Telecommunications @ the Millennium

The Telecom Act Turns Four

Office of Plans and Policy[*]
Federal Communications Commission
William E. Kennard, Chairman

February 8, 2000

Four years after the 1996 Telecommunications Act became law, the vision of robust competition laid out in the Act is beginning to unfold. This report examines developments in the industry and their impact on consumers and the economy from just before the Act to the present – a survey of the telecommunications marketplace at the millennium.

- **The telecommunications industry has grown dramatically since 1996 and is increasingly a foundation of economic growth for the whole economy.** Revenues in communications services have grown 17 percent since 1996 while the broader information technology sector (which includes related industries that rely heavily on communications infrastructure) has contributed more than one-third of the growth of real output in the economy between 1995 and 1998.

- **Prices have continued to fall even as demand has surged.** As the price of communicating over the nation's networks (wireline and wireless alike) has fallen, use has increased. The fall in prices, improved quality, and increased availability has been a direct benefit to consumers, who now pay less for more. It has also lowered firms' costs of doing business, releasing resources for other investments and helping to keep all prices down – which ultimately benefits consumers.

- **Competition among networks and technologies underlies these benefits.** Private companies have responded to increased competition and changes in technology and consumer demand by investing in their systems, by deploying new services, and by lowering their costs.

[*] This staff report does not necessarily reflect the views of the Federal Communications Commission or any of its Commissioners.

The Telecommunications Industry is Booming

The telecommunications industry has grown since 1996, creating 230,000 new jobs and generating $57 billion[1] more revenues.

Revenues in communications services, which include all telephone services, radio, cable and broadcast television, and certain other services, have grown from $331 billion in 1996 to $388 billion in 1998, a growth of 17 percent in real terms (Figure 1). That figure does not include the rapid growth in sales of communications equipment – telephone handsets, central office switching equipment, etc. – where revenues have grown $26 billion, 24 percent, between 1997 and 1999. With the growth in output, employment in the communications equipment and services industries has grown from 1.6 million in 1996 to 1.8 million in 1999 (Figure 2).

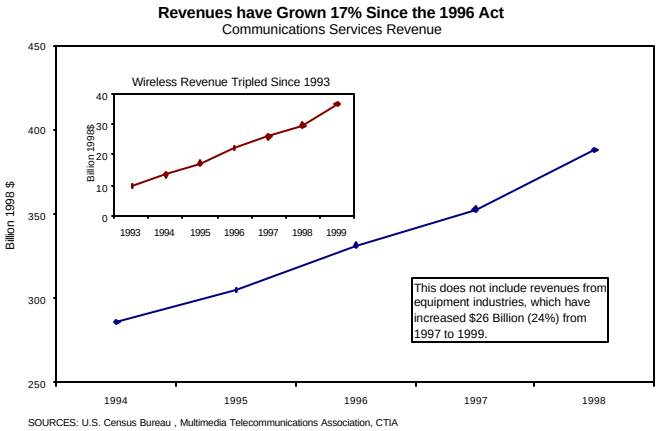


Figure 1

Growth and service improvements in the telecommunications industry also have important secondary impacts on the rest of the economy. While the above figures present an industry growing at a healthy pace, they understate the full impact improvements in the telecommunications sector have had on the economy. This is because communications are end products as well as inputs to the production of other goods and services.

By providing cheap, efficient underlying infrastructure and services, the communications industry has played a pivotal role in the development of a host of data and communications related industries that could not exist without it. For example, the Internet, and electronic commerce generally, is built on the communications infrastructure.

The "digital economy" is changing the way we do business, carry out our day to day lives, and interact with each other. New virtual markets are being created to more efficiently trade goods and services. Companies like General Motors and Ford are now developing Internet trading networks to link their thousands of suppliers. These systems could electronically process upwards of $300 billion in transactions every year. We are only beginning to understand the profound positive effects these changes will have on the economy.

