only national long distance network. Still under attack for its anticompetitive practices, AT&T once

again found itself making a deal with the government. As part of the Communications Act of 1934, which consolidated three earlier communications regulatory bodies into the Federal Communications Commission (FCC), AT&T gave up many of its patents in other lines of business such as radio in exchange for regulatory protection and preservation of its dominance in the telephone industry.

From 1934 to 1949 AT&T enjoyed relative stability except that its vertical integration into equipment was bitterly attacked by the Walker Report authored by one of the new FCC commissioners. Due to World War II, any follow-up to this report was delayed. The company kept ahead of threatening technological competition through its research unit, Bell Laboratories. Now, however, it sought regulatory protection from the FCC to prevent rivals from entering the signal distribution business. One such example was microwave transmission, where the FCC ruled that only companies licensed as common carriers could provide microwave service and non-common carriers could not interconnect with microwave networks, effectively closing the market to potential competitors.

AT&T's ability to keep new entrants out of its primary line of business and Western Electric's near monopoly on the manufacturing side of the business caused the US Justice Department to again file suit against AT&T on anti-trust grounds. The suit focused on the separation of regulated monopoly service and the unregulated equipment manufacturing business. It specifically called for AT&T to rid itself of Western Electric

and end all restrictive agreements between AT&T, Western Electric, and its operating companies.

Due to intervention by the Defense Department (during the post World War II and Korean War years) as well as a presidential election, the case was stalled until 1955. Finally in 1956, AT&T agreed to a consent decree in which the Justice Department specifically laid out its lines of business and operating conditions. While it was not forced to divest itself of Western Electric, AT&T itself could now operate only as a common carrier except where Western Electric was concerned. Western Electric was confined to conducting telephone related research and manufacturing operations. At the same time, AT&T was to establish, according to the Decree, a more liberal policy of licensing its patents. AT&T had succeeded once again in avoiding a costly and possibly disastrous antitrust case, but had also, once again, watched its routes of expansion close.

But the pressures of change could not be contained. New technologies and innovative uses of existing ones continued to emerge and their sponsors, seeking to compete, sought help from the FCC against AT&T. Between 1956 and the final law suit which resulted in the AT&T divestiture, rulings were made by the FCC which showed its willingness, on a case by case basis, to allow new entrants into the telecommunications business. The two key rulings in the area of customer premises equipment were the "Hush-A-Phone" (1956) and "Carterfone" (1968) cases. In both circumstances, the FCC ruled that non-AT&T equipment could be

attached to the network, and a minimum system of restrictions was developed.

Turning to services, in the 1959 "Above 890" decision, the FCC ruled that there was sufficient spectrum for private microwave carriers to provide point to point communications. By 1969, one microwave delivery company, MCI, won a court ruling which ultimately allowed all specialized common carriers to provide private line service. Soon, this was expanded into general service, with rights to interconnect with AT&T's local networks in order to reach customers. By 1975, AT&T found itself facing regular competition for the first time in 50 years.

II. TRANSFORMATION OF TELECOMMUNICATIONS POLICY

The policy changes were partly due to a general political and economical philosophy of reducing the role of the state which made government institutions more receptive to allowing new participants to enter. This philosophy of liberalization long preceded the conservative Reagan Administration. Inspired by Lockean principles of natural law, classic American ideology seeks individualism, fragmentation of private power, limitation of government (with the major exception of its role in national security), and protection of property rights and contracts. As applied to communications policy, this philosophy justified a governmental role that is far narrower than in most other countries, and based government's residual role largely on the grounds of market failure and national security.

In the 1970s and 1980s, telecommunications in the United States continued to undergo changes of structure and policy subsumed by the terms "deregulation" (actually "liberalization") and "divestiture." Through decisions by regulatory bodies (especially the Federal Communications Commission, the Justice Department, State Commissions, legislation, and court) the customer equipment market, previously dominated by AT&T was entirely opened, and telecommunications network services were substantially liberalized. As a result, in long distance transmission a number of alternatives to the traditional AT&T monopoly emerged. In the local distribution of telephone services and in switching competition also began to develop, at least for large users. In international communications, where a separation between record and voice service existed, restrictions were dropped.

The break-up of AT&T, the world's largest telecommunication organization, which had once controlled some 80% of the US communications market, was brought about by an antitrust suit of the United States Justice Department on the basis of unfair business practices to suppress its competitors, and it resulted in the most massive reorganization in business history. The divestiture agreement put AT&T's local operating companies, approximately two thirds of its assets and employees, into seven regional holding companies. These mostly provide traditional telephone service, but increasingly and aggressively looked for other opportunities inside and outside the communications field.

One of the major implications of the divestiture was that the operating companies, no longer linked to AT&T, were free to acquire equipment from producers other than Western Electric, AT&T's manufacturing subsidiary. In further developments, through several so-called "Computer Inquiry" decisions by the FCC, AT&T and the regional holding companies were permitted to enter new and unregulated markets such as data processing and computer fields. By the late 1980s, the FCC was in the process of dropping rate-of-return regulation and of instituting liberalized interconnection rules (Open Network Architecture).

Thus, America's well-ordered system of one large monopoly telephone carrier, one domestic telegraph company, and a handful of international telegraph companies was transformed within a few years into a complex system with a bewildering number of players and institutions.

III. REGULATORY STRUCTURES

For all the talk of deregulation, the number of regulatory bodies, in two senses of the word, is larger in the US than anywhere in the world. The basic framework of government involvement in US telecommunications is complex. The public sector does not own or operate civilian telecommunications services, except for a few small municipally-owned cable television operations, rural telephone systems, and educational television broadcasting stations. Although almost all civilian telecommunications facilities are privately owned, their use is

often -- but not always -- subject to licensing and regulatory oversight. These regulations are set on the federal, state, and occasionally local level.

Federal policy emanates mainly from the Federal Communications Commission (FCC), a body of five commissioners appointed by the President but thereafter independent from the Executive. It operates as a hybrid within the American constitutional order, with legislative powers (adoption of regulations), executive authority (enforcement of its rules), and a judicial role (adjudication of cases). The Commission allocates frequencies and regulates all broadcasting, satellite, and other civilian uses of the electromagnetic spectrum. The FCC is also in charge of interstate telephony -- that is, transmissions from one state to another - and everything affecting interstate communications. The FCC has also some jurisdiction over cable television.

State regulatory commissions (Public Service or Public Utility Commissions) -- which also are independent in status -- play an important role in regulating intrastate telephony, and in some instances also cable television. In most states, commissioners are appointed by the governor, in others they are elected for state-wide office every few years. Municipal authorities regulate cable television through their powers to grant franchises to lay cable in their streets.

On the federal executive level, the Commerce Department's National Telecommunications and Information Administration (NTIA)

helps to coordinate the Executive Branch's overall telecommunications policy. It plays a role in international communications, together with the Office of U.S. Trade Representative and the State Department, which is the lead agency in international negotiations. Despite its international visibility, the NTIA cannot match the FCC's domestic regulatory powers.

In addition, the Executive Branch's Department of Justice plays a major role through its Antitrust Division, which oversees much of the telephone industry by way of enforcing the 1982 court order which broke up AT&T. The primary authority in that case is federal district court Judge Harold Greene, who frequently decides whether telephone companies and other parties are complying with the AT&T divestiture decree, and who has thus become a major presence in telecommunications matters.

Conforming to a broader policy trend in the US governmental decision making process, federal courts -- particularly the US Court of Appeals for the District of Columbia Circuit -- have become a significant locus of de facto telecommunications policy making. The circuit courts hear appeals from trial courts and administrative agencies; their decisions can be reviewed only by the Supreme Court, which hears only a small percent of circuit court decisions. For example, the D.C. Circuit forced the FCC to allow non-AT&T equipment manufacturers to sell terminal units for connection into the local AT&T exchanges, making competition in the equipment market possible (Hush-a-Phone v. FCC, 238 F.2d 266,

D.C. Cir. 1956). The Justice Department and the Federal Trade Commission also play a role in regulating industry competitive behavior and structural changes -- primarily mergers and acquisitions -- and by forcing divestitures as with AT&T.

Most important for telecommunications policy, at least in theory, is the US Congress. The primary legislation for US telecommunications is the Communications Act of 1934. But this Magna Carta of US telecommunications rarely has been amended by legislation, despite many attempts. Policymaking, in light of changed circumstances, has been left largely to the FCC's and the courts' discretion. Congress often wields its power indirectly, however, by giving signals to the FCC through bills, resolutions, hearings, and the budgetary process. Congress can reduce an agency's budget unless it adopts certain policies, a position which obviously can have a strong influence on an agency. In 1988, Congress put serious pressure on the FCC in two areas: the so-called Fairness Doctrine in broadcasting, and the transition to price-cap regulation in interstate telephony.

Congress has to consider various constituencies. These include AT&T and the Bell Operating Companies, which with their numerous employees and shareholders make up a substantial political bloc, and whose commitment to service traditionally commands respect.

In recent years, other companies also gained a voice, in particular the rival long-distance carriers whose survival is at the heart of the pro-competitive policy. They add an independent

voice to the traditional independent telephone companies, of which the largest, GTE, is almost the size of a BOC. Most, however, are rural and small.

Information and Enhanced service providers (ESPs) are a younger and smaller industry segment. As partial resellers, price is an important factor to them. Large business users, a vocal constituency, are concerned with control, flexibility, price, and confidentiality of network usage.

Residential users desire ubiquitous reliable service at reasonable rates, generally referred to as "universal service." Consumer groups actively protect this principle. Rural residential users are primarily concerned with receiving basic service at rates which are similar to urban and suburban ones. Large business users want innovative technology options, dynamic service, prices that are not above cost, and minimal restrictions on operating their own private networks.

The Communications Workers of America (CWA), the primary union operating in the telecommunications field with some 700,000 members, also wields a voice, particularly on changes that affect its members.

There are related constituencies with interest in telecommunications. The entrepreneurial cable television industry has gone through a remarkable building period, in which it wired up most of America in a very short time with a second communications link, and established a wide-varied system of program supply that has overcome the traditional television

network bottleneck. Cable is supplemented by various over-the-air broadcasters, including the microwave "wireless cable." Together, these media have led to a considerable diversity and competitiveness, and offset in some areas the power of the telephone industry. Both segments of the communications industry depend on each other to some extent, and there is turbulence in the areas of overlap which are increasing. In particular, the cable industry fears incursions by the telephone companies, supported by the latter's protected economic positions and "deep pockets." Cable television (as well as broadcasting) is in the process of moving from the regulatory status of fairly tightly controlled entities to one more closely resembling print publishers with constitutionally protected Free Speech rights. Another constituency is the electronics industry, which is described separately. Newspaper publishers, too, have concerns with telecommunications' ability to become information providers.

The political parties of the United States have at best an indirect impact on the formation and exercise of telecommunications policy. Generally, the nature of the political party in power did not greatly affect the direction of change in telecommunications policy, though at times it affected its pace. There is a substantial amount of overlap between the two parties over individual issues, such as in the philosophy of rate setting. But the tone or emphasis can be different. The Democratic position has been more oriented towards protecting residential users; Republicans, conversely, have placed somewhat

more emphasis on economic development and large users. This has translated into a greater reliance on market forces, though Democratic dominated FCC's have been just as active in that direction, and indeed the AT&T divestiture case was initiated under Democrats and concluded under Republicans.

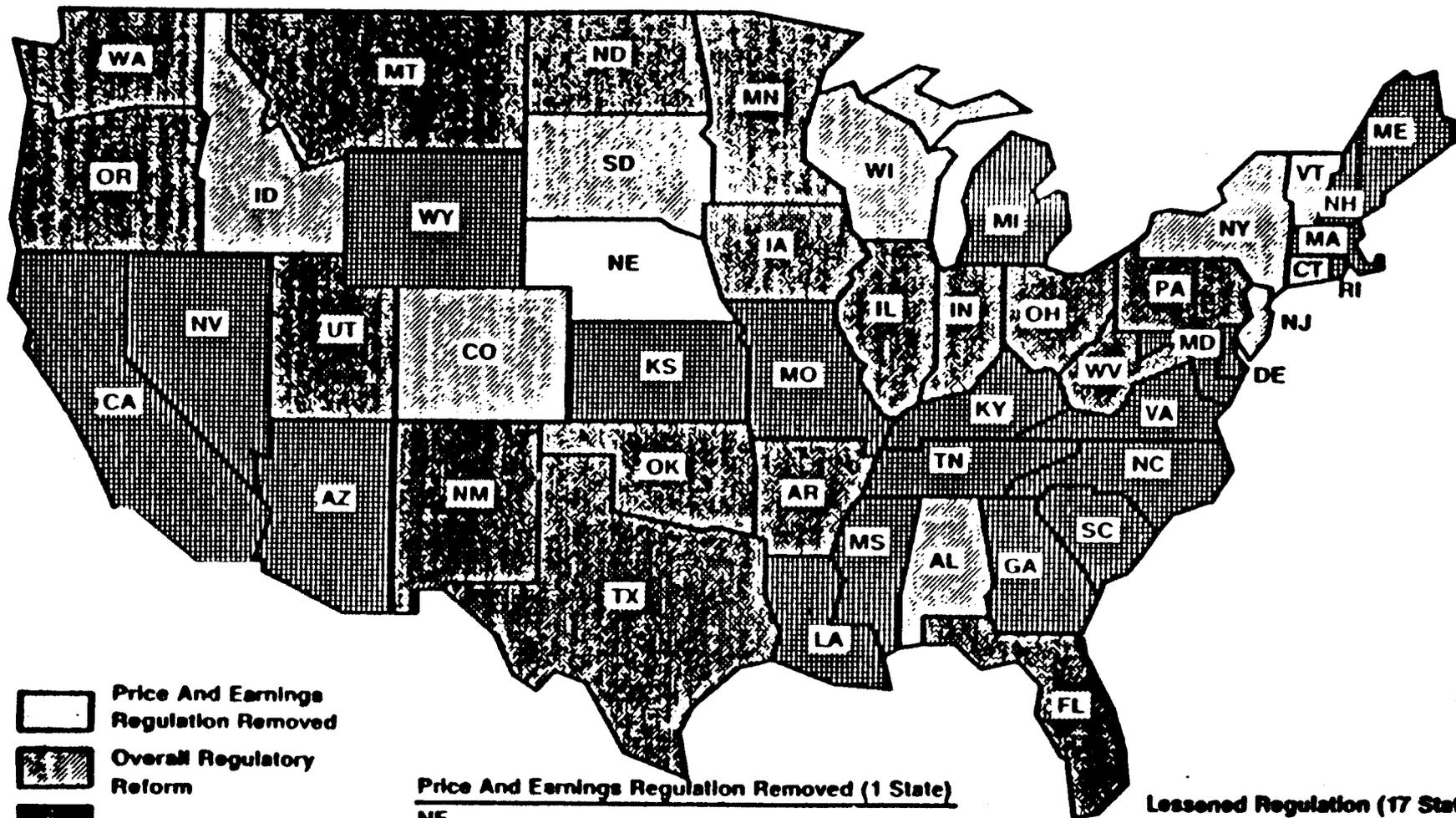
This multiplicity of decision-making bodies of the several level of government frustrates coordinated and comprehensive policy-making. On the other hand, this process also accommodates decentralized and ad hoc decisions, many of which are responses to specific problems, rather than part of a grand design. This has permitted a fairly rapid re-orientation of US telecommunications policy. Figure 1, for example, shows some of the diversity in state commission regulatory policies

A key feature of the American telecommunications policy environment is its federalist structure. For a long time, the system of federal and state responsibility for communications regulation had been one of co-regulation. The cooperative spirit was so great that the federal level permitted a system of revenue transfers to the states' regulated domain to support low local rates for which the federal government had no direct oversight responsibility. As the 1970s unfolded, however, the divergence in goals between the federal and state levels of government became pronounced, and the old system fell apart.

There was no federal regulation for the first 35 years of telephony. Federal regulation started in 1910 with the Mann-Elkins Act, which extended an undefined regulatory authority

FIGURE 1

LEC REGULATORY REFORM CLIMATE MARCH 1988



-  Price And Earnings Regulation Removed
-  Overall Regulatory Reform
-  Lessened Regulation
-  Traditional ROR Regulation

Price And Earnings Regulation Removed (1 State)

NE

Overall Regulatory Reform (9 States)

NJ,NY,AL,SD*,WI,CT,VT**,CO***,ID****

*Effective 7/1/88 Provides For A 90-Day Review Period With A 10/1/88 Implementation Date

**Awaiting PSB Approval

***Method Of Regulation To Be Decided

****Certified Carriers May Apply For Lessened Regulation On 7/1/88, With Applications To Become Effective In 30 Days

Lessened Regulation (17 States)

PA,WV,AR,FL,OK,TX,IL,IN,IA,MN,ND,OH,MT,NM,OR,UT,WA

Traditional Regulation (21 States)

MD,VA,GA,KS,KY,LA,MS,MO,NC,SC,MA,TN,MI,AZ,WY,DE,ME,NH,RI,NV,CA

to the Interstate Commerce Commission. Although the ICC largely failed to exercise this authority, it did actively establish a position of dominance over state regulation of the railroads in the Shreveport rate cases. By analogy, the states' regulatory authority in the telephone area became also legally tenuous, even though the ICC did not in fact exercise its powers.

When the Communications Act of 1934 was drafted, the states urged a statutory limitation on the new Federal Communications Commission's powers over intrastate wire communications. Congress responded positively by including in the Act Sections 2(b) and 221(b), which together prohibit FCC regulation "in connection with intrastate communication service by wire..." The congressional intent clearly was to limit the scope of federal telephone regulation. The House report on the bill, for example, stated that "some 97 1/2 or 98 percent of all telephone communications is intrastate, which this bill does not affect." How wrong they were!

During the era following the 1934 Act, public policy makers were under continuous pressure to reconcile the statutory fiction of separation of intrastate and interstate network components with the reality of integration. What emerged from these efforts was a system of co-regulation, in which both federal and state agencies regulated the same facilities at the same time, and in which the federal level cooperated in keeping local rates low.

The cooperative system, however, could not last when its constituents' fundamental goals diverged. This divergence of

goals occurred when the FCC began to embrace the concepts of efficiency, competition, markets, and entry, while the state commissions continued to emphasize equity and redistribution.

The split between the states and the FCC emerged first in a serious fashion in terminal equipment. In a series of decisions which culminated in Carterfone, the FCC opened the accessory equipment market to rivals of AT&T. Many states, on the other hand, advocated a restrictive approach during this period, largely for fear of having the phone companies lose revenue which supported residential rates.

However, the Commission prevailed, in the landmark North Carolina v. FCC court decision. The court found that the states' action had frustrated the Commission's efforts to discharge its responsibilities to create a national system of telecommunications, and was therefore invalid. The court read the protected part of telecommunications very narrowly and rendered it almost meaningless.

That was about fifteen years ago, and since then preemption by the FCC of state regulation has been moving steadily and inexorably forward. The furthest preemption attempt by the FCC was to impose uniform depreciation rules. Several state commissions refused to go along, and this went up to the Supreme Court in 1987. For once, the states prevailed.

IV. THE NETWORK SYSTEM

Operation of the various types of telephone networks in the

United States is highly decentralized.

a. Local Service

(i) There are 22 Bell Operating Companies, e.g. the New England Telephone Company. They are organized into seven Bell Regional Holding Companies, e.g. NYNEX. The BOCs provide the bulk of local service, with more than 1,000 small independent companies serving approximately ten percent of the nation's geographic area and twenty percent of its population. The largest independent company is General Telephone & Electronics (GTE). Local companies are restricted to service within their Local Access and Transport Areas (LATAs), and may not enter long-distance or international communications. They are regulated by various bodies, primarily state commissions and the FCC.