These secondary linkages are, of course, difficult to measure. One approach is to look at the growth in industries that rely heavily on communications infrastructure and services. For example, employment in

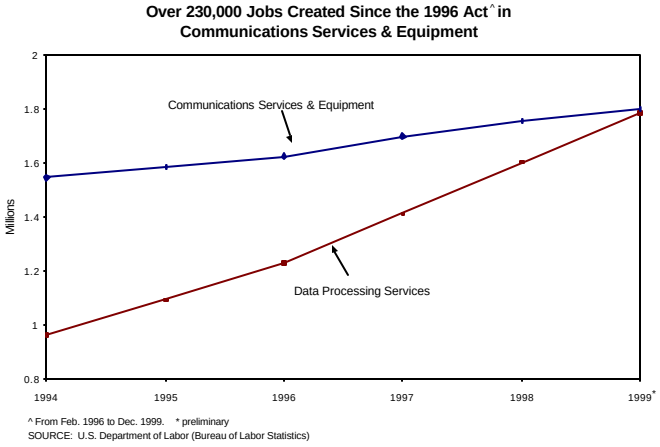


Figure 2

[1] All figures are 1998 dollars unless otherwise noted.

the data services industry has grown by 666,000 since February 1996 (Figure 2). **In one study, the Department of Commerce estimated that information technology producing industries (the producers of computer hardware and software, data services, and communications equipment and services) directly contributed, on average, over one-third of the real economic growth between 1995 and 1998.**[2] That same study found that, because of the declining prices of their products and services, these industries reduced overall inflation by 0.7 percentage points in 1996 and 1997.

The benefits of the digital age are being extended to all Americans. The FCC has implemented rules pursuant to the Act that require all telecommunications products and services to be made accessible to people with disabilities. The Act also provides the FCC with important tools to update universal service policies to ensure that Americans in remote and rural areas receive service.

By 2006, it is estimated that half of the U.S. workforce will be employed in industries closely linked to information technologies. It is important that all Americans be able to participate in the emerging digital economy. Therefore, the 1996 Act established the Schools and Libraries Universal Service program (E-Rate) to provide affordable telecommunications services for schools and libraries, especially those in rural and economically disadvantaged areas.

Nearly three times as many public schools were connected to the Internet in 1998 (89 percent) as were connected in 1994 (35 percent), while schools in low income areas went from 19 to 80 percent connected quadrupled (Figure 3). However, at the end of 1998, only half of all classrooms were connected to the Internet. Some data suggest that one million classrooms were connected to modern networks in 1998 and 1999. This program is on the road to ensuring that all American children will have the technology tools to thrive in the global information age.

Prices are Falling as Demand is Increasing

In general, prices are falling.

Prices for wireless and long distance telephone service have fallen dramatically over the past years. Long distance prices (international and domestic), as approximated by average revenue per minute, have fallen by 34 percent since 1993 (Figure 4). For

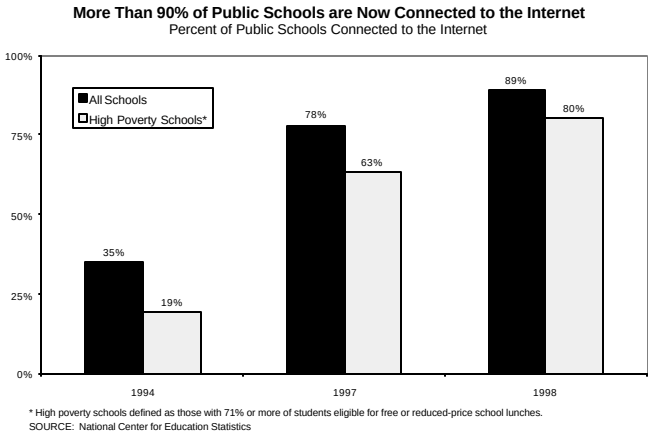


Figure 3

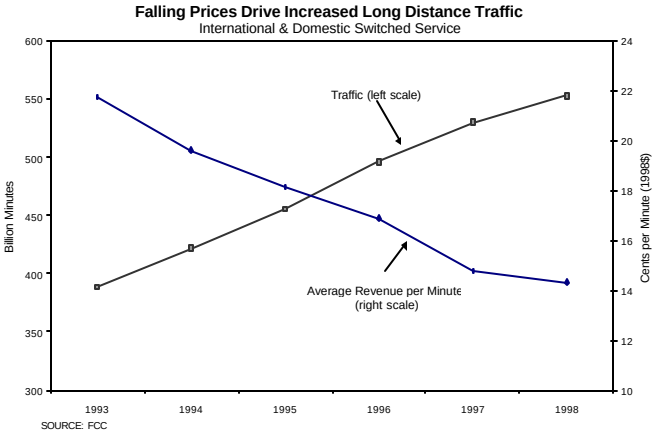


Figure 4

Figure 5

[2] U.S. Department of Commerce (1999). *The Emerging Digital Economy II.*

residential consumers, domestic long distance prices relative to other goods and services have fallen by 10 percent since 1993 (Figure 5). New calling plans now offer consumers long distance rates of only 5 cents per minute. International long distance prices have fallen by more than half since 1993. Mobile prices have fallen by 35 percent since 1993, and average monthly local bills have dropped by $30 – from $70 in 1993 to $40 in 1999 (Figure 6).