(ii) Various private "bypassers" have begun to compete with the BOCs in providing local service through a number of technologies. These technologies include:

- a. Cable television transmission;
- b. Point-to-point microwave;
- c. Digital Termination Service (DTS), a two-way point-to-point switched microwave service;
- d. Private fiber optic links;
- f. Cellular and digital radio, both mobile and stationary.

(iii) Shared tenant services (STS), a hybrid form of local transmission in which several users share a PBX and leased

lines.

b. Long-distance Service

(i) In 1988, AT&T controlled about 60% of the entire long-distance market (including intra-LATA inter-exchange service) and about 70% of so-called "interLATA" (long-distance) service, measured by minutes of use.

(ii) Other common carriers (OCCs) in particular MCI, Sprint, as well as regional firms provide the rest of InterLATA service.

(iii) The BOCs provide, within their LATAs, long-distance service, which accounts for about 18% of national long-distance traffic.

(iv) "Resellers" of long-distance service (including in part the OCCs, which often lease lines from AT&T) and many others buy long-distance service at low bulk rates and resell it at a profit to smaller users.

(v) Providers of long-distance links include railroads and highway authorities which install fiber optic lines on their routes.

(vi) Domestic record carriers, primarily Western Union and RCA, provide mostly telegraph services, and increasingly data transmission.

(vii) Specialized companies -- including data networks and value-added networks such as Telenet and Tymnet -- provide packet switching and other high-technology services.

(viii) Satellite carriers (such as RCA), often

operating as common carriers, lease transponder capacity to other common carriers and private users.

c. International Carriers

(i) AT&T provides the bulk of international voice service, and now also provides record service.

(ii) Other carriers such as MCI International and Sprint provide service to countries with whose postal, telegraph, and telephone (PTT) authorities they have agreements. In the Pacific, the Hawaiian Telephone Company handles much of the traffic.

(iii) Comsat, the US Signatory to Intelsat and Inmarsat, originally operated solely as a "carrier's carrier," and is now able to access users directly. For international civilian satellite communications (as distinguished from cable or microwave), Intelsat was the sole link. US carriers may go through either Comsat or a private carrier to access Intelsat for international satellite service.

(iv) International record carriers (IRCs) such as RCA, ITT, TRT, and MCI International (formerly Western Union International) also offer telegraph and telex service. The IRCs originally were restricted to international record service. These restrictions now have been abolished.

(v) Specialized carriers and value added carriers such as Telenet use leased circuits to provide data base and related services.

(vi) Applications have been approved for new

international satellite carrier systems (PanAmSat); similarly, approvals have been granted for new trans-Atlantic cable ventures (PTAT).

(vii) Private networks have proliferated and reached huge sizes [Figure 2], thus changing the nature of the network system.

These networks -- local, long-distance, and international -- are substantially free to offer all types of telecommunications services, with restrictions which include the following:

1. Although AT&T can carry other companies' electronic publishing or videotex communications, it may not provide its own information service until at least 1989.
2. The BOCs may provide such services as their own information services only through a fully separated subsidiary.
3. Under the Cable Communications Policy Act of 1984, local telephone companies may provide cable television service only in rural areas. But they are free to construct and lease cable facilities to cable companies, as long as the local telephone companies do not control the systems' programming in any way.
4. Since local telephone companies' rates are regulated, an expansion of their service offerings is subject to regulatory scrutiny if it affects rates.
5. For local transmission, the siting is very much in

FIGURE 2: EXAMPLES OF LARGE PRIVATE BUSINESS NETWORKS, CIRCA 1986-1987

Organization	Number of Access Lines
General Motors	250,000
Boeing	70,000
McDonnell Douglas	54,000
University of California	13,000
Merrill Lynch	17,000
Westinghouse	180,000 ^e
Bank America	> 10,000
Sears	> 10,000

Source: (1) - (5) Huber Report, Table IX.22.

(6) - (8) Communications Week, February 22, 1988, Closeup Section

^e = estimated. R. Crandall, "Fragmentation of the Telephone Network: Implications for Policymakers," The Brookings Institution, Washington, D.C., 1988 (in progress).

flux. Some states have instituted rules to restrict local bypass in favor of the local exchange telephone companies. ("Bypass" occurs when an unregulated company uses any of the means discussed previously to provide services within a LATA without using the local public switched exchanges.) In several instances, intra-state long-distance service entry -- that is, service between LATAs -- is also restricted to entry by additional carriers under state rules. Some of these regulations are subject to court litigation.

In addition, certain geographical service restrictions apply. BOCs and other local telephone companies have exclusive franchises for public switched service in their geographic area, although this exclusivity is being undermined de facto by various forms of bypass and shared tenant services. Instances of invasion by one telephone company across the franchise line into the territory of another have occurred. BOCs cannot offer long-distance or international service, while AT&T cannot provide local service. GTE has provided both local and long-distance services, but through separate subsidiary companies.

Common carriage provides access rights to all users, including resellers that compete with a carrier. Local exchange companies must grant access to all long-distance carriers and to all telephone users. Customers indicate their "primary" carrier, to which domestic and international long-distance calls

automatically are routed by a local exchange. Customers thus are connected directly to the long-distance carrier of their choice, without having to dial elaborate access codes, as was necessary in the past. Customers also can utilize private branch exchanges (PBXs), to select a different long-distance carrier for each call according to a "least-cost-routing" computer.

Reselling of domestic local and long distance transmission is allowed and is extensive. Trends include sharing of the bandwidth on satellite transponders, reselling of local transmission by shared tenant services, and competing coin and credit-card public telephones. Resellers do not require an authorization from the FCC. If they are available to the public, they need only file a notification with the FCC and/or the state PUCs. Where there is no such general offering, e.g., one bank reselling its surplus transmission capacity to another, no filing is necessary.

Of particular importance are the rates for access to local exchange networks by long-distance carriers. In the past, complex financial accounting rules ("separations and settlements") provided an internal subsidy from AT&T's long-distance service to the BOCs. Complicated FCC tariffs also governed the access charges paid by the BOCs. After divestiture, this system was revamped, with equal access charges for carriers to be phased in as equal access to the BOCs for non-Bell long-distance carriers was introduced.

Various other telecommunications charges are regulated. The BOCs' rates and terms are regulated by state commissions, mostly on the principle of rate-of-return regulation. Several states have relaxed these rules, either by outright deregulation, or by instituting negotiated price regulation in place of rate-of-return rules. Due to the dominance of the local exchange companies in local residential distribution, full deregulation of local charges is unlikely in the near future.

The principle of rate-of-return regulation is to permit a "fair" return on invested capital, at a rate comparable to investments of similar risk. Rates thus include revenues that result in a fair profit, after subtractions for operating expenses, depreciation, and taxes. Because this return is aggregated, not every service or customer category need pay its share of costs and return on capital. Internal subsidies are common. For example, rates often are lower for rural than for urban users, and for residential than for business users. Since rate setting is meaningless without a definition of the product, federal and state agencies also set service quality requirements.

Starting in 1986, some states moved partly away from rate-of-return regulation to negotiated rates or "price-cap" regulation, and the FCC proposed a national application of this regulation to interstate services. In domestic and international long-distance service, rate regulation has already been substantially reduced.

V. THE ELECTRONICS INDUSTRY

After AT&T's development of the transistor in 1949, the key development in the acceleration of high technology electronics in the United States was the move from the earlier discrete devices to the newer integrated circuits by Texas Instruments and Fairchild 1959/60. These innovations made mass production easier and facilitated substantial component integration within one chip. Young companies which were wedded neither intellectually nor financially to the older ways moved into the new technology. These firms left the traditional, vertically integrated European and American tube manufacturers far behind.

With the onset of integrated circuit technology, the role of the American government as a purchaser of electronic components, until then a major factor, began to decline. In 1960, public procurement of semiconductor was \$258 million, 48% of the total. By 1973, it had fallen to \$201 million dollars, 6% of total US sales (Levin, 1982). [Levin, R.C, 1982, "The Semi-Conductor Industry," in R.R. Nelson, ed., Government and Technical Progress: A Cross Industry Analysis, New York: Paramount Press.] In 1987, due to the military building, government procurement (military and civilian) had risen again to about \$1.2 billion, or 12% of domestic sales (Semiconductor Industry Association, 1988, Communication).

The integrated circuit period lasted a decade, until the introduction of large scale integration (LSI) in 1971 with the development of the microprocessor. The LSI period in turn lasted

a decade and was followed by the very large-scale integration (VLSI) stage beginning in the early 1980s. At the beginning of the LSI period, American firms were dominant in high technology, and increased their lead over their European competitors, while the Japanese also made serious advances. American firms also took the lead in several VLSI products.

Today, the electronics industry in the United States is characterized by large and older firms on the one hand and smaller entrepreneurial firms, fueled by an active venture capital market, on the other hand.

Total sales of the industry increased an average 9% over the past decade and measured \$223 billion by 1987. Total imports to the United States were \$57 billion in 1987 and exports amounted to \$38 billion (Electronic Information Industry). The primary segments or groups of the electronics industry in ascending size are: computers and industrial electronics, communications equipment, electronic components, and consumer related products (Electronic Information Association).

The larger electronics manufacturing firms include AT&T, General Electric, GTE, Hewlett-Packard, IBM, NCR, Texas Instruments, Motorola, and Zenith. AT&T was established in 1885 as a subsidiary of the 1876 American Bell Telephone Co. and became the parent company by 1907. AT&T's manufacturing arm used to be known as Western Electric and is now AT&T Technologies. It operates mostly in the telecommunications industry but has produced numerous breakthroughs in many areas of electronics and

computers through its renowned research arm, Bell Laboratories. AT&T's profits for 1987 were \$2 billion, and it has about 310,000 employees.

Due to the US Justice Department's 1956 Consent Decree, AT&T was prevented from entering the computer and electronic component manufacturing industry. Nonetheless, it continued its research into electronics and computer technology until 1984 when these restriction were lifted by the Modified Final Judgement. It has been active in digital switching and transmission technology, fiber optics and photonics, the UNIX computer operating system, semiconductor technology, and more recently superconductors. Since divestiture, it has also entered the computer field, but in this extremely competitive industry with relatively low profit margins, its success has been modest.

NCR is perhaps the oldest of all firms operating in the electronics industry. It was formed as the National Cash Register Co. in 1844 and incorporated as NCR in 1926. It manufactures and markets systems for processing business information and still holds a large portion of the cash register market. It has 62,000 employees, revenues of \$5 billion netting and profits of \$419 million.

General Electric, the third largest US Corporation in 1987, was formed in 1878 to pursue Thomas Edison's applications of electricity. It performs in a broad range of industries including manufacturing, high tech and service businesses. Its total revenues in 1987 were \$40 billion and net earnings were \$3

billion.

Other firms are GTE, Zenith, Texas Instruments and Motorola. GTE began in 1918 as the Richland Center Telephone Co. in rural Wisconsin and evolved into a vertically integrated firm employing 160,000 workers primarily in telephone operations and equipment. Its 1987 profits were \$1.1 billion. Zenith began in electronics in 1918 and is now turning a profit in its computer systems and components division after years of losses. It is the last remaining manufacturer of television sets in the United States. Zenith employed 35,000 in 1987 with net sales of \$2.3 billion.

Texas Instruments was founded in 1938. Headquartered in Dallas, Texas, it manufactures electrical and electronic components and instruments for consumers, industry, and government. It is pursuing semiconductor markets in the Pacific Basin area and is a major defense contractor domestically. Its sales in 1987 were \$5.5 billion, with a net income of \$308 million.

Motorola goes back to 1928. It is a leading manufacturer of equipment and components, employs about 100,000, and has profits of \$300 million on sales of \$6.7 billion.

IBM, founded as International Business Machines in 1924, initially manufactured Holerith punch card equipment. By the late 1950s, its primary business was the development and manufacturing of computers. In 1986, IBM had 403,508 employees worldwide and, as the largest US corporation in 1987, had net earnings of \$5 billion.

IBM's market share is very large, and the firm can command a premium price for its products due to its reputation and ubiquity. But for all of its power, IBM has competed against various types of rivals, first against the other American mainframe producers known as the "BUNCH" -- Burroughs, which is now merged with Sperry-Univac into Unisys, NCR, Control Data, and Honeywell. Also known as the Seven Dwarfs, these firms have not been particularly effective competitors and some have left the market, but their existence has limited IBM's power to some extent.

IBM's power was at its peak in 1964, securing 70% of the computer market. This power was short-lived, however. Other companies were successful in developing plug-compatible peripheral equipment, forcing IBM to retaliate by sharply cutting its prices. It also employed other non-price tactics to make compatibility more difficult, leading to the US government's mammoth anti-trust lawsuit (DeLamarter, 1986). [DeLamarter, Richard Thomas, 1986, Big Blue New York: Dodd, Mead, and Company.] Partly as a consequence, IBM moderated its behavior. Although the government's anti-trust lawsuit was dropped several years later, the market had not stood still in the meantime, and IBM could not expect a similar market power.

The entire field of data processing has grown so much that the number of specialized products is huge. IBM has been forced to compete in many fields: in the super-computer market it has not only competed domestically with Cray Technologies, but also

with Japanese and European firms; in the component manufacturing field, large firms such as AT&T, Texas Instruments, and Motorola, and medium-sized ones such as Fairchild, National Semiconductor, Intel, AMD -- together with their formidable Japanese counterparts -- have played a major role in the advancement of technology; for mini-computers, with Hewlett-Packard, DEC, Prime, and Data General; and for micro-computers, with a large number of small, inventive competitors, particularly Apple.

In such fields as communications, IBM chose to join forces with other firms. It entered the competitive telecommunications transmission field with Comsat and Aetna in SBS, a venture which proved unsuccessful. In the PBX market, IBM joined Rolm, initially purchasing 19% of the smaller operation's stock and later buying a majority share. Here too, the fit of the companies proved bad, and in 1987 Rolm was spun off as an independent firm outside of IBM's control.

Hewlett-Packard Co. was one of the first electronics and high technology firms to be started by independent engineers with relatively modest funds. Incorporated in 1947, HP developed into a major designer and manufacturer. Employing some 82,000 workers, and garnering total revenues of over \$8 billion, HP recorded net sales for 1987 of \$51 million.

Regional centers tended to cluster numbers of small electronics, computers, and software "start-up" firms, creating economies of agglomeration where those of scale were absent. Perhaps the best known of these is "Silicon Valley," near

Stanford University and San Francisco. It is the home to some 2700 young electronics, high technology, and engineering firms which share many of the same characteristics: highly skilled employees, many of whom are young scientists or engineers (Silicon Valley has the greatest concentration of PhDs and highly educated people in the US); rapid growth; a worldwide market for products; and a high ratio of R&D costs to sales. (Silicon Valley Fever, Rogers and...) Silicon Valley has allowed ambitious, creative persons to find the critical mass for entrepreneurial success, far faster than it might have been achieved working for a large, established firm.

Fueled by the high-tech and computer sales, it is estimated that the state of California will become the world's fifth largest economy by the year 2000 (Wall Street Journal, 7/31/86, 2, p.2). Perhaps one of the better known firms to emerge out of Silicon Valley and California is Apple Computer. Founded in 1977 by two young college dropouts, Apple employs 65,000 and its reported income for 1987 was about half a billion dollars on net sales of \$3 billion.

Other high tech centers in the United States include Route 128 just outside Boston, home to Lotus Development, Wang Laboratories and Digital Equipment Corporation; Bellevue, Washington, site of Microsoft, Inc., one of the largest software manufacturing firms in the United States; and The Research Triangle in North Carolina. In each instance strong universities provided the nucleus around which industries grew.

VI. COMPETITION FOR LOCAL SERVICE

Competition has also emerged in local transmission, mostly for business customers. This competition is referred to as "bypass." Bypass also uses private lines that are leased from the local telephone company. Though such lines still provide the local telephone companies with revenue, such revenue is normally considerably lower than what they would realize through the same traffic on their public switched network.

There are several alternative forms of local communications available. An overview of service options available in New York City is provided in the following Table.

The Table below provides the information above for leased forms of local service in Manhattan. They are normalized for the price per 1 Kbps, to permit comparisons. As can be seen, microwave (\$.20 - \$.65), fiber optic links, (\$.61), Cable Company coaxial lines (\$1.15), and T1 telco carriers (\$1.70) are the low cost providers.

For the user, the optimal choice of communication links depends not only on the price, but also on a number of technical, economic, environmental, and regulatory variables. These include, for example, data volume, availability of duct space, microwave paths and frequencies, lines of sight, southern exposure, order-lag of leased lines, number of origination and destination points, and desired security and reliability. It also depends on the willingness to own and maintain equipment and a network, and whether to be served by a multi-service

communication carrier or to deal with multiple communication providers for separate services.

Figure 3: Price Comparison of Local Transmission Link

(Manhattan; leased lines or channels; 5 miles unless noted)

<u>Transmission Medium</u> (leased)	<u>Price per Month</u> (Kilobits)	<u>Capacity</u> (per 1 kilobit/sec. transmission capacity)	<u>Normalized Price</u>
Switched Voice Grade Circuit	117.16 (a) (69.16) (b)	1.2	97.60 (57.60)
Direct Analog Data Communications	236.40 (c)	9.6	24.60
Digital Data Service	373.00 (c)	56	6.70
T1 Line	2645.26 (c)	1,544	1.70
Fiber Line	2644 (i) 13,500	1,544 44,736	1.70 .30
Coaxial Cable	1750 (m)	1,544	1.15
Point-to Point Microwave	1200 (k) 1000	6,132 1,544	.20 .65
Digital Termination Service (DTS)	600 (l)	56	10.71
Multi-point Distribution System (MDS)	5,000 (j)	3,088	1.62
Satellite Transponder	110,000 (d)	64,000 (max. of 1,544 kbps)	1.70
Cellular Radio	2,000 (e)	.3 (f)	6667
Infrared	400 (g,h)	1,544	.25

FOOTNOTES FOR TABLE ON PRICE COMPARISONS.

- a. Assumes \$21.16 basic business rate access charge, plus usage charge for 8 hours/day usage, 20 days/week.
- b. Assume usage of 4 hours/day, 20 days/week.
- c. New York Telephone.
- d. Prices range from \$66,667 to \$150,000, depending on length of lease and preemption protection. Source: RCA Globecom.
- e. \$15-69 basic service depending on the type of service; usage depends on peak/off-peak. Assumes 4 hours peak/day; 20 days/week (\$1920 usage). Equipment installed \$1300-2000. Assumes 5 years life. Source: NYNEX.
- f. Voice rate 1.2 Kbps.
- g. Owned equipment \$14,000. 5 year life: maintenance \$1,000/yr. Source: Light Communications, Inc.
- h. Range 3/4 miles.
- i. "Novalink," provided by Illinois Bell in Chicago business district. Source: Illinois Bell Technical Reference Manual, 1984.
- j. Class Y Service (24 Hours/day), one way transmission only. Source: Contemporary Communications.
- k. Contemporary Communications. (1.) T2 Transmission. (2.) T1 Transmission. Eastern Microwaves rate is \$900 equipment, \$22/mile video coverage. 6 Mbps.
- l. On basis of 30% use of node ports (100 ports). Contemporary Communications.
- m. Manhattan Cable.

Source: (Noam, 1986) [Noam, Eli, 1986, "The "New" Local Communications: Office Networks and Private Cable," Computer Law Journal, Vol. VI, pp. 901-42.]

Bypass means that large customers will obtain cheaper local service than residential customers, a reversal of the traditional redistribution where business customers had paid more than residential subscribers for local service. The political and regulatory pressures that such a historic change presents are significant.