The only areas where prices have not fallen significantly since the 1996 Act is in local telephone and cable television services. Local rates have declined only 2 percent relative to all other goods since the Act. Although cable rates have decreased in terms of the price per channel received, overall cable bills have risen by 1.8 percent between 1998 and 1999 in real terms.

Usage is increasing.

With the drop in prices, Americans are making more long distance calls and mobile phones are becoming commonplace. Wireless subscriptions in the U.S. grew from 13 million in 1993 to over 76 million in 1999 (Figure 6), and are projected to increase to 149 million by 2003. In other words, the penetration rate of mobile service is expected to go from one in ten Americans in 1993 to six in ten in 2003. Similarly, since 1993, long distance traffic has increased 42 percent (Figure 4).

The Internet is driving growth in data traffic.

The Internet was in its infancy in 1996 when there were only 14.3 million host computers (computers with an IP address through which users can "log-in") connected to it in the world and only 27 million Americans using it (Figure 7). Today, there are more than 44 million Internet hosts (Figure 8), and nearly 80 million users in the U.S. Every day more people use the Internet in their business and personal lives. Families communicate through electronic mail and businesses are using the Internet to link their ordering systems to manage their inventories more efficiently. Electronic commerce has grown from next to nothing in the early 1990's to around $70 billion in 1999, and is projected to exceed $1 trillion in the next few years. This growth is one of the drivers causing data traffic to double every 100 days.

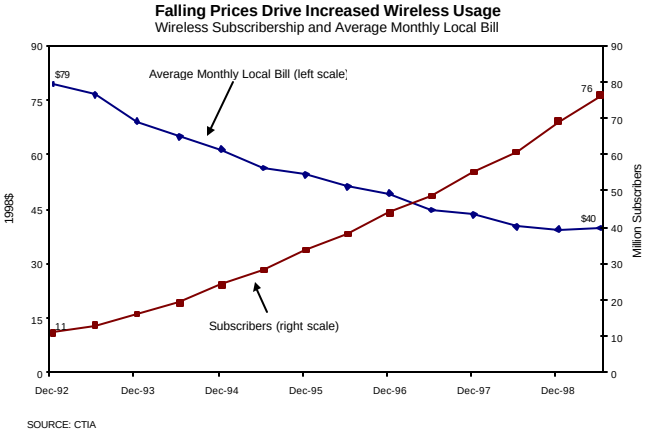


Figure 6

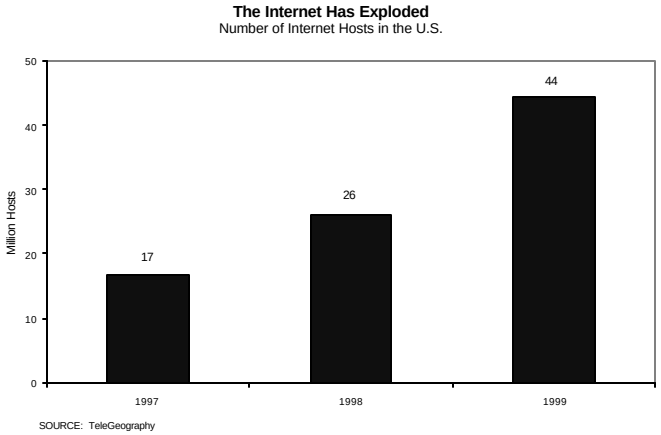


Figure 7

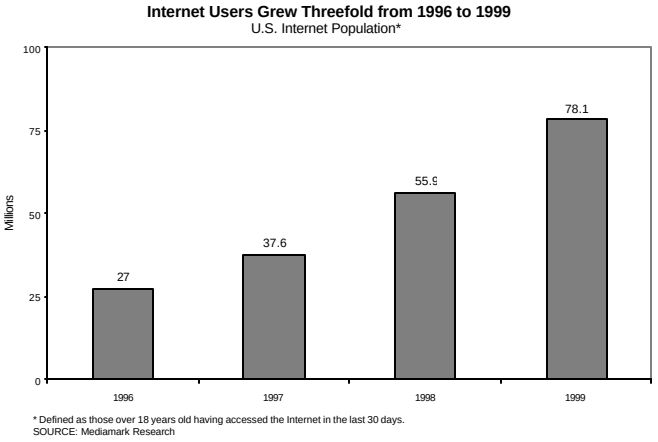


Figure 8

Residential broadband is born.