Quite typically, the largest 3% of customers of the local

telephone companies account for 50% of revenues. Telephone companies thus are susceptible to major revenue loss if some of their best customers change to bypassing. As a result the fixed cost of the network has to be distributed over the remaining subscribers, resulting in rate increases and further incentives to bypass or drop off the network altogether. The federal regulatory response to this problem has been to impose a flat-rate end-user access charge as a partial substitute for a usage-sensitive charge on the long-distance carrier. These latter charges provided an incentive for by-pass. In New York, the local telephone company charged AT&T more than eight cents per minute for a connection, with only 3 cents per minute of costs. (Other calculations put these numbers at 7 and 4 cents, still a fair margin.) By-passing could thus be profitable even if the costs were as much as 5 cents. Under a flat-rate access charge on the user of telephone service, such incentives for "uneconomic", i.e., regulation-induced bypass, would be reduced. The FCC's policy response has been to phase in a flat-rate access fee for users, who thus would not be affected in their usage decisions. This policy has been severely criticized for shifting the burden to users and away from carriers. Congress was sufficiently aroused that the FCC postponed implementation until after the 1984 elections.

Thus users were saddled with a new charge which partly or entirely offset the savings in long-distance rates. The FCC substituted the usage-sensitive payment which long-distance

companies paid to the local exchange companies with a flat end-user charge. The long-distance companies passed the savings to the end-user; hence, rate reductions look better than they are. End-users, after the flat-rate charge, may be worse off than before, depending on the intensity of their long-distance usage.

Shared Tenant Services

New forms of private local networks emerged in the business and residential spheres. In the office setting, these communications links are, first, local area networks (LANs) mostly for the transfer of high-speed data and voice and the connection of information equipment, and second, shared tenant services, (STS), within buildings or clusters of buildings that bundle the communications of small users.

To reach long-distance carriers, shared tenant service PBXs can utilize a variety of private lines and other links that bypass the public switched networks of local telephone companies, and which a single tenant could not afford. They can therefore be described as "reselling" local transmission service.

The logic that drives STS are economies of scale, which encourage the bundling of the communications of multiple tenants. This logic does not stop at the property line of a building, but will move beyond this physical boundary and seek to consolidate the communication services of several buildings, and, over time, of entire areas. Thus, clusters of STS are likely to develop in central business districts, as regulatory barriers

crumble. These groupings, centered around large PBXs, will functionally be quasi-local telephone exchange companies, even if their regulatory designation may be different. Their emergence will establish local competition not only on the level of transmission links, which is "bypass," but also on the level of local switching services.

VII. Value-Added Networks

In the United States packet switching networks have existed since the early 1970s. It all originated at the Pentagon, whose Defense Advanced Research Projects Agency (DARPA) had the Cambridge, Massachusetts firm of BBN (Bolt, Beranek, and Newman) develop the "Arpanet" nationwide network to link researchers with each other. Arpanet was and still is a major success, and it induced BBN to start the commercial network Telenet, which has been in operation since 1975 as the precursor to packet switched networks around the world.

Basic packet switching transmission has two main advantages. The first, technical in nature, is error detection and correction, which is enormously useful for data transmission. The second advantage, economic/regulatory in nature, is the ability to slice transmission time into minute quantities, which can be resold to provide a profit where there is a differential between retail and wholesale prices. Data transmission rates, however, are not high enough for high-traffic users of data. That, together with LANs' tendency to charge by

volume, means that leasing private lines may make more sense for large users than using a "public" VAN. (However, packet switches have become faster--from 1,500 packets/sec to 5,000 packets/sec, and even to 60,000 anticipated through parallel processing.)

Other entrants were Graphic Scanning (Graphnet), PCI, and Tymshare (Tymnet). PCI soon failed. Tymnet made some profit since it had computer time-sharing customers and the VAN was a way of serving them. The most "public" of the networks, Telenet, struggled along with revenues that grew slower than predicted; and it was eventually sold to GTE. In 1986, GTE Telenet, together with the long-distance carrier GTE Sprint, were combined into GTE's joint venture with United Telecommunications, soon dominated by the latter, which in turn contributed its own Uninet (levels-2 and 3), and a substantial fiber optic physical network (level-1). The two firms' operations merged. In 1985, Telenet had about 38% of the market, Uninet had 12%, and Tymnet 31% (Yankee Group, 1986).

In the period 1978-83 Telenet grew at rates of up to 40% annually. After this period, growth slowed to an estimated rate of 28%. Expansion to 350 American cities was costly and it broke even only after 1983. Revenue estimates for 1984 were somewhat above \$100 million. It connected about 2,000 host computers, and in 1984 averaged 200,000 sessions a day (Link, 1984). [Link Resources, "Competition in Value Added Networks," New York, 1984]

Tymnet and its parent Tymshare were acquired by the aircraft

manufacturer McDonnell Douglas. Tymnet was originally an internal operation of Tymshare.

Other packet switched networks in the US include:

CompuServe Network which is owned by the large tax accounting firm of H&R Block, and provides a large amount of credit card authorization.

Autonet, a subsidiary of the large computer processing company ADP (Automatic Data Processing) founded by New Jersey US Senator Richard Lautenberg. This VAN grew out of ADP's providing services to its customers, and became public in 1983.

Graphnet, one of the earliest VANs which specializes in facsimile.

MarkNet, owned by General Electric Information Services Co. (GEISCO), partly designed to use the excess capacity of GE's own internal network. Its 1985 market share was 5%.

Cylix, acquired by RCA in 1982, and based on satellite transmission.

IBM Information Network available since 1982 in part to extend the reach of its SNA computer inter-linking system. IBM was already in that market as a time-share service, then sold out, but reentered in 1982.

MCI Data Transport, which provides service customization and a limited number of nodes. It was aimed at large users and tried to become the interconnector of BOC-VANs.

All of these networks are relatively small in terms of market share. IBM had 2%; MCI and CompuServe 1.5%.

The overall growth of packet switching service is provided on Table 28.

AT&T's involvement in VAN service was tumultuous and so far unsuccessful. Regulation caused some of its problems, but others were a result of its own ponderousness and miscalculations, and indicate that economies of scale should not be overvalued in this field.

In 1975, when it still felt secure as a monopoly, AT&T entered the VAN market. It intended to provide an "Advanced Communications Service" (ACS) with packet switching, protocol conversion, message storing and forwarding, and private network provisions. Technical development took its time. AT&T wanted to have a large-scale star architecture, so that all the data would come to one central location, but this did not work technically. It took from 1978 to 1982 to rearrange the network and write the very complicated software. By then, the legal status of the ACS offerings, also known as Bell Data Network, was part of the FCC's First and Second Computer Inquiries. Eventually AT&T was permitted to offer "enhanced services" on an unregulated basis, but only through an organizationally fully separated subsidiary (which it named AT&T Information Systems, ATTIS), in order to reduce the potential for competitively unfair cross-subsidization of the enhanced services. AT&T then created "Net 1000" which provided packet switching, computer time-sharing service, and other services. Because of the Computer II restrictions, AT&T offered the underlying basic packet switching service under the

name of Accunet Packet Service (APS), a regulated and tariffed service available also to other VAN suppliers as well on a non-discriminatory basis. APS could not engage in protocol conversion except from X.25 to X.75 to permit internetwork service. APS rates were distance-insensitive. Transmission rates were 4.8, 9.6 and 56 kbps.

NET 1000 pursued some applications, in particular the mortgage and purchase order segments of the market, but it was unsuccessful in both. By early 1986, after major losses (\$100 to \$500 million), AT&T closed it down. Thus, the telecommunications market leader had failed in this field.

Following the divestiture decree in 1982, it was unclear whether the Bell Operating Companies could provide VAN service and whether the Computer II rules regarding separation of enhanced from basic services applied. This was clarified by the FCC when it declared basic packet switching (X.25-to-X.25) to be a "basic" service which BOCs therefore could provide, subject to regulation.

This still left the BOCs without authority to provide protocol conversion, even X.25-to-X.75 for purposes of internetworking, i.e., for long-distance packet transmission. These conversions were considered to be "enhanced services," and had to be undertaken by a fully separated subsidiary. Although this structural solution addressed a real problem, it made no sense in operational or accounting terms, and the BOCs petitioned for increasingly expansive waivers, which they received up to a

point. In March 1985, the FCC removed barriers from the BOCs and permitted a bundled provision of basic packet transmission with the "enhanced" protocol conversion asynchronous X.25-to-X.25 and X.25-to-X.75, thus opening an important part of the VAN market to the Bell companies. However, they were also required to provide such services also to their competitors at non-discriminatory terms; they had to file an accounting plan of separation, and they could not unfairly cross-subsidize their service. Specific rules were established for cost allocation and pricing. In May 1986, the FCC further decided, in its Computer III decision, to abolish the requirement for a fully separated subsidiary for enhanced services, and substituted as yet unspecified accounting separations. It reaffirmed, however, the dichotomy between basic and enhanced services.

As a consequence of these various developments, the BOCs are increasingly able to be active and flexible in setting up enhanced VAN service, while at the same time they are in the process of being required under open networks arrangements, to open their switches' capabilities for the use in other VAN applications.

VIII. ISDN IN THE UNITED STATES

For United States policy makers, ISDN created several problems. Much of the early ISDN discussion was technical in nature, and not necessarily in tune with the broader policy concerns of U.S. telecommunications policy.

Because ISDN calls for standardization, integration, and international coordination, centralized telecommunications systems such as those in Europe had an easier time formulating their ISDN goals than in the United States, where such central decision-making does not exist in telecommunications. Particularly after the AT&T divestiture, American industry was fragmented, and coordination difficult to achieve. The Bell Operating Companies formed a central technical organization, Bellcore, to provide some of the services that the old AT&T had provided; but by the nature of decentralization, it could move only slowly. Furthermore, independent telephone companies, including such major firms as GTE, were outside of Bellcore, as are the computer and component industries.

The FCC at first largely excused itself from the details of ISDN standard setting involvement, and left the technical and system issues to the United States Committee on the CCITT (US-CCITT).

In 1984, the FCC declared that customer provision of the network termination device (NT1) should be a national option and asked for comments on the definition of a so-called "U" interface point between customer premises equipment and the network.

Open Network Architecture

Open network architecture (ONA) expanded the concepts of service alternatives and network fragmentation into the very core of the networks, and lowered barriers to entry for rival and

varied communications services. ISDN, in contrast, raises entry barriers by providing a highly integrated network. ONA unbundles, while ISDN consolidates.

The open network architecture concept must be distinguished from the similarly named open systems interconnection (ISO) of the International Standards Organization which provides a definitional framework of seven broad layers of the entire network process. ONA takes this further by not only going into more detailed sub-functions of several of these layers, but also proposing their functional separation, together with a business and regulatory policy concept.

ONA is a framework that disaggregates network components in such a way that permits open access; it operates on the concept that all central office functions consist of components known as Basic Service Elements (BSEs) that can be unbundled. Different communications services use different building blocks, or different configurations of them, sequenced in various ways by a routing central point (RCP). The open network architecture permits the use by outside parties (users or third-party service providers) of the building blocks of their choice. Where any of the blocks could be provided cheaper or better from another supplier, it could be substituted and combined with blocks of the local exchange company. In other words, competition would exist for the various functions of the exchange switch by unbundling its multiple functions.

Through ONA, the local exchange company would permit the

resale of separate parts of its services, down to separate functions of the local exchange.

In the long run, the implications of an open network include:

- * a future competition in central exchange services, including potential incursions across franchise territories by some LEC's exchange services and even facilities.

- * a major enhancement in the possibilities of local transport competition (bypass) and of private group networks.

- * built-in strains between the two main service elements of LECs -- local transport and exchange -- that could lead in the future to a full-scale structural separation.

- * a move towards a "distribution" rather than centralized physical architecture of public central office functions, analogous to the computer industry's evolution into distributed processing.

IX. INTERNATIONAL SERVICES

The volume of international telecommunications traffic increased in recent years much faster than international trade in general. From 1970 to 1981, international calls originating in the US increased by a factor of 11.3, and telex by a factor of 8.89. At the same time, American international trade grew by a factor of 6 in nominal terms, with American multinational firms abroad growing by a factor of 3; in real terms, these rates are lower, with factors of 3 and 1.5, respectively (Antonelli, 1984). [Antonelli, Cristiano, 1984, "Multinational Firms, International Trade and International Telecommunications," Information, Economics, and Policy, Vol. 1:333-343.]

One part of the impetus behind this rise in international traffic has been the dramatic decrease in investment cost for a transatlantic circuit; from \$133,000 in 1940 to about \$670 in 1987 (for the fiber optic TAT-8 cable), and still lower in the near future. Satellite circuit costs plummeted from \$86,000 on the Early Bird in 1968 to \$450 for the more recent Intelsat-VI satellite generation. However, this drop in costs has not been matched by an equal drop in rates; consequently, the profit margin on international service remains very high. According to one study, British Telecom charged \$750,000 for a direct broadcast-grade connection between London and New York in 1981, whose cost to BT was only \$53,000, already well above economic cost (Stapley, 1981: p.150). [Stapley, Barry, 1981, "Managing Communications: The Value of Choice," Telecommunications Policy,

June.]

An FCC study shows that the average rate from Europe to the United States exceeded those in the opposite direction by 34% in 1981 (Kwerel, 1984: p. 18). [Kwerel, Evan, 1984, "Promoting Competition Piecemeal in International Telecommunications," OPP Working Paper Series, Federal Communications Commission, Dec.] In 1981, the weighted average for foreign tariffs was almost 95% higher than the American tariff (Kwerel, 1984: p. 19).

Lower rates in the US are partly the result of a long struggle among various market segments and participants. Clear boundaries were still delineated in 1964, when the FCC prohibited AT&T from entering the international record market (i.e., telegraph and data transmission). The FCC concluded that AT&T's participation would threaten the viability of the so-called International Record Carriers (IRCs). Authorization of the transatlantic TAT-4 cable was contingent upon AT&T's exclusion from such services, with the exception of those that it was already providing to defense agencies of the U.S. government (General Accounting Office, 1983). [General Accounting Office, 1983, "FCC Needs to Monitor a Changing International Telecommunications Market," GAO/RCED-865-92, March 14.]

Among record services, the FCC made a further distinction between domestic services, from which Western Union was restricted, and international services, which were provided by the IRCs, including Western Union International, which had been divested from Western Union to become a wholly independent and

unaffiliated entity. IRCs could only operate in the United States from certain limited and approved "gateways." A telegram from Cleveland to Singapore, for example, would be routed by Western Union to an IRC gateway, transmitted by an IRC to Singapore, and then passed on to the Singapore PTT.

The market segmentation led to a lack of competition as well as to substantial earning's margins. Partly because of the high profitability, the situation became unstable and cracks began to appear. The artificial nature of the market segmentation then became evident and led to policy response within a relatively short time.

The FCC set maximum rates for international telecommunications services on the basis of rate-of-return regulation. In practice, however, these rates were not closely monitored because AT&T's international department was not examined separately from its overall operations. Figures for 1979, the first year that AT&T was required to provide separate reporting, show that the net earnings of overseas voice service represented a very high 36.5% of total investment.

Similarly, the FCC did not investigate the rate of return for any IRC between 1958 and 1976. A 1979 audit report found that telex service was subsidizing telegraph and private services. The IRCs' rate of return for telex services ranged from 34.4% to 58.3% for the most profitable carrier and from 18.6% to 25.4% for the least profitable carrier, with the variation in the percentages depending on methodology (GAO, 1983:

p. 8).

High profits encouraged the emergence of arbitrage. In 1981, a telex message from Germany directly to the United States cost \$2.58 per minute, but only \$1.76 if routed via the United Kingdom. This led to substantial transatlantic traffic through London telex bureaux. The European PTTs tried to stamp out this arbitrage, citing CCITT rules which they themselves had authored, but they were rebuffed by the European Commission and the European High Court of Justice.

Not surprisingly, as the FCC's liberal domestic policies took shape, its restrictive entry and service policies for international telecommunications made less and less sense, at least from the US perspective. Users wanted new services and options, and new carriers such as Graphnet, Telenet, and International Relay sought to enter the market. In 1976, the FCC authorized Graphnet and Telenet to provide international record service, thereby allowing competitive entry into international telecommunications. The FCC routinely approved applications by MCI, US Sprint, and SBS to provide international service.

The FCC and Congress recognized the need for liberalization of international telecommunications and in 1979 further reversed course. In a series of rulings in 1979 and 1980, the FCC largely removed the dichotomy of voice and record carriage, and eliminated the rules prohibiting AT&T and the IRCs from entering each other's markets.

In 1979, the FCC also removed many of the restrictions on

the expansion by domestic and international record carriers to new gateway cities from which international traffic could be sent. This meant that the majority of the large business centers could now be served directly by an international record carrier, rendering Western Union unnecessary for the domestic leg of international transmissions. At the same time, the IRCs were required to unbundle their rates into separate charges for terminal equipment, transmission, and local access, and to interconnect so that customers could use one telex machine to access all IRCs.

By permitting Western Union to offer international communications services, the FCC had to overcome the opposition of the IRCs, which feared that Western Union would provide far stronger international competition than domestic competition due to public recognition of its name and the large number of telex machines already operating in the United States. Although the US Court of Appeals, 2nd Circuit, overturned this decision in 1980, the International Record Carrier Competition Act subsequently amended the Communications Act of 1934 to permit Western Union IRC service. At the same time, the Act permitted the IRCs to provide domestic record service.

The FCC also eliminated rate-of-return regulation for most common carriers except AT&T. The FCC determined that only a dominant domestic carrier (i.e., AT&T) needed to -- or would be permitted to -- file interstate tariffs. The decision still required that common carriers file applications and tariffs for

international service, however. Subsequently, the rate regulation was extended to international service.

The FCC found that AT&T and the Hawaiian Telephone Company were the only dominant international message telephone service providers and were therefore subject to full rate regulation. Other carriers were subject to "streamlined" regulation, whereby they filed initial applications to serve new points, but did not have to obtain permission to activate additional circuits; instead, they were merely to report their circuit activations twice a year. Tariffs are presumed lawful if filed on 14 days' notice and must include supporting data.

Most sovereign administrations observed all this with some misgivings, since it challenged long-established partnership arrangements and rate structures. But once their initial distaste for the increased complexity in the international telecommunications regime subsided, they realized the potential advantage of the situation. As the only address within their countries for AT&T, MCI and others, the PTTs were in a monopolist position that could profitably force rival American carriers to compete against each other for operating agreements.

To prevent the IRCs from being thus "whipsawed," the FCC, since 1977, enforced a Uniform Settlements Policy requiring all US carriers to have uniform settlement rates with all other carriers for the same routes. When the Benelux PTTs and Nordtel (the Inter-Scandinavian telecommunications body) invited all potential suppliers of data communications services to submit

bids which included the division of accounting, i.e., an element of price bids, the American reaction was swift. Though normally champions of liberalization, the FCC now requested that US carriers collectively defer negotiations with Nordtel. Nordtel backed off and notified the carriers that it did not plan to use its monopoly power for exclusive bids.

The FCC's rules against whipsawing hindered competition with AT&T for PTT business. Uniformity clearly benefits the incumbent. In order to be admitted to otherwise hostile territory, the new US carriers needed to offer the foreign administrations more attractive deals than those offered by AT&T. In Congressional hearings on the International Telecommunications Deregulation Act of 1982, arguments were made against such competition for dealings with the European PTTs.