- When the 1996 Act was written, only a handful of households in a few select test markets were being offered broadband access to the Internet (Figure 9). Today, 1.7 million customers connect at speeds at least 25 times faster than a 28.8 Kbps modem. Cable modem service is now offered to nearly 30 million homes.
- Cable companies' service offerings have spurred telephone companies (both incumbents and their competitors), to deploy Digital Subscriber Line (DSL) technologies to deliver broadband access over telephone lines. This burgeoning competition is fueling deployment of broadband access and helping to keep prices low while improving service.
- Broadband Internet access is not just about faster net-surfing. It enables a fundamentally different Internet experience. Though the narrowband Internet is capable of transferring video and audio files, only a few would think of it as a substitute for television or radio service. But a high-speed broadband link lets one download high quality video in real-time and has little problem playing audio that is "streamed" from net-radio stations on the Internet.

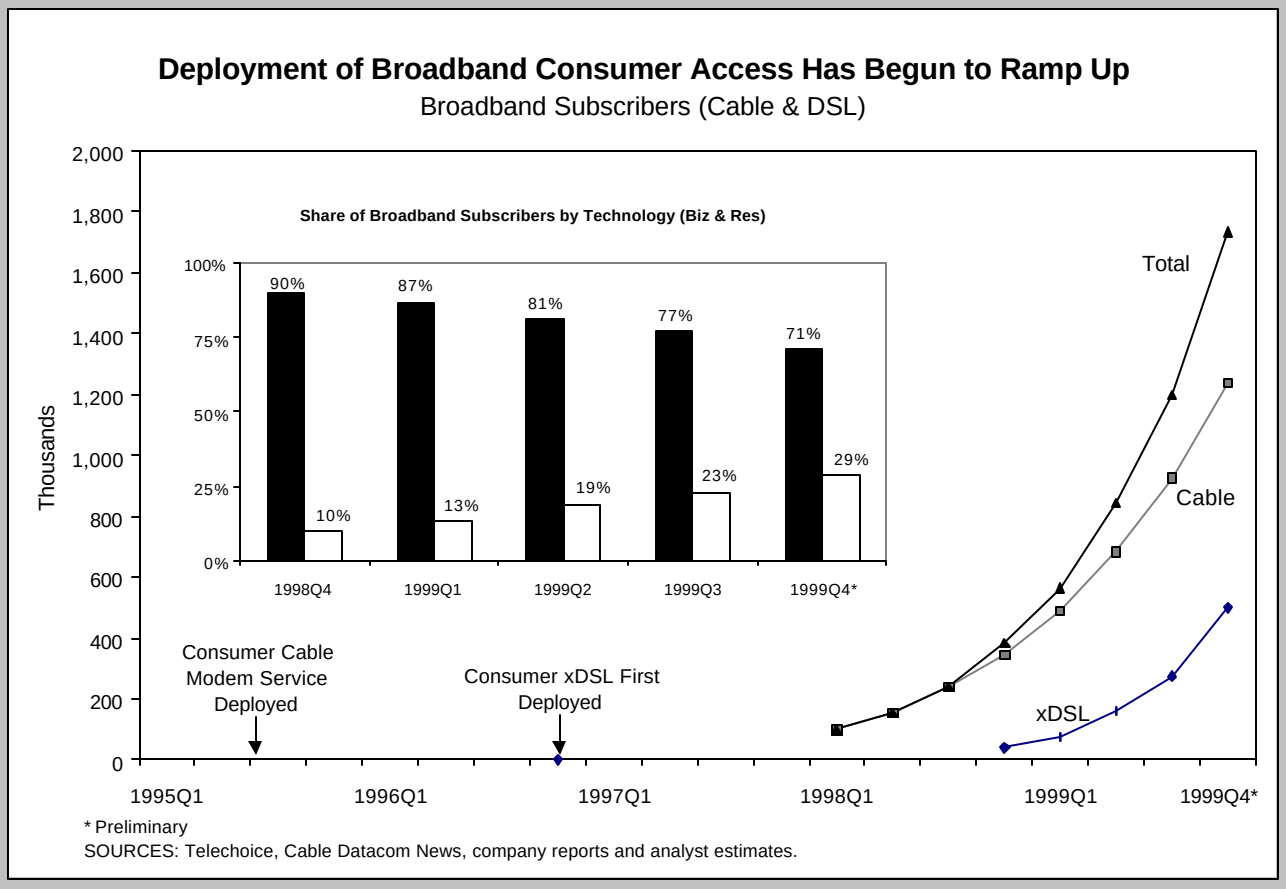


Figure 9

Industry is Investing and Innovating

Companies are responding to demand, competitive pressures and new opportunities by investing heavily in their networks.

Competitors and incumbents invested roughly $25 billion more in 1999 than they did in 1995 (Figure 10). [3] These investments are driven by increasing demands on the nation's networks for voice and data traffic, to build new networks to compete with incumbents, and to offer better services to consumers in response to competitive pressure. In order to accommodate the rising traffic, companies have been investing heavily to expand their high-speed networks, and have nearly doubled the extent of the nation's fiber system (Figure 11). As demand for global communications has increased, the industry has responded by dramatically expanding capacity. By 2001 there is expected to be roughly 140 times as much trans-oceanic capacity as was available in 1996.

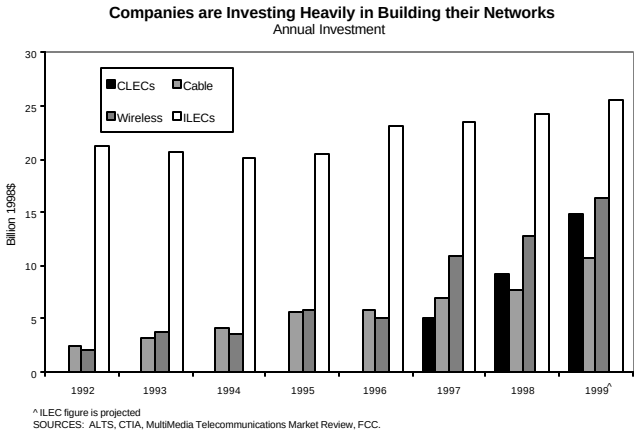


Figure 10

New entrants are building new networks.

Since the 1996 Act opened markets to competition, new entrants have invested ever larger amounts in building out their facilities and developing new services to compete with incumbents. They are laying fiber across the country, and installing switching equipment to link customers on their networks. Competitive Local Exchange Carriers (CLECs) have installed over 800 voice and 1,400 data switches, and laid 162,000 route miles of fiber through the end of 1999.

Similarly, wireless providers have, in the matter of a few years, built out entirely new networks across the country, and have been able to keep pace with increasing demand as more and more people discover the advantages of going mobile.

Not only have these new wireless operators brought competition to virtually every major market in the U.S. (Figure 12), but they have also facilitated the creation of truly nationwide wireless networks. For example, a business person could take a trip visiting clients in Boston, St. Louis, and Los Angeles and never leave the national networks of operators like AT&T and Sprint PCS.

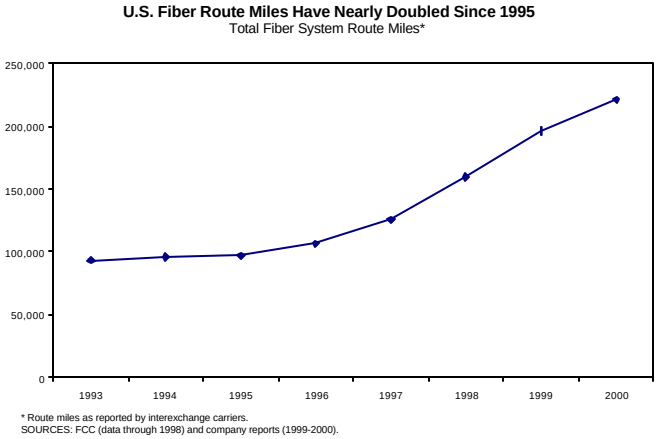


Figure 11

[3] Since comprehensive estimates of investment in different sectors based on similar methodologies and sources are not available, the amounts in Figure 10 should not be directly compared. For example, some investments by cable and wireless companies appear in both those categories and the CLEC category.