AT&T held the following position: "When a carrier, in order to get into a market, accepts less equitable arrangements than the present carriers in the marketplace, we will ultimately lose in our national interest." To which William McGowan of MCI responded, "I think if the United States expresses its policy of being pro-competitive, it will have an impact, not on everybody and not for a period of time, but for a sufficient number of countries that it will infect the next country with the benefit of having some other supplier" (U.S. Senate Hearings, 1982). [International Telecommunications Deregulation Act of 1982, hearings before the subcommittee on communications of the Committee on Science, Commerce, and Transportation, US Senate,

97th Congress, 2nd session on S.2469. June 14, 15, 17, 1982.
Serial no. 96-126. US Government Printing Office, 1982.]

In an attempt to reduce the barriers to entry created by the PTT, MCI bought an existing and well stabilized IRC, Western Union International (renamed MCI International) from Xerox. The company concluded agreements with several countries, and established London and Hong Kong as international hubs for its traffic to other countries.

An important distinction is made in international communications between transmission by submarine cable and transmission by satellite. The several submarine cables linking North America and Europe are owned and operated by consortia of European and North American telecommunications administrations and firms. As part owners of several of them, AT&T and the IRCs route some of their transatlantic traffic over these facilities. In contrast to their participation in the submarine cable operations, AT&T and the other American international carriers and domestic satellite operators were specifically excluded from international satellite transmission, which is reserved to Comsat, the American designated carrier of the International Satellite Organization Intelsat. Created in 1964 at the instigation of the United States, Intelsat is a cartel-like organization with a considerable monopoly over satellite transmission of international public telecommunications. Each member country designates a carrier to manage outgoing and incoming Intelsat communications traffic. For most countries,

this carrier is the governmental PTT authority. Following intense domestic debate in the United States, however, Congress denied AT&T this role in an attempt to limit its power. The role was instead given to Comsat, which was created through the Communications Satellite Act of 1962 as a publicly chartered, privately owned company. Under the 1962 legislation, Comsat was solely a "carrier's carrier," and neither AT&T nor the IRCs were permitted direct access to Intelsat, and Comsat could not connect directly with users. In 1965, Comsat had a 61% share in Intelsat, reflecting its share of traffic. Since then, its share has steadily declined to approximately 25% in 1988.

Following enactment of the Comsat Act, the FCC developed various policies to effectuate and protect Comsat's role as the US signatory and monopoly US provider of international satellite service. A key component of this role was the construction and operation of these stations. Comsat and the US international service carriers, AT&T and the IRCs, would own and operate stations jointly through a cooperative Earth Station Ownership Committee (ESOC). This approach gave Comsat the major role in earth station management as well as in investment decisions, and allowed Comsat to bundle earth station costs with space segment costs in setting rates.

Following pressure from various carriers and users, the FCC proposed a more liberal international earth stations policy in 1982. Carriers and users wanted Comsat to separate out charges for its space segment (satellite) and earth segment (earth

station), and they also wanted the option of building their own lower-cost earth stations at sites with efficient access to Intelsat. In 1984, the FCC authorized international earth stations (Frieden, 1983). [Frieden, 1983, Getting Closer to the Source: New Policies for International Satellite Access, 37 Fed. Comm. L.J. 293.]

Not surprisingly, the competitive pressures that led to modifications of policies regarding earth station ownership and authorized users necessitated an examination of whether Comsat should continue to be the sole source of access to Intelsat.

The FCC permitted Comsat to go beyond its role as a carrier's carrier and to provide services to customers directly. The FCC made this conditional upon a major restructuring of Comsat, which has separated Comsat's unregulated competitive activities from regulated activities.

The FCC also gradually decreased its role in the planning aspects of international facilities in favor of reliance on the market. In the past, the FCC had been jointly involved in the international facilities planning process with carriers and foreign authorities. The planning process had begun as simple negotiations between the FCC and the PTTs for landing rights and terminal points. As technology became more varied, the planning process also became increasingly complex. With the advent of satellite communications, the FCC began to regulate the ratio of satellite to cable circuits for transatlantic telecommunications services. For the TAT-5 cable, the FCC required AT&T to use one

cable circuit for every five satellites circuits activated. After considerable pressure from PTTs and American carriers, this ratio was reduced to 1:1 in the 1972 approval of the TAT-6 cable, subsequently applied only to AT&T. The carriers traditionally preferred submarine cables because of their known technology and the carriers' ownership of the IRUs. Moreover, carriers used satellites under leases, which could not be included in a carrier's rate base. Following the PTTs' initiative for comprehensive planning, the FCC agreed in 1976 to substitute a long-range planning process for the disruptive and time-consuming review process previously used. In 1988, the FCC terminated AT&T's traffic balance restrictions, thus allowing Comsat and AT&T to reach their own agreement on facilities usage.

Using the planning process, the FCC consulted with interested parties and in 1977 rejected the TAT-7 cable as being economically unjustified. The rejection caused strong protest from many of the European PTTs, other governmental agencies, AT&T, and the IRCs. In 1979, the FCC reversed its decision, claiming that the new cable would result in increased service reliability. Although the FCC still believed that TAT-7 was unnecessary to satisfy demand through 1985, the strong European pressure led the Commission to balance the economical efficiency arguments, which were supported by the revenue requirements of the new facilities of about \$68 million, with its desire to maintain good international relations.

Another move towards deregulation in international

telecommunications services was the FCC's Second Computer Inquiry decision which deregulated enhanced telecommunications services that go beyond "basic" and regulated transmission. In the 1982 Telenet-Tymnet decision, the FCC reaffirmed that the Second Computer Inquiry decision extended to international telecommunications services. Thus, enhanced communications services to other countries from the United States would not be subject to regulation of facilities or rate of return.

New Carriers

International telecommunications had become enormously profitable. Figure 4 shows the investment per circuit for cable and satellite. The investment cost per cable circuit dramatically decreased from \$133,000 to \$670 for the TAT-8 fiber optic Transatlantic cable. Since 1979, the coordinated and integrated planning framework has floundered.

Because some PTTs made almost one quarter of their profits in international services, it was not surprising that new entrants arrived, first by sky and then by sea. In 1983, the FCC extended its domestic "Open Skies" policy and accepted an application for a license from Orion Telecommunications to build a private satellite system over the North Atlantic. Orion planned to launch its own satellites, to not use any Intelsat facilities, and to aim at segments such as customized business services and private lines that were previously not well served by Intelsat.

Just as MCI had done for domestic services, Orion denied

that it was trying to enter the market of the dominant firm and instead argued that it would create a new market (Cowhey and Aronson, 1985). [Cowhey, Peter S. and Jonathan B. Aronson, 1985, "The Great Satellite Shoot-Out," in Regulation, 27-35, May/June.]

Orion's application was followed by similar filings from other firms, including Pan American Satellite (for service to the Caribbean, Mexico, and Latin America).

The applications followed the same procedures as any request for authorization to operate a radio frequency spectrum device under Title III of the Communications Act. The procedure essentially requires an applicant to show financial, legal, and technical qualifications, and to establish that its operation would not cause electrical interference to any other service. The only difference between an application for an international satellite facility and any other Title III application, such as for a mobile radio or a television station, is that a geosynchronous orbital position must be available for allocation by the FCC. The total number of available orbital slots is governed by the regulations of the International Telecommunication Union (Rice, 1980). [Rice, David, 1980, "Regulation of Direct Broadcast Satellites: International Constraints and Domestic Options," in D. M. Rice, M. Botein & E. B. Samuels, eds., Development and Regulation of New Communications Technologies, New York: New York Law School.]

The applications caused a debate within the American government concerning whether the United States should endorse or

permit international systems to "bypass" Intelsat. A large part of this concern emanated from provisions in the Intelsat agreements concerning non-Intelsat international satellite systems.

The intra-governmental debate kept the applications pending at the FCC, and culminated in February 1985 with the issuance of a White Paper which was intended to provide guidance to the FCC in its deliberation. The Executive Branch's involvement in the debate was most likely discretionary rather than legally required. Although the President has a statutory role under the Act, Executive Branch participation is not mandatory. Presumably, the FCC could have proceeded on its own because of its status as a legally independent agency. The Executive Branch can use its obvious influence, however, to break regulatory logjams, including the one of Orion's application.

The Executive Branch's White Paper cautiously approved the concept of separate private systems, as long as they did not interconnect with public switched networks. The FCC conducted a proceeding on the pending applications and eventually granted them, subject to limited conditions. Not surprisingly, Comsat opposed the private satellite systems vehemently, and both Comsat and Intelsat sought legislation which would preclude such systems or restrict their operations.

According to the Intelsat agreement, no satellite competition is permitted that would cause economic harm to Intelsat operations and profits. Intelsat uses vague criteria in

FIGURE 4

Kessler Marketing Intelligence, 1987, "Worldwide Markets For Undersea Fiberoptic Systems."

TABLE 5

**COST PER CIRCUIT-YEAR
1956-1989**

YEAR	SYSTEM	COMPRESSED VOICE-CIRCUITS	LIFETIME (YEARS)	COST (DOLLARS)	CIRCUIT COST PER YEAR
1956	TAT-1	50	24	49,580,000	\$41,317
1959	TAT-2	74	24	42,700,000	\$24,043
1963	TAT-3	138	24	50,600,000	\$15,278
1965	TAT-4	128	24	50,400,000	\$16,406
1970	TAT-5	845	24	79,000,000	\$3,895
1976	TAT-6	4,000	25	197,000,000	\$1,970
1983	TAT-7	8,000	25	180,000,000	\$900
1988	TAT-8	37,800	25	350,000,000	\$370
1989	TAV-1	151,200	25	450,000,000	\$119



making such assessments, however. It did not find, for example, that the PTTs' Eutelsat system was causing "significant harm" because the European PTTs asserted, with more political than economic logic, that they would use no satellite system other than one which they would operate.

As both users and shareholders of the Intelsat consortium, Intelsat's constituent organizations did not want to see their profits whittled down by competition. To that end, they enlisted the traditional cross-subsidy argument. In international terms, the argument stated that the profits from the high-density North Atlantic and North Pacific routes were needed to provide a subsidy for low-density traffic to and among Third World countries.

Alternative delaying tactics took their toll. By 1986, PanAmSat was the only project still being actively pursued. This was partly due to the tenacious opposition of Intelsat and its constituent PTTs, and partly because the demand for transmission was lower than projected. On June 1988, the PamAmSat with its 24 C-Band transponders was launched, and its chairman Rene Anselmo promised to crack the monopoly of Intelsat with service to Central and South America, the Continental US, the Caribbean, and significantly, Western Europe.

International arrangements are also threatened by rivalry from already emerging competitors in private submarine cable facilities. Two companies, Tel-Optik and Submarine Lightwave Cable Company (SLCC), applied for licenses to operate

international submarine cable in the United States. The submarine cable applications did not raise issues under the Intelsat agreements, and the FCC thus granted the Tel-Optik application in 1985. Cable & Wireless and E.F. Hutton participated in that venture. Soon, one of the Bell Regional Holding Companies, Nynex, acquired an option, thereby raising the question about the permissibility of Bell Companies' international involvement. Similar applications were made and approved for Pacific routes.

X. EMPIRICAL EVIDENCE FOR THE IMPACT OF DEREGULATION AND
DIVESTITURE

One of the immediate concerns of American policy was the effect of the AT&T divestiture on residential subscribers. Figures of 300% increases were frequently anticipated. In absolute numbers, the figures are far less dramatic. Nationwide, local rates in real terms increased at the annual rate of 6.9%; but interstate long distance rates declined by 7.8% (Crandall, 1988). [Crandall, Robert W., 1988, Fragmentation of the Telephone Network: Implications for the Policymaker, Washington, DC: Brookings Institution.] In absolute terms, local residential rates increased from 1980-86 by about \$4.30, half of it after divestiture, (Noll & Riely, 1988). [Figure 5] [Noll, Roger G., and Susan Riely, 1988, " The Laboratory of the States: Local Service Prices Before and After Divestiture," Palo Alto, CA: Center for Economic Policy Research.] In New York State, basic rates rose by 46%; but in absolute terms this was a \$2.61 increase per month. [Figure 6] Add to that declining equipment cost, and the total effect on the average household has not been high in absolute terms. For New York State, New York Telephone's overall average bill, holding equal for consumption, has increased only 80 cents/months from 1983 to 1986 (NYT, 1988). Overall telephone rates for the US as a whole rose since 1984 (the dashed vertical line) by about 15%, but that was barely above the rate of inflation (CPI) of 14.1%, and did not include the lower equipment costs. [Figure 7] Furthermore, many of the

rate increases were in the first phase after the divestiture for all states, local rate hikes approved by state carriers declined from \$3.87 bil. in 1984; to \$1.15 bil in 1985 and \$.29 bil. in 1986; and to negative \$.46 bil. in 1987 [Figure 8] (of which one quarter was accounted for by New York) i.e. to declining rates. (FCC, 1988) In the year 1987/8, rates declined by about 4% (FCC, July 5, 1988, Telephone Rates update)

Rates did not rise as much as initially feared because costs could be contained. Partly this was due to lower interest rates and taxes. But other factors were higher productivity, reduced employment, and reduction of equipment prices. Productivity rose since the divestiture by almost 40%, according to the labor union CWA. [Figure 9]. The number of employees declined steadily; [Figure 10] the sharp decline in early 1984 is based on reassignments, not real reductions. Wages, however, rose for the remaining employees [Figure 11]. Central exchange equipment costs declined steadily, from \$230 per line in 1983 to an estimated \$144 in 1988. [Figure 12].

Equipment prices fell as the BOCs gained the freedom to go shopping at other suppliers. AT&T's national market share, e.g. for central office switches, fell from 70% in 1983 to 46% in 1986, with Northern Telecom reaching 40%. Overall, the expenses per access line, not including the reduced taxes, declined from about \$38 to about \$33, [Figure 13] i.e. almost 13%, including inflation of 14%. Revenues per line, at the same time, increased since 1984, from about \$82 to \$88, [Figure 14] leading to an

FIGURE 5

**Table 1: Rates for Single-Line Residential Service:
Averages for All Companies**

Size of Locality (# of Terminals)	YEARS						Change 1980-86
	Pre-Divestiture		Divestiture Plans		Post-Divestiture		
	1980	1981	1982	1983	1985	1986	
Smallest	\$6.49	\$6.69	\$7.42	\$8.64	\$10.68	\$10.92	\$4.43
1,000	6.60	6.82	7.54	8.76	10.78	11.01	4.41
5,000	7.05	7.25	7.97	9.20	11.15	11.36	4.31
25,000	7.84	8.05	8.82	10.11	11.95	12.13	4.29
50,000	8.26	8.54	9.43	10.73	12.60	12.71	4.45
100,000	8.70	8.96	9.85	11.21	12.94	13.07	4.37
250,000	9.40	9.72	10.56	11.72	13.70	13.81	4.41
500,000	9.86	10.30	10.97	12.24	14.05	14.01	4.15
750,000	9.74	10.02	11.33	12.00	12.89	12.96	3.22
1,000,000	9.56	9.94	10.37	11.44	12.81	12.88	3.32
Difference	3.07	3.25	3.05	2.80	2.13	1.96	-1.11
# of Companies	52	53	54	54	51	51	

Source: National Association of Regulatory Utility Commissioners, Exchange Service Telephone Rates, 1980 through 1983, and Bell Operating Companies Exchange Service Telephone Rates, 1985 and 1986.

R. Noll & S. Riely, Stanford University, "The Laboratory of the States: Local Service Prices Before and After Divestiture," 1987.

FIGURE 6

Residence Lowest Cost Measured Service Selected U.S. Major Metropolitan Areas

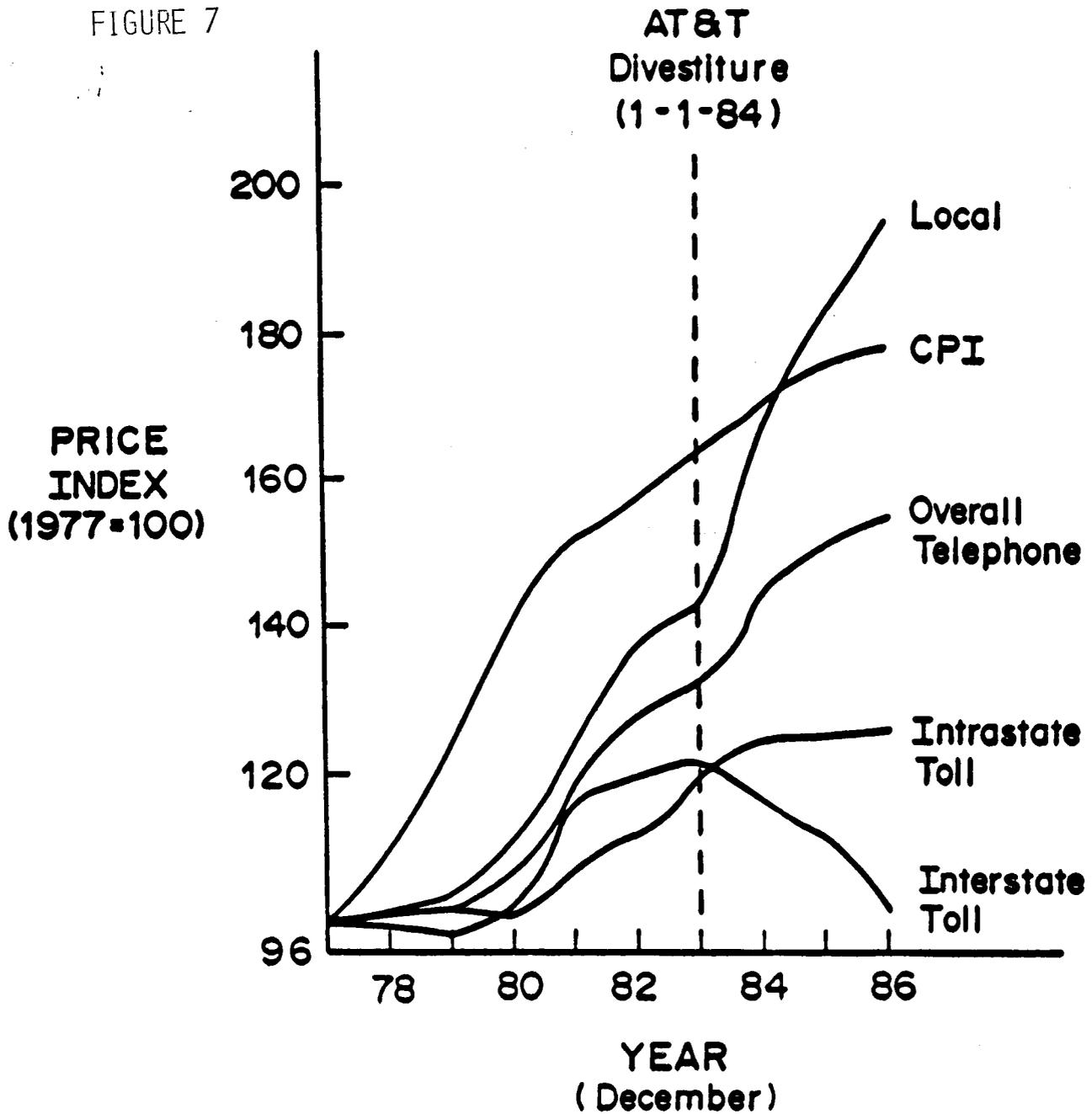
	<u>1983</u>	<u>1987</u>	<u>% Change</u>
PORTLAND, ORE.	\$ 7.60 (-)	\$ 12.35(-)	+63
NEW ORLEANS	\$ 7.35 (\$1.00)	\$ 10.46 (\$1.00)	+42
KANSAS CITY	\$ 6.40 (-)	\$ 8.40 (20 calls)	+31
NEWARK	\$ 5.20 (20 calls)	\$ 7.74 (20 calls)	+49
NEW YORK CITY	\$ 5.31 (-)	\$ 7.92 (-)	+49

**NOTE: Rates are for non-lifeline services and include
Access Line and inside wire.**

() Indicates allowance

Rates as of 1-87

FIGURE 7



Source:

J. Horning, R. Lawton, J. Racster, W. Pollard, D. Jones & V. Davis, National Regulatory Research Institute, "Evaluating Competitiveness of Telecommunications Markets: A Guide for Regulators," Columbus, Ohio, 1988.

Fig. 6-1. Consumer telephone rates, 1977-1986

TABLE 9

State Telephone Rate Cases
(Millions of Dollars)

	<u>Revenue Increases Requested During Quarter</u>	<u>Revenue Changes Ordered During Quarter</u>	<u>Requests Pending at End of Quarter</u>
1984 First quarter	\$ 627.7	\$ 1,175.6	\$ 4,851.9
Second quarter	93.7	2,054.2	1,675.6
Third quarter	2,242.9	284.5	3,387.5
Fourth quarter	<u>1,059.4</u>	<u>361.2</u>	3,672.3
Total	4,023.7	3,875.5	
1985 First quarter	976.6	246.3	3,779.0
Second quarter	172.4	314.8	3,316.3
Third quarter	108.3	286.5	2,664.2
Fourth quarter	<u>369.9</u>	<u>307.3</u>	1,437.3
Total	1,627.2	1,154.9	
1986 First quarter	155.1	58.0	766.2
Second quarter	249.9	57.9	362.0
Third quarter	230.0	173.3	315.7
Fourth quarter	<u>8.7</u>	<u>.8</u>	322.6
Total	643.7	290.0	
1987 First quarter	7.0	-41.0	67.1
Second quarter	19.4	-48.5	47.7
Third quarter	62.0	-91.0	94.0
Fourth quarter	<u>57.9</u>	<u>-279.9</u>	124.7
Total	146.3	-460.4	

FCC, Common Carrier Bureau, Industry Analysis Division,
"Trends In Telephone Service," Washington, D.C., 1988.

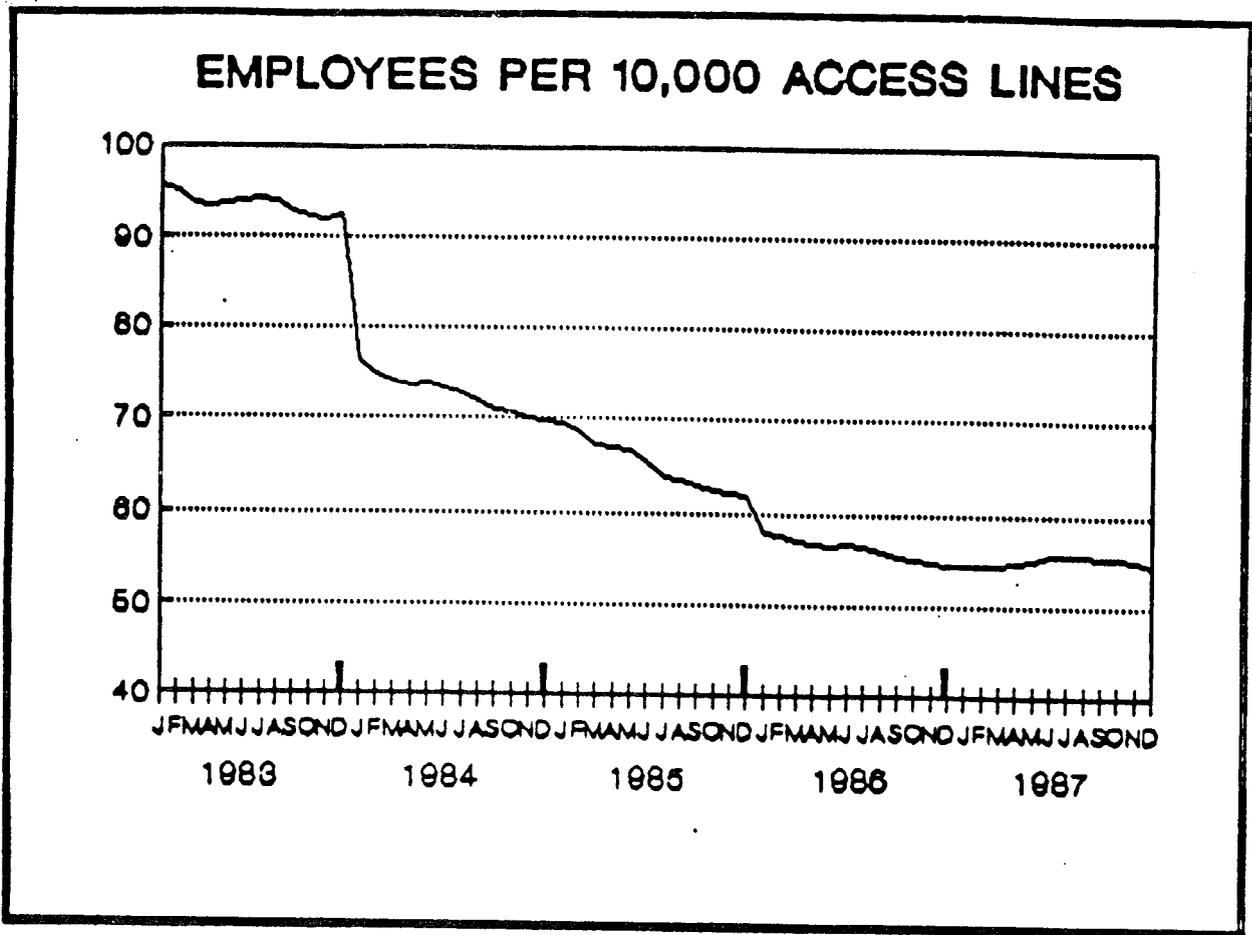
FIGURE 9

Table 1-17
 Telephone Industry Productivity Gains
 (Access Lines Per Employee)

	1981	1982	1983	1984	1985	1986
Employees	1,028,351	989,625	878,638	736,505	725,000	672,000
Access Lines(000)	107,416	108,593	111,373	114,349	118,275	122,203
Lines/Emp.	104	110	127	155	163	182
Percent Gain		5.1%	15.5%	22.5%	5.1%	11.5%

Source: Communications Workers of America, Information Industry Report, Vol.1, No.2, Dec. 1987.

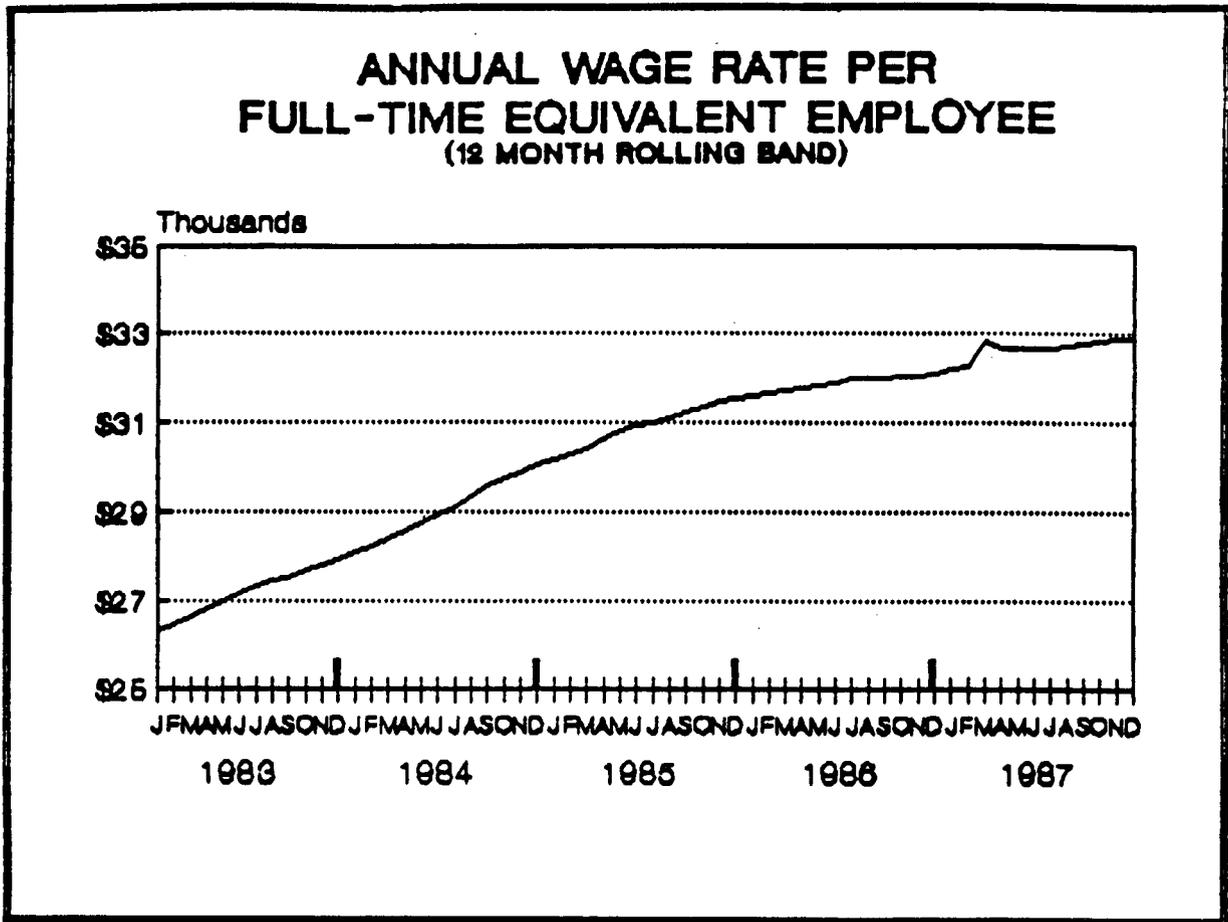
FIGURE 10



	1983	1984	1985	1986	1987
JAN	95.5	76.3	69.3	57.9	54.6
FEB	95.0	74.8	68.5	57.5	54.5
MAR	93.8	73.9	67.3	57.0	54.5
APR	93.3	73.4	67.0	56.7	54.7
MAY	93.6	73.6	66.6	56.6	54.9
JUN	94.0	73.1	65.6	56.7	55.6
JUL	94.1	72.6	63.9	56.4	55.8
AUG	93.9	71.8	63.5	55.9	55.7
SEP	93.0	71.0	62.9	55.3	55.4
OCT	92.3	70.5	62.5	55.0	55.3
NOV	91.9	70.0	62.1	54.8	55.1
DEC	92.6	69.8	61.8	54.6	54.6

Source: New York State Public Service Commission, from data reported by New York Telephone 1988.

FIGURE 11



	1983 -----	1984 -----	1985 -----	1986 -----	1987 -----
JAN	\$26,305	\$28,111	\$30,139	\$31,561	\$32,186
FEB	\$26,473	\$28,266	\$30,261	\$31,612	\$32,279
MAR	\$26,645	\$28,425	\$30,378	\$31,691	\$32,840
APR	\$26,855	\$28,578	\$30,657	\$31,728	\$32,669
MAY	\$27,012	\$28,751	\$30,780	\$31,799	\$32,683
JUN	\$27,196	\$28,930	\$30,905	\$31,868	\$32,687
JUL	\$27,384	\$29,124	\$31,005	\$31,963	\$32,683
AUG	\$27,453	\$29,362	\$31,125	\$31,980	\$32,744
SEP	\$27,547	\$29,599	\$31,244	\$31,994	\$32,804
OCT	\$27,689	\$29,736	\$31,332	\$32,004	\$32,863
NOV	\$27,805	\$29,875	\$31,422	\$32,054	\$32,880
DEC	\$27,957	\$30,020	\$31,511	\$32,101	\$32,901

FIGURE 12

COST OF DIGITAL CENTRAL OFFICE SWITCH
(In Millions of Dollars)

10,000 Line	1983	1984	1985*	1986*	1987*	1988*
Switch	2.73	2.53	2.29	2.08	1.91	1.73
20,000 Line						
Switch	4.60	4.18	3.80	3.36	3.08	2.88

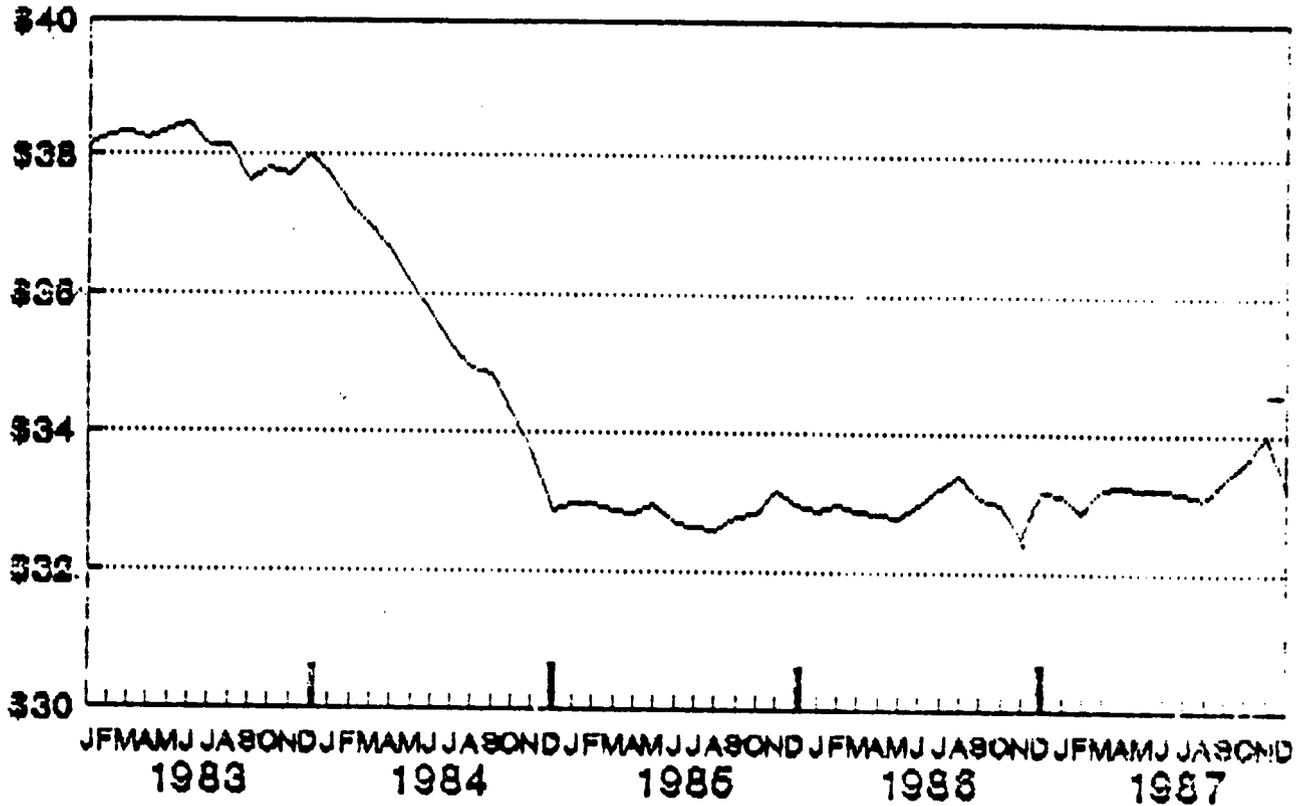
- Switch costs exclude installation

* Estimated by New York Telephone

Source: NY PSC as reported by New York Telephone.

FIGURE 13

EXPENSE PER ACCESS LINE EXCLUDING TAXES (12 MONTH ROLLING BAND)



New York State Public Service Commission,
Communications Division, 1988. (From data reported by
New York Telephone.)

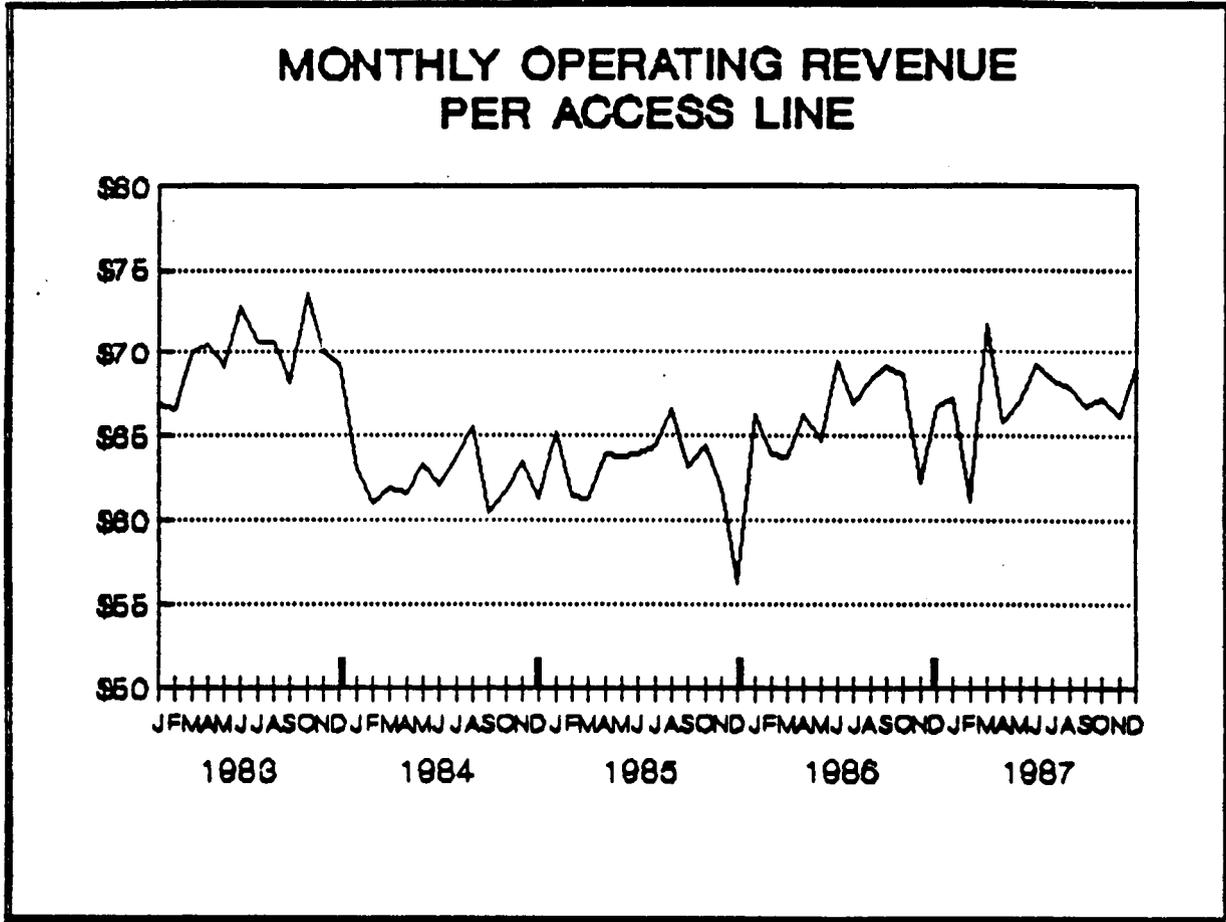
overall comfortable rate of return of 13.6%.

The prediction of steep rate increases also did not take into account the working of the political-regulatory system where strong commitment to social concerns protected local service rates. Furthermore, social safety nets in the form of budget or "life-line" service for the needy were introduced, as described above.