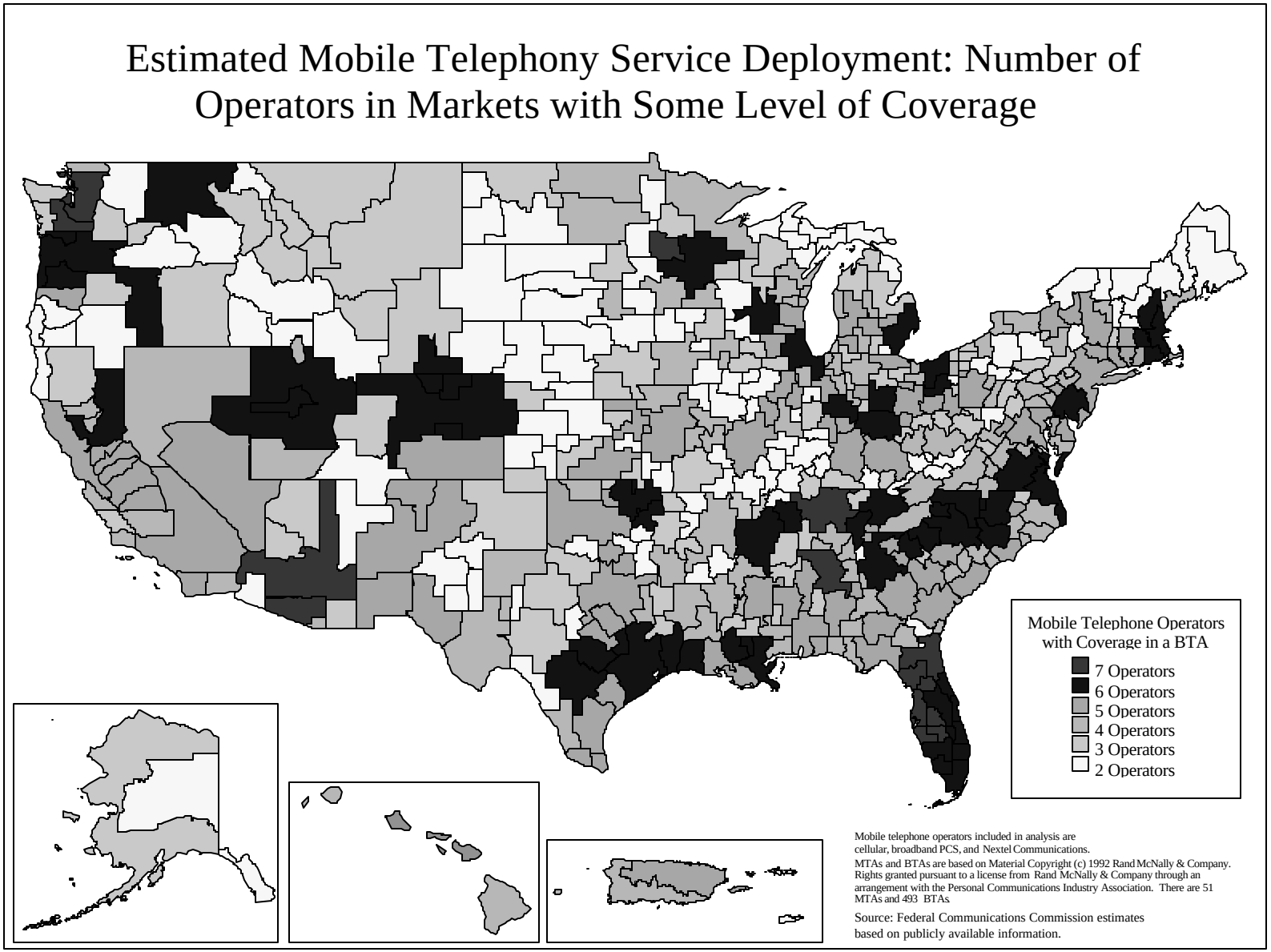

Estimated Mobile Telephony Service Deployment: Number of Operators in Markets with Some Level of Coverage
Mobile Telephone Operators with Coverage in a BTA
7 Operators
6 Operators
5 Operators
4 Operators
3 Operators
2 Operators
Mobile telephone operators included in analysis are cellular, broadband PCS, and Nextel Communications.
MTAs and BTAs are based on Material Copyright (c) 1992 Rand McNally & Company. Rights granted pursuant to a license from Rand McNally & Company through an arrangement with the Personal Communications Industry Association. There are 51 MTAs and 493 BTAs.
Source: Federal Communications Commission estimates based on publicly available information.

Figure 12

… and incumbents must upgrade to compete and grow.

Faced with competition in their traditional markets, incumbents have renewed their investments. Cable companies invested nearly twice as much in 1999 as they did in 1995. They are upgrading their cable systems to advanced two-way systems that can deliver not only more video channels, but high-speed Internet access and telephone service as well. Similarly, investment by incumbent local exchange carriers (ILECs), while flat in the early 1990's, grew by 19% between 1995 and 1998.

In the wireless industry, incumbent cellular operators have converted large sections of their networks from analog to digital technology in order to compete with the fully digital networks of broadband PCS operators.