Subsidized rates for the poor were approved. In New York, "Lifeline" service of \$1/month for basic dial tone was instituted in 1987 by the Public Service Commission. FCC access fee was waived and usage was discounted by about 10% in two options. Installation fee for those who did not yet have a telephone was reduced to \$2/month over a year. No deposit is necessary. An estimated 1.5 million users are eligible for the program; eligibility is determined by membership in one of several social support programs such as welfare. (It should be noted that many support programs include an allowance for a telephone; thus, net cost to the user is still lower than the above figures. Some households can get up to \$5/mo. more in food stamps if they have a telephone subscription.)

Thus, despite fears, overall telephone penetration did not decline after divestiture, but increased, from 91.4% in November 1983 to 92.7% in March 1988 (FCC, 1988,) [Figure 15]. For the middle class, (\$30,000/yr household income) penetration was 98% and higher. [Figure 16] For the poor (\$5,000 - 7,500), it rose from 82.7% to 84.0%. (The official poverty line for a household

FIGURE 14



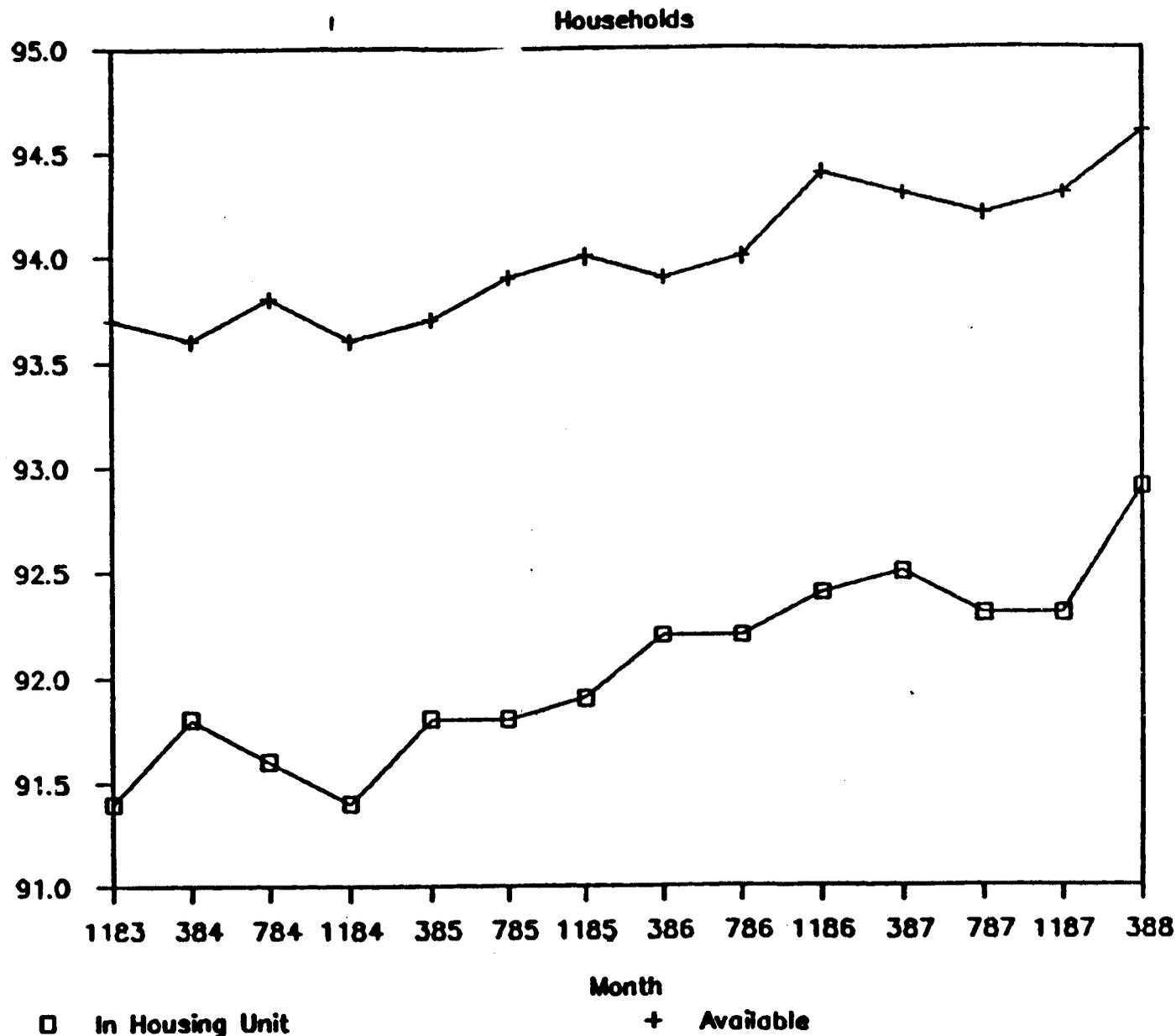
	1983 -----	1984 -----	1985 -----	1986 -----	1987 -----
JAN	\$66.90	\$63.01	\$65.08	\$66.19	\$67.21
FEB	\$66.48	\$61.00	\$61.35	\$63.87	\$61.14
MAR	\$70.03	\$61.85	\$61.28	\$63.79	\$71.73
APR	\$70.43	\$61.56	\$63.95	\$66.25	\$65.83
MAY	\$69.05	\$63.30	\$63.71	\$64.70	\$67.02
JUN	\$72.73	\$61.99	\$63.88	\$69.34	\$69.15
JUL	\$70.53	\$63.71	\$64.43	\$66.89	\$68.25
AUG	\$70.62	\$65.45	\$66.57	\$68.25	\$67.78
SEP	\$68.02	\$60.52	\$63.10	\$69.08	\$66.78
OCT	\$73.52	\$61.66	\$64.33	\$68.62	\$67.21
NOV	\$69.97	\$63.36	\$61.94	\$62.23	\$66.06
DEC	\$69.14	\$61.24	\$56.36	\$66.76	\$69.08

Source: New York Public Service Commission from data provided by New York Telephone.

FIGURE 15

Telephone Penetration

CHART 1
Percent with Telephone



Source: FCC, Common Carrier Bureau, Industry Analysis Division, "Telephone Subscribership in the U.S.," Washington, D.C., 1988.

FIGURE 16

Percentage of Families With a Telephone By Income
Unit Penetration July 1987

<u>Income</u>	<u>Percentage</u>
Total	92.3
Under \$5,000	70.7
\$5,000-\$7,499	83.6
\$7,500-\$9,999	86.5
\$10,000-\$12,499	89.6
\$12,500-\$14,999	91.2
\$15,000-\$17,499	92.2
\$17,500-\$19,999	94.8
\$20,000-\$24,999	96.0
\$25,000-\$29,999	97.6
\$30,000-\$34,999	98.0
\$35,000-\$39,000	98.8
\$40,000-\$49,999	99.3
\$50,000-\$74,999	99.4
\$75,000+	99.4

Source: J. Fuhr, Jr., "Telephone Subsidization in Rural Areas,"
Chester, PA, 1987.

FIGURE 17

AVERAGE MONTHLY FLAT RATE LOCAL TELEPHONE SERVICE

	RESIDENTIAL	BUSINESS	DIFFERENCE	DIF %
NEW YORK TELEPHONE	\$11.71	\$30.75	\$19.04	162.60%
INDEPENDENT TELCOS	\$8.65	\$16.08	\$7.43	85.90%
DIFFERENCE	(\$3.06)	(\$14.67)	(\$11.61)	
DIFFERENCE %	-26.13%	-47.71%	-60.98%	

o Rochester Telephone not included, as an urban system.

of 4 was \$11,012 in 1987). For poor Blacks (\$5,000-7,500), telephone penetration rose from 74.7 to 76.1%. For poor Hispanics, it rose from 71.1 to 71.7%.

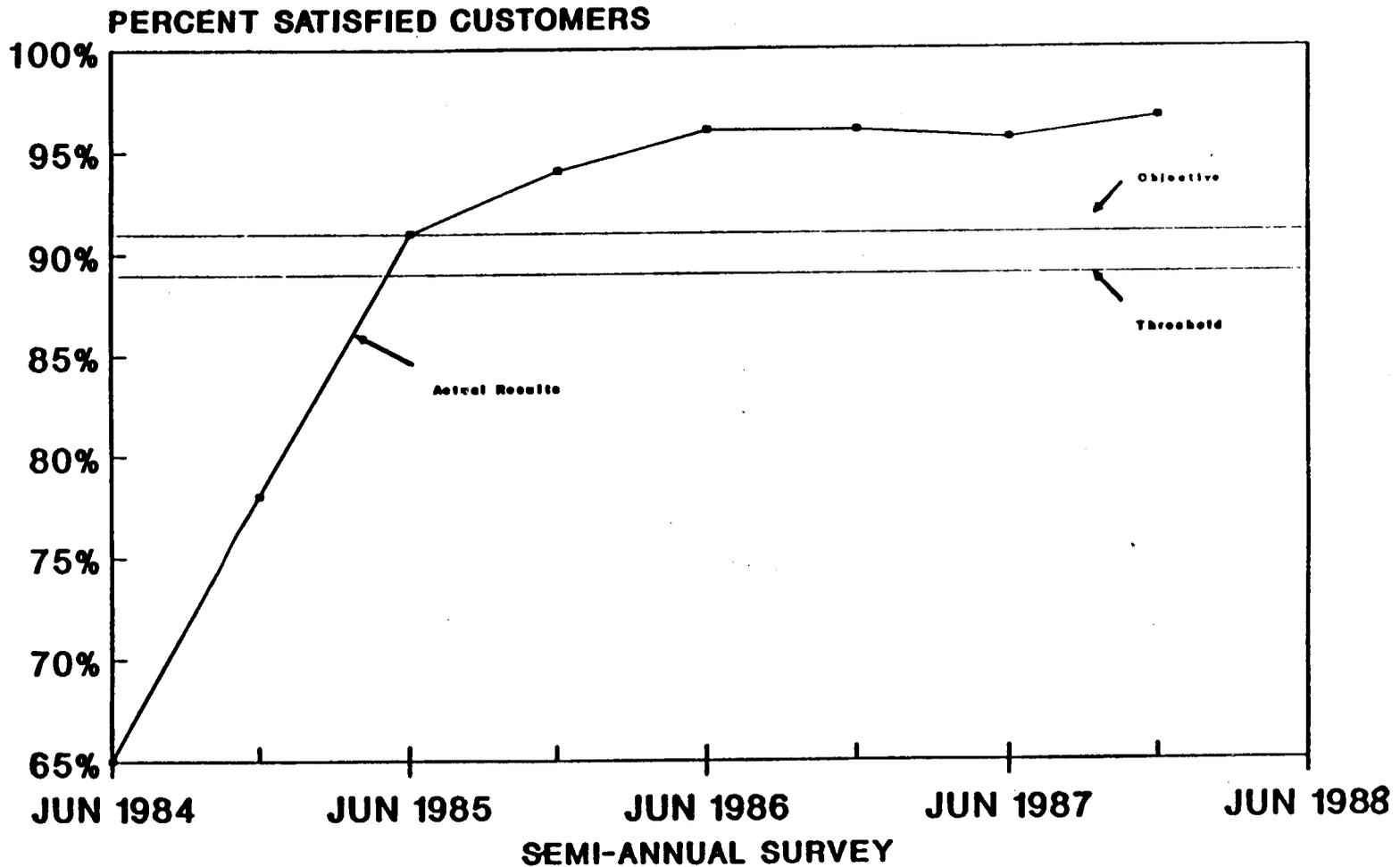
Telephone rates for rural areas are often (but not always) lower than in urban areas, because flat rate service is cheaper for small exchanges, because of various subsidy mechanisms, and because of lower overheads. Figure 17 shows a 26% price difference between New York Telephone (mostly urban and suburban) and the independent telephone companies (typically rural). The table also shows the price difference between residential and business rates. In typical farm states such as Iowa and Kansas, telephone penetration (95.1 and 95.2%) is higher than the national average. 95% of all farms have telephones.

Service quality, at the same time, held steady -- both medium-sized and large users reported greater satisfaction than before in a series of surveys (from 83% and 65% in 1984 to 92% and 95% in 1986 through 1988 for medium and large customers). [Figures 18 and 19] (New York Telephone Customer Survey) (NYT, 1988, Communication to the PSC) For all customers, a "comfort" index of 18 variables held steady at about 88 out of 100 from 1984 to 1988 (NYT, 1988, Communication to the PSC). [Figure 20] Similarly, customer complaints to the PSC were not increasing [Figure 21]. (In recent months, however, the quality measures in parts of New York City has deteriorated.)

Overall, it is highly unlikely that residential customers will bear the full cost of their service; it is more likely that

FIGURE 18

CUSTOMER ATTITUDE SURVEY I LARGE BUSINESS CUSTOMERS

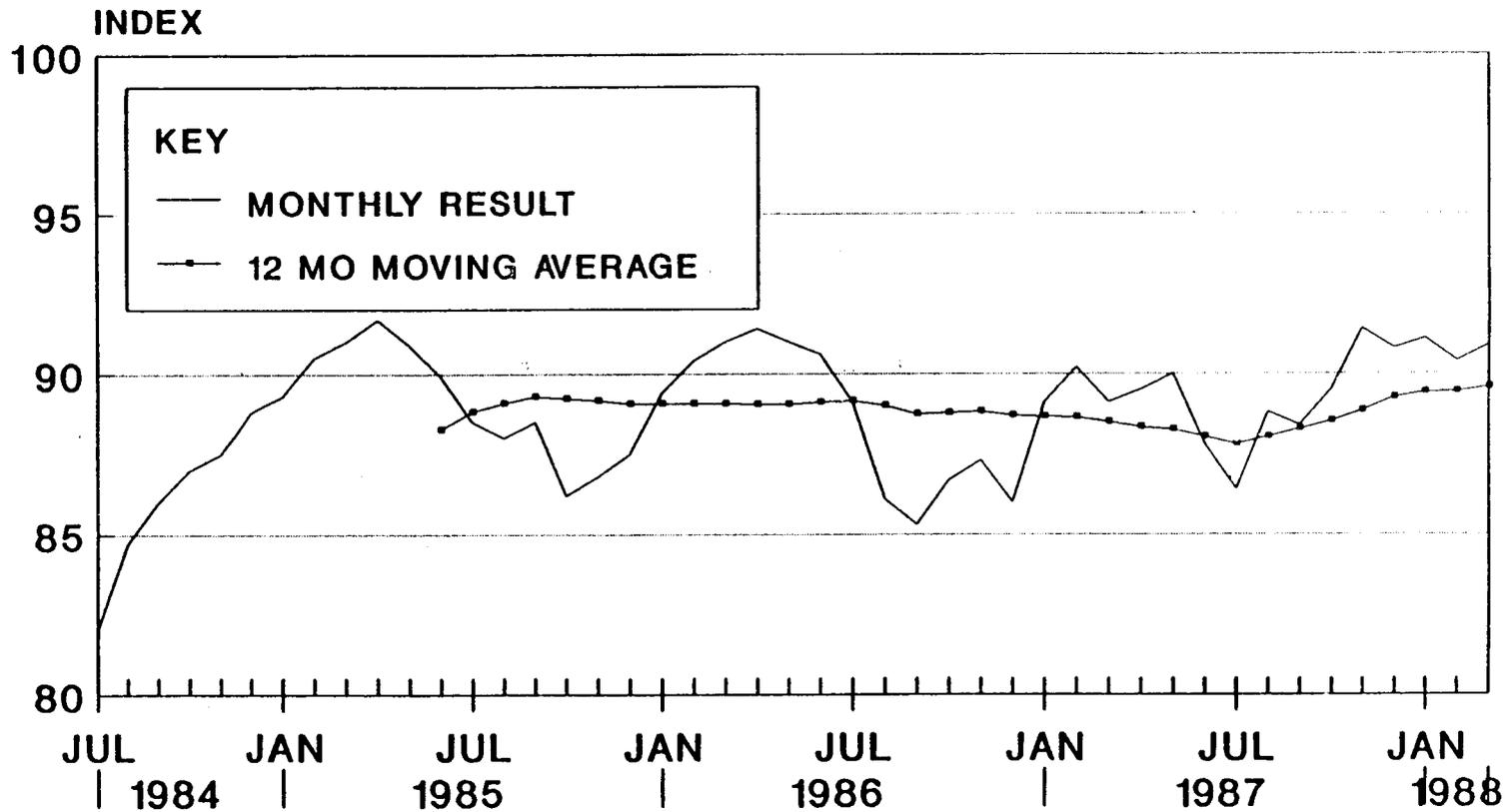


THE TOP 200 BUSINESS CUSTOMERS - THOSE CUSTOMERS WITH THE LARGEST ANNUAL REVENUES.

FIGURE 20

CUSTOMER COMFORT LEVEL

A COMPOSITE INDEX OF OVERALL SERVICE QUALITY

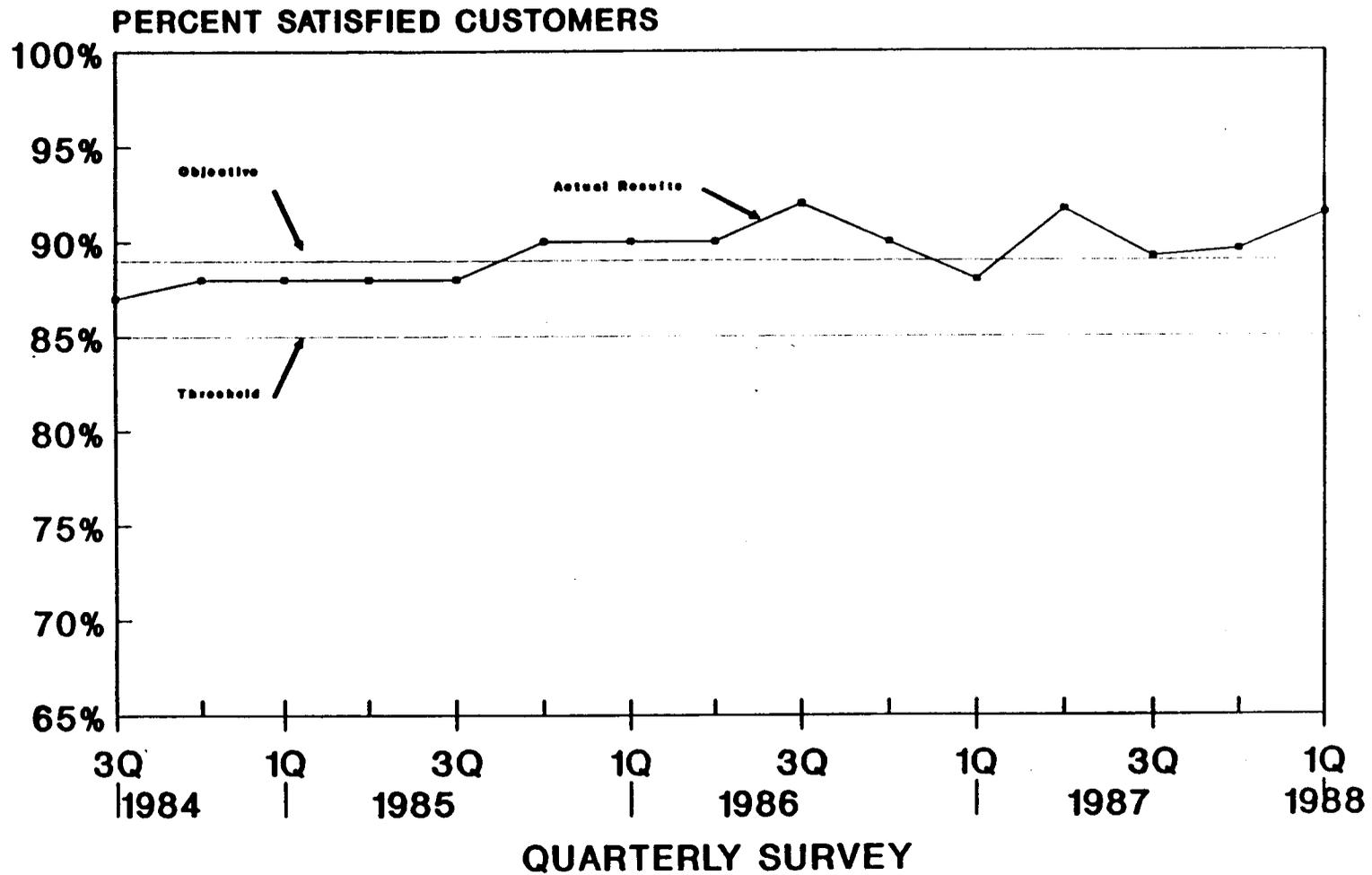


THIS INDEX IS BASED UPON EIGHTEEN DIFFERENT SERVICE MEASUREMENTS OF INSTALLATION & REPAIR.

Source: New York State Public Service Commission from data provided by New York Telephone.

FIGURE 19

CUSTOMER ATTITUDE SURVEY II MEDIUM SIZE BUSINESS CUSTOMERS



**BUSINESS CUSTOMERS
WITH ANNUAL REVENUES OF \$50,000 OR MORE
BUT NOT IN THE TOP 200.**

there will be some alternative form of subsidy, either internal -- to the extent that this will not lead many business users to "bypass" the system -- or through some form of a communications surtax for a universal service fund. Finally, the rate pressure is forcing the local exchange telephone firms and their holding companies to discover ways of cutting costs and to find new business opportunities. The total result is that residential users are not likely to be as badly off as it seemed at first; they will primarily pay more than they did before divestiture if they have a low volume of long-distance calls. Most reassuringly, a strong sentiment for supporting the poor and elderly in their telephone usage is evident.

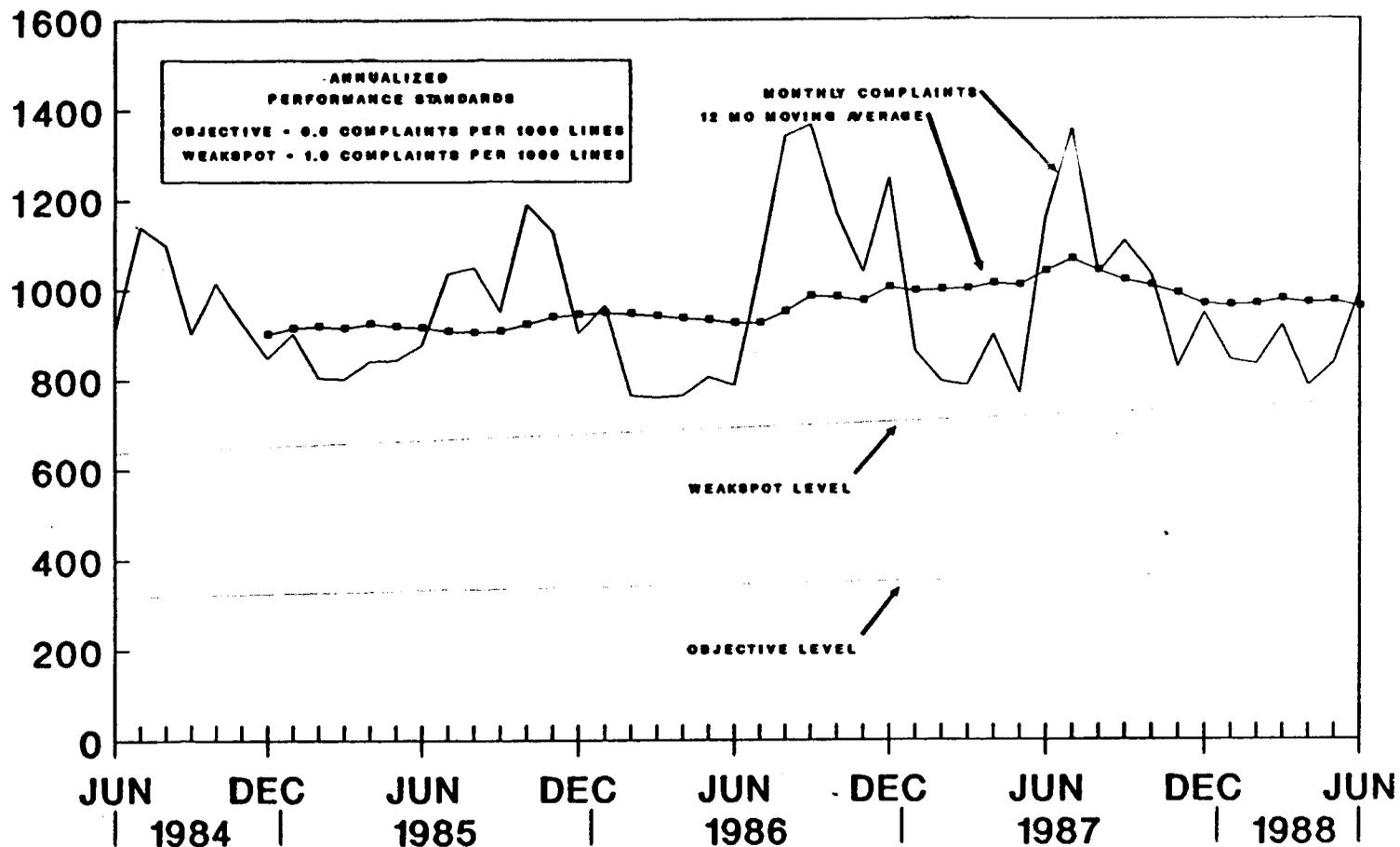
There was also a great fear about a technological decline, because Bell Labs' Research and Development would be curtailed by profit-minded management. Actually, the opposite occurred. One study found that total R&D employment rose from 24,100 in 1981 to 33,500 in 1985. (AT&T and the regionals' joint R&D firm, Bellcore, combined.) (Noll, 1987) [Noll, A. Michael, 1987, "The Effects of Divestiture on Telecommunications Research," Journal of Communications, Vol. 37 no. 1, pp.73-80.] By 1988, the regional companies had added their own laboratories, and total R&D employment had risen to an estimated 35,600. [Figure 22] However, overall R&D is still quite low [Figure 23.]

XI. IMPACT ON THE LONG DISTANCE MARKET

AT&T's long-distance rates were reduced by 40-45% in real

FIGURE 21

NEW YORK TELEPHONE COMPLAINTS TO THE COMMISSION



FOR PURPOSES OF THIS GRAPH, THE PERFORMANCE STANDARDS HAVE BEEN RESTATED IN TERMS OF NUMBERS OF COMPLAINTS. THESE EQUIVALENTS GENERALLY INCREASE OVER TIME DUE TO LINE GROWTH.

FIGURE 22

PRE- AND POST-DIVESTITURE RESEARCH AND DEVELOPMENT : AT&T

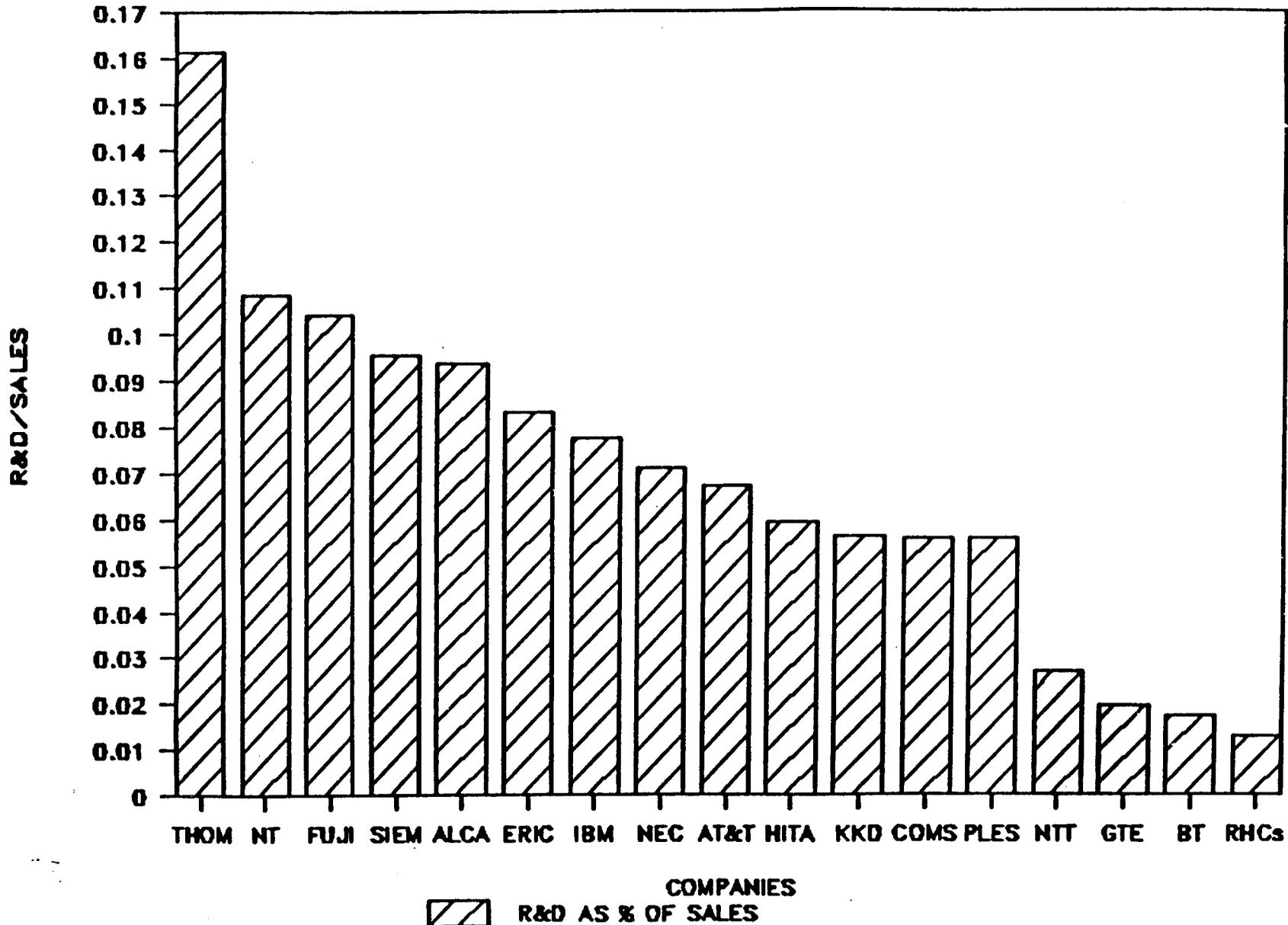
	<u>1981</u>	<u>1985</u>	<u>1988</u>
	Bell Labs	AT&T R&D	AT&T R&D
Budget	\$ 1.6 bil	\$ 2.37 bil	\$ 2.46 bil
Employees	24,100	24,500	26,200
		Bellcore	Bellcore
Budget		\$ 0.86 bil	\$ 0.80 bil
Employees		7,700	7,320
			Regional Holding Companies (est.)*
Budget			\$ 0.21 bil
Employees			2,100
	Bell Labs	AT&T & Bellcore Combined	AT&T, Bellcore & Regional Holding Cos. Combined (est.)*
Budget	\$ 1.6 bil	\$ 3.23 bil	\$ 3.47 bil
Employees	24,100	33,500	35,600

* Assumes that all seven Regional Bell Holding Companies will undertake research efforts at a similar level to that of NYNEX Corp, \$30 mil/company = \$210 mil.

Source: A.M. Noll, "Bell System R&D Activities: The Impact of Divestiture," Telecommunications Policy, June 1987.

Right column estimates by the author.

FIGURE 1: 1986 R&D EXPENDITURES AS % OF SALES REVENUES



R. Harris, "The Implications of Divestiture and Regulatory Policies for Research, Development and innovation in the U.S. Telecommunications Industry," Berkeley, 1987.

terms since the divestiture until 1988 (But see discussion of the end-user line charge which partly offset this saving.) The company has been fairly successful in protecting its position, though its market share had no place to go but down. Of inter-LATA long-distance service, it reports its share as about 70% [Figure 24.] As a percentage of all users, however AT&T's share is higher because it has more small subscribers. If short-haul interexchange service is included in the market definition (i.e. including the local exchange companies regional (intra-LATA) service, AT&T share is only about 60%. MCI, the strongest of AT&T's rivals, has a share of close to 10%, and it has absorbed IBM's long-distance venture SBS. GTE Sprint experienced serious financial difficulties; it first merged with United Telecommunications into "US Sprint," and then substantially reduced its stake in the venture. Subsequently dominated by United with a market share of about 6%, a fierce marketing battle took place across the country as "equal access" was being phased in exchange-by-exchange.

Questions have been raised about whether AT&T may end up again as a monopolist. This is unlikely:

(a) SBS and GTE's difficulties have been partly management problems. MCI, by 1988, was a healthy and profitable (second quarter profits for 1988: \$73 million) \$5 billion company with an ever-increasing line of services, it was buying back IBM's 16% share in the company.

(b) The FCC has not let the monopoly re-emerge, and that

meant handicapping AT&T to some extent, as is still the case.

(c) The seven Bell regional companies, which at present are precluded from that field, will probably provide some long-distance service in the long-run.

(d) The long-run trend is for "smart" equipment to select "least-cost-routing" among several companies. Thus, subscribers will not choose one long-distance company anymore, as they usually do now, but different calls will use different carriers.

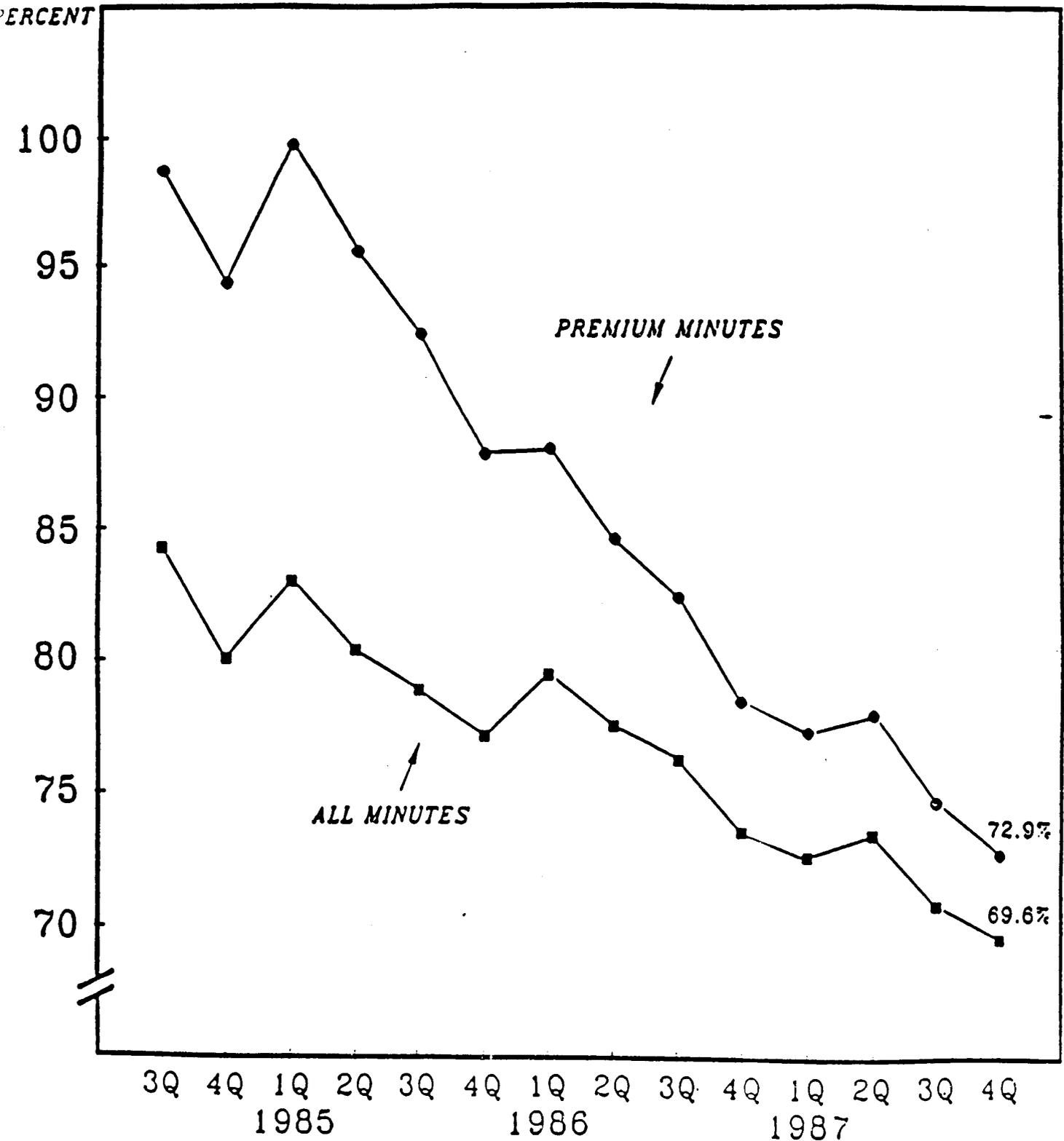
(e) Long-distance will become a commodity business, with railroads, highway authorities, and satellite firms providing capacity for service packages put together by wholesalers.

(f) AT&T's share declines each year by about 2%; at present, not all households are yet connected to "equal access" exchanges that permit easy choice among carriers. AT&T's volume increased by 7.6%, but that of its competitors by almost 40% [Figure 25.] The number of competitors increased from 42 in 1982 to 451 in 1987 [Figure 26.] (Of these, most are only resellers.)

The most important point is that even if AT&T's market share is still dominant, its prices had to come down, in real terms, by about 45% since divestiture.