The industry is becoming more innovative.

With competition, firms have been under increasing pressure to cut costs, introduce new products, and improve service. As one measure of this increased innovation, the number of telecommunications patents granted annually by the U.S. Patent Office grew from 3,744 in 1994 to 7,674 in 1998. These patents cover a wide range of innovations such as the digital coding and decoding of conversations on wireless networks that have improved the sound quality of mobile telephones and allowed many more conversations to be carried over the same amount of spectrum. Overall patenting activity has been growing throughout the U.S. economy, but the telecommunications sector has grown more than three times as fast as the overall rate from 1994 to 1998. Telecom's share of all patents has grown from less than 1.5 percent in the early 1990's to 3 percent during the first half of 1999 (Figure 13).

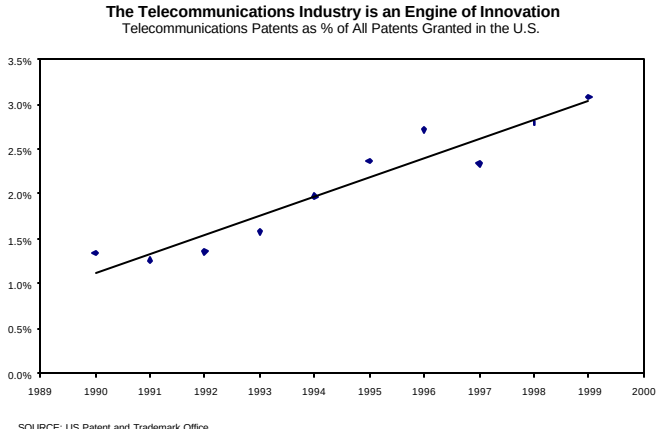


Figure 13

Competition is the Driving Force

The 1996 Act provided a blueprint for competition among a variety of suppliers using different technologies to compete on a level playing field to deliver services to consumers. The Act mandated the elimination of barriers preventing companies from competing against each other – letting cable, wireless, long distance and other companies into local telephony and establishing the conditions by which the Bell companies could enter the long distance market. On the fourth anniversary of the Act, we see competition in the local market beginning to take hold and are beginning to see competition across multiple platforms to deliver services to consumers.

Competitors in the local telephone market have invested billions of dollars to build networks, and are successfully competing with incumbent carriers. According to some estimates, new competitors in local markets (both independent CLECs and the local arms of large long distance companies) have been adding over 1 million lines per quarter. Their share of the local market has increased to 4 percent of lines served and over 6 percent of local service revenue (Figure 14).

Local competitors have been particularly successful in the business market, where competitors have added 65 percent of all new lines deployed in the third quarter of 1999 (Figure 15).

Local competition is developing at a rate comparable to the development of competition in the long distance market.

In the long distance market, competitors that didn't exist before the 1970's now have over half of the long distance market as measured by revenue. However, in 1979, long distance competitors only had a one percent share of the long distance market. It took those competitors more than four years to take six percent of the market from incumbents. Similarly, in 1996, when the Act was passed, competitors had a one percent share of the local market. But it has taken them only two and one half years (through the second quarter of 1999) to reach the six percent mark (Figure 16).

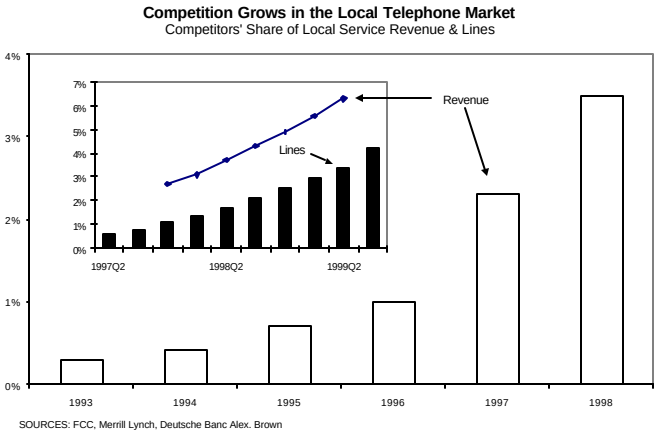
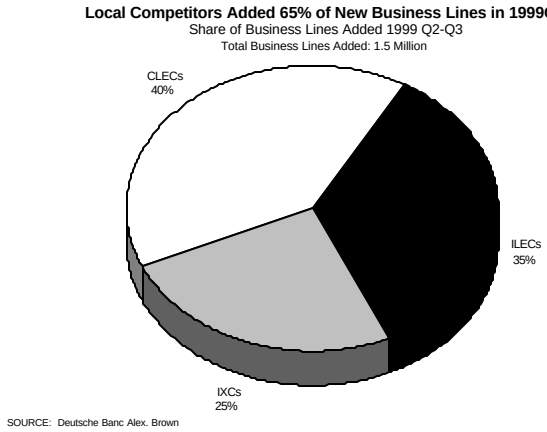