Another fundamental economic problem of competition in telecommunications, at present only in its incipiency, was not well anticipated. It is the problem of unstable competition when marginal costs are quite low. With the expansion of the various long-distance networks, one may soon reach overcapacity; with low marginal cost, price wars should then be expected that would not

AT&T SHARE OF INTERSTATE MARKET (SWITCHED MINUTES)

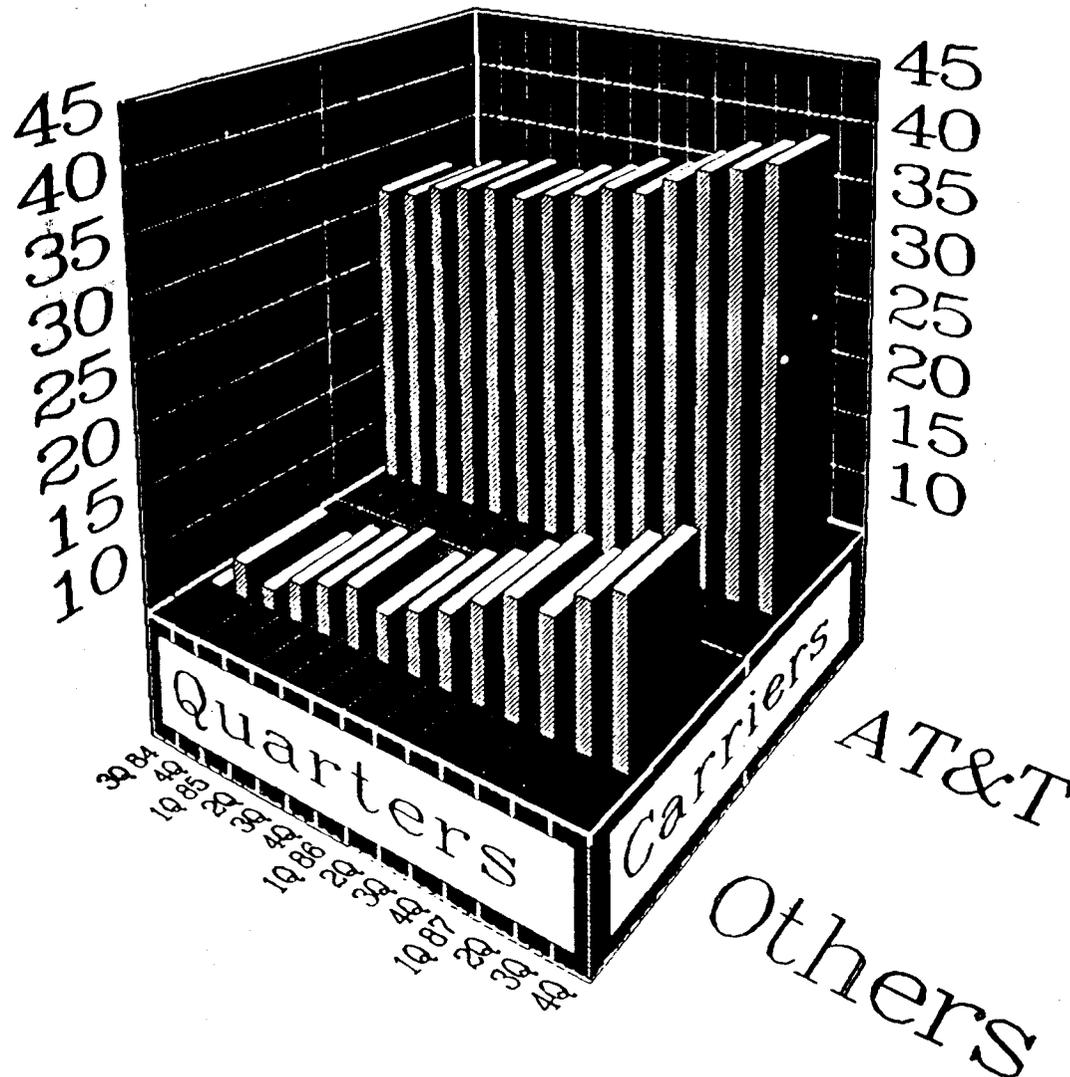


Source:

AT&T, "Reduced Regulation of AT&T in the Interstate Marketplace," (using data from the FCC, Common Carrier Bureau, Industry Analysis Division), 1988.

FIGURE 25

Interstate Switched Access by Carrier



Growth Rate: Others = 39.7% AT&T = 7.6% TOTAL = 14.1%

Source: Data from FCC, Common Carrier Bureau, Industry Analysis Division, "AT&T's Share of the Interstate Switched Market: Fourth Quarter, 1987," Washington, D.C., 1987.

FIGURE 26

Number of Firms with Carrier Identification Codes	
June 30, 1982:	13
December 31, 1982:	11
June 30, 1983:	25
December 31, 1983:	42
June 30, 1984:	65
December 31, 1984:	123
June 30, 1985:	179
December 31, 1985:	217
June 30, 1986:	276
December 31, 1986:	334
June 30, 1987:	397
December 31, 1987:	451

Source: FCC News, Federal Communications Commission,
February 2, 1988, page 15

its customers -- comprising 80% of the total market -- were foreclosed to other suppliers by its ties to AT&T's manufacturing subsidiary, Western Electric.

Although most analysts expected the BOCs to cling to AT&T as their equipment supplier after divestiture, in fact they embraced a wide variety of non-AT&T equipment quite rapidly.

Imports increased from \$1.6 billion in 1983 to over \$3.5 billion in 1987 [Figure 27.] Exports increased from \$.8 billion to \$1.0 billion. In central office switches, the foreign-based companies' share increased enormously [Figure 28.] AT&T's share dropped from 70% to 46% in 4 years. The number of foreign equipment increased enormously, in particular from Asian suppliers [Figures 29 and 30.] All these tendencies created a trade problem which is likely to be for American policy makers the major political issue in international telecommunications

Technical network standards are coordinated for the BOCs by Bell Communications Research (Bellcore). There appears to be no sign that Bellcore is using this role to favor AT&T or other US manufacturers. Neither the executive branch, the FCC, nor the state commissions have shown a desire to set standards beyond those already in place.

Procurement of network equipment by local telephone companies is governed by their obligation to state regulators to pay the lowest possible prices. They are under pressure to keep rates low due to the loss of subsidies from long-distance service. The ability to compare cost trends for the 22

permit a recovery of total costs. In such circumstances, one can see the re-emergence of stabilizing rate regulation in the future, this time presiding over an oligopoly rather than a monopoly.

XII. IMPACT ON THE EQUIPMENT MARKET

The connection of terminal equipment to the interstate network is regulated by the Communications Act and the FCC's regulation. Part 68 of the FCC's rules sets minimum technical standards that equipment must meet in order to be connected to any public switched network.

Terminal equipment users have non-discriminatory access to the telephone network. Equipment sellers must register their products, however, with the FCC before marketing them. Registration requires the disclosure of a unit's technical specifications, so that the FCC's staff can identify any possible system degradation prior to installation of the equipment. There is, however, no approval process and one can buy a telephone, of dubious quality, for as little as four dollars on a New York City street corner.

The US market for central office (i.e., local exchange) equipment was characterized in the past by a fairly competitive situation among non-AT&T companies. AT&T was precluded from that market, but -- perhaps as a result -- many other companies were active in it, including foreign suppliers such as Ericsson and Northern Telecom. In contrast, the vast Bell system and all of

FIGURE 27

**Table 1-18
Telecom. Trade**

Year	U.S. Imports (\$000)	U.S. Exports (\$000)
1980	478,238	557,040
1981	564,331	652,215
1982	816,392	829,144
1983	1,683,268	789,960
1984	2,249,371	777,251
1985	2,377,793	832,103
1986	2,776,071	870,182
1987 (1st qtr.)	1,231,000	666,600

Source: International Trade Commission. Includes Cordless telephones and telephone answering devices; intercoms are not included.

1-19
Exports/Imports of Telecommunications Equipment
(January-September 1987)
(millions of dollars)

Country	Exports from US to:	Imports to US from:	Balance
France	\$ 32.6	\$ 26.7	\$ 5.9
West Germany	78.6	35.3	43.3
Great Britain	156.4	36.2	120.2
Canada	224.6	307.6	-83.0
Hong Kong	36.7	241.2	-204.5
Japan	110.6	1774.0	-1663.4
South Korea	49.8	367.5	-317.7
Taiwan	110.0	519.5	-409.5

Source: Department of Commerce

Source: Communications Workers of America, Information Industry Report, Vol.1, No.2, Dec. 1987.

Table T-10

**Bell Company Network Products Procurement
Percentage Purchased from Foreign-based and Affiliated Firms**

Switching Equipment Procurement

<u>1983</u>	<u>1984</u>	<u>1985</u>
6	18	29

Fiber Optic Procurement

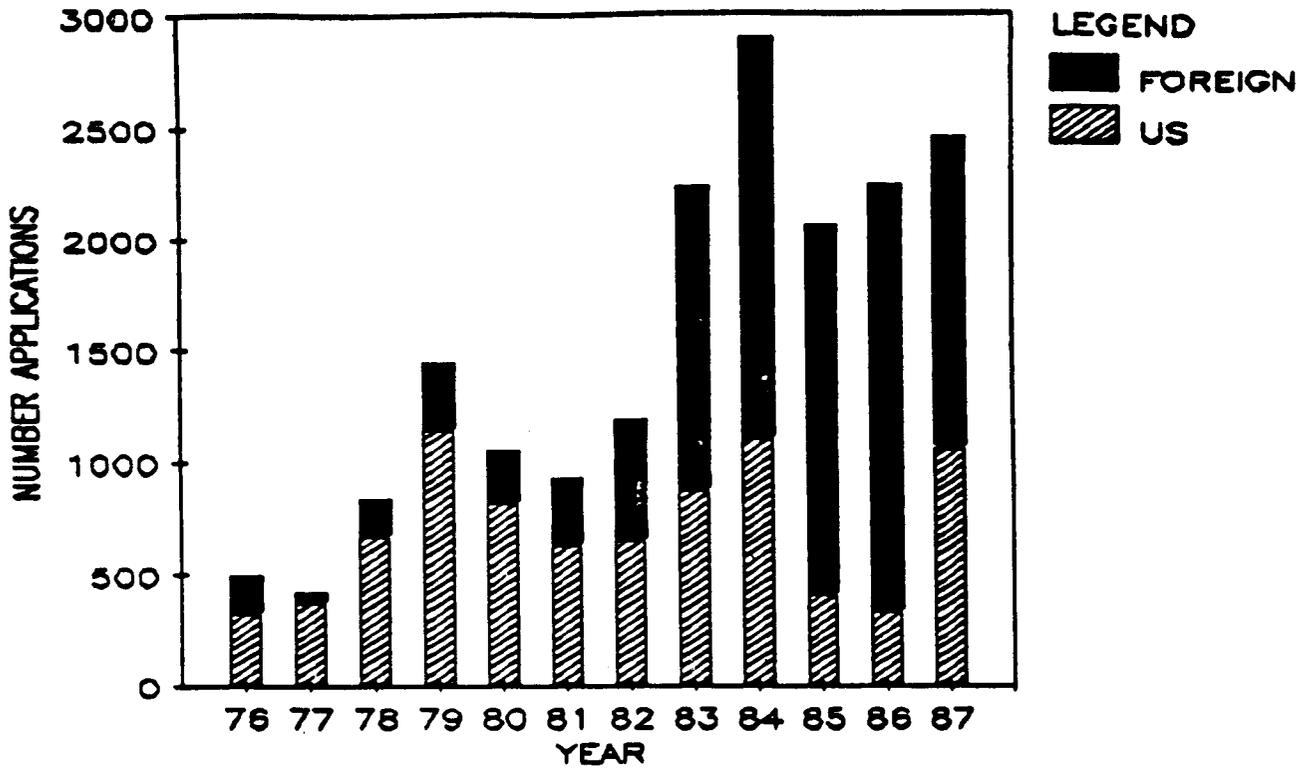
<u>1983</u>	<u>1984</u>	<u>1985</u>
35	23	40

Transmission Equipment Procurement

<u>1983</u>	<u>1984</u>	<u>1985</u>
5	3	23

Source: U.S. Department of Commerce, NTIA Trade Report Staff, "NTIA Trade Report: Assessing the Effects of Changing the AT&T Antitrust Consent Decree," Washington, D.C. 1987.

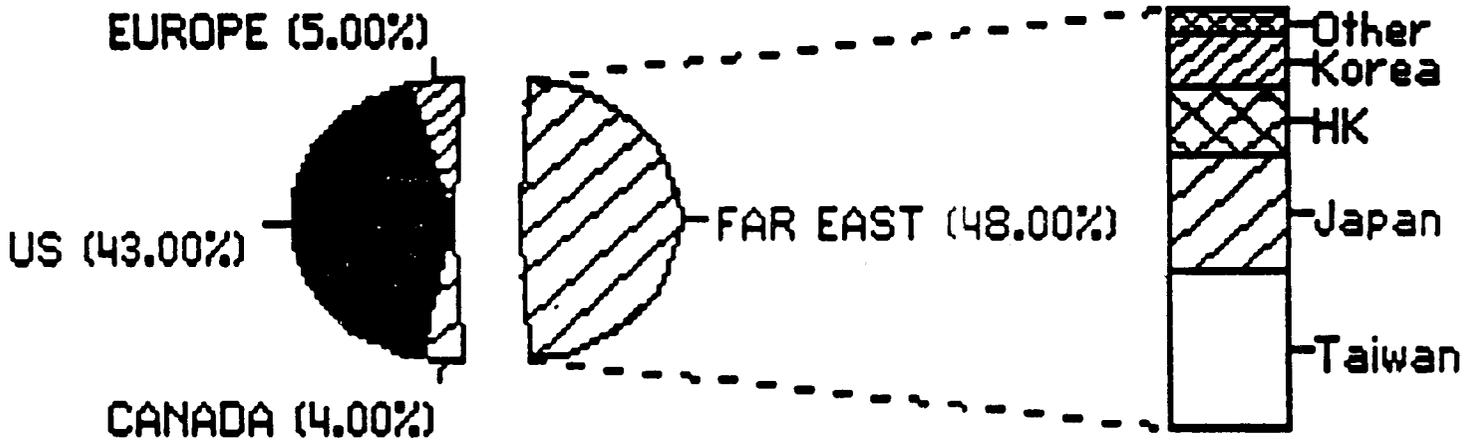
ANNUAL DISTRIBUTION OF US & FOREIGN PART 68 APPLICATIONS



18,471 applications since 1976

1987 PART 68 REGISTRATIONS BY COUNTRY

FIGURE 30



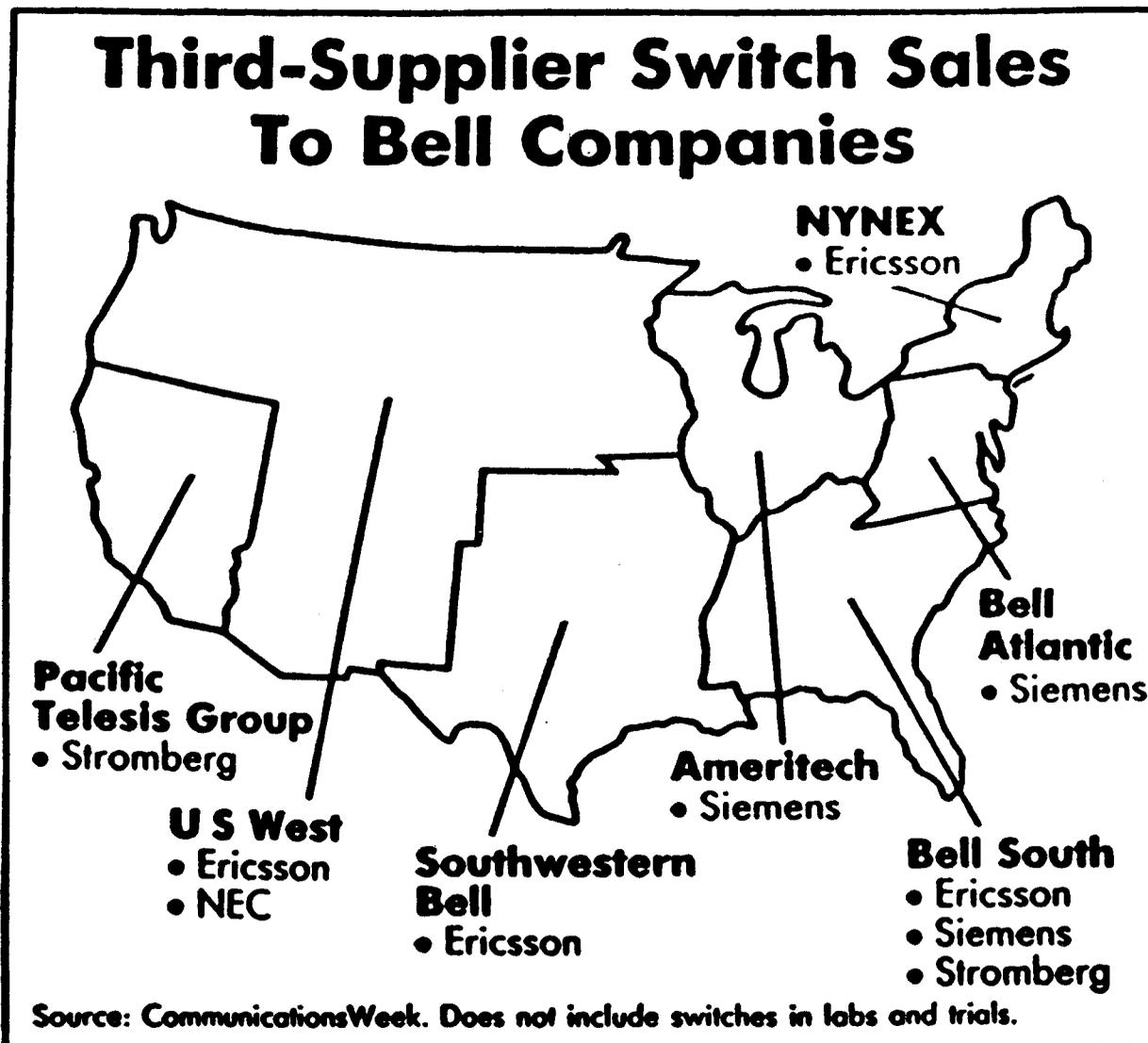


EXHIBIT 1

RETURN ON EQUITY:
TELEPHONE COMPANIES COMPARED TO TOP 1000 CORPORATIONS

	1984	1985	1986	1987
AMERITECH	14.1	14.5	15.0	14.9
BELL ATLANTIC	13.1	13.8	14.1	14.4
BELL SOUTH	13.4	14.2	14.4	13.8
NYNEX	12.9	13.3	13.9	13.7
PACTEL	12.8	12.8	14.1	12.3
SW BELL	12.9	13.6	13.4	12.8
US WEST	13.3	13.3	12.7	12.9
RBOC AVERAGE	13.2	13.7	14.1	13.6
TOP 1000 CORPS.	13.2	11.4	10.4	10.9

SOURCES: Business Week, "Scoreboard Special, 1985," "The Top 1000," (special issues 1986, 1987) "Corporate Scoreboard," November 16, 1987). For 1987 only the top 900 corporations are included.

companies also forces them to seek low-cost equipment. The "gold plating" (over-capitalization) of the past is unlikely to persist in today's environment. Because of the divestiture, the BOCs no longer have any incentive to increase Western Electric's profits, since none of those profits are returned to the BOCs.

XIII. OUTLOOK

When the AT&T divestiture was announced, US critics, and with them many European observers, interpreted this event as a victory for AT&T, which had shed, it was believed, the sluggish and regulated parts of its business and gained the rights to the world of the future, the new information technology. This interpretation disregarded the long fight that AT&T had waged to preserve its end-to-end vertical integration, which was the cornerstone of its corporate philosophy. So far, the experience has been sobering for AT&T in the equipment field, in particular in computers. The Bell companies, in contrast, have been doing well, averaging rates of return of 13.6%, well above the average for the top US corporations and at a lower risk. [Figure 31].

It is important not to confuse the health of AT&T with that of American telecommunications. The infrastructure is alive and well. A glance at the trade press with its constant announcements of new services, products, ventures and market entrants shows the vitality that characterizes all parts of communications. Indeed, it is precisely the vitality of this process that will undermine the economic rationale for the

divestiture, namely to separate the competitive and monopolistic sectors of telecommunications. As these separations crumble under technological reality -- and from the regulators' desire to give local exchange companies new sources of revenue for rate relief in residential and rural telephony -- the AT&T divestiture increasingly becomes a mere size-reduction of a giant firm into a set of mini-AT&Ts, coupled with liberalization, and less of a functionally targeted and elegant economic separation that its Justice Department originators had envisioned.

US Telecommunications increasingly resemble much more the rest of the economic system. It is much more complex, and perhaps less efficient in some ways than the old system, but it is a truer reflection of an underlying pluralist society.

Where does this leave future US policy? It would be naive to expect less regulatory tasks. Many disputes become less intramural and more regulatory in nature. The main regulatory tasks which the new and pluralistic system raises are:

1. Protection of interconnection and access.
2. The role of telecommunications policy as economic development policy.
3. Regulatory treatment of telephone carriers in their capacity as mass media.
4. The prevention of oligopolistic behavior and of cyclical instability.
5. Establishment of new mechanisms of redistribution.
6. Establishment of global arrangements to match the

global scope of networks.

These issues will, no doubt, lead to significant regulatory controversies.