Figure 15



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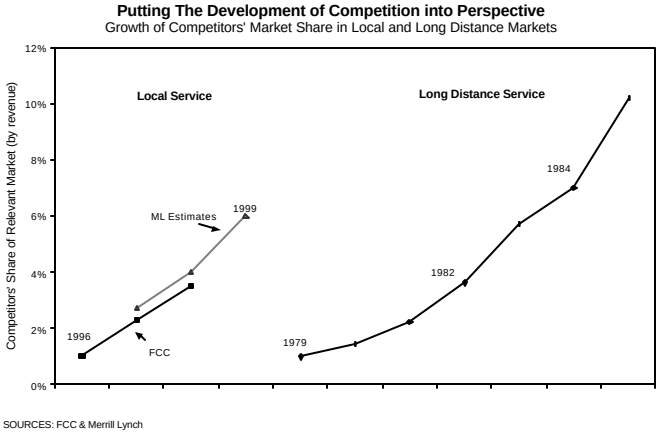

Figure 16

Competition from satellite companies has eroded cable television's market share, forcing them to upgrade their cable systems.

Cable television companies have seen their market share fall by over ten percentage points in the 1990's (Figure 17). Between 1998 and 1999, competitors (mainly DBS operators such as DirecTV and Echostar) took 2 out of every 3 new multi-channel video subscribers (Figure 18). This competitive pressure has forced cable companies to upgrade their cable systems. Upgraded cable systems offer consumers more video choices, but also allow them to offer broadband Internet access and even telephone service. As Figure 17 shows, more people have more channels to choose from. Over 30 percent of the homes passed by cable TV can receive broadband Internet access today. About 130,000 customers already get telephone service from their cable company, and nearly 50 percent of all households are projected to be able to do so by 2005.

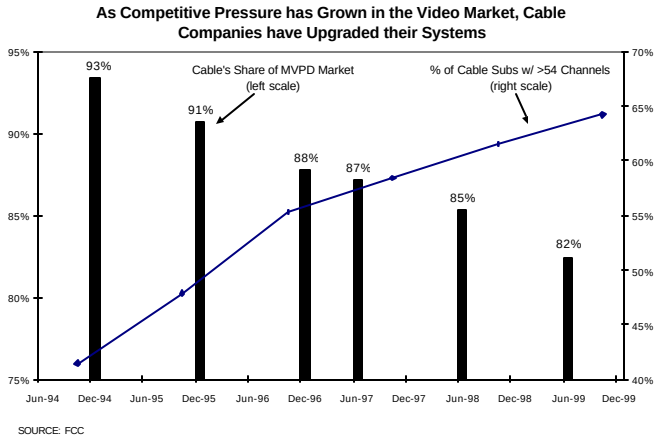

Figure 17

The wireless explosion.

Since the FCC first auctioned spectrum licenses in 1994, over 8,000 licenses have been awarded and new entrants have quickly developed wireless networks throughout the country. The 1996 Act further facilitated the development of competition in wireless markets by

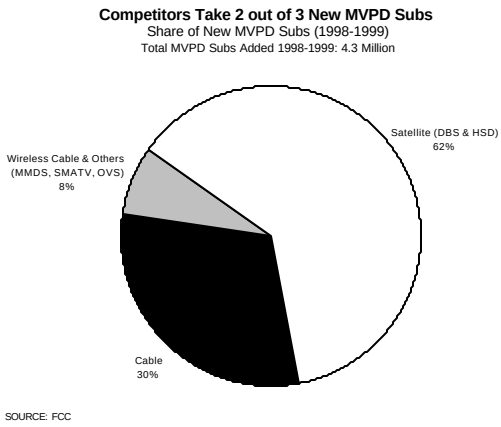

Figure 18

New York State is the Bellwether of Competition to Come

- New York was one of the first states in the country to require their incumbent telephone networks to interconnect with new entrants. On December 22, 1999, based on the extent of local competition, the FCC approved Bell Atlantic's application to provide long distance service in New York. Bell Atlantic, the New York State Public Utilities Commission, and local competitors in New York, have all worked hard to bring competition to the local market in New York state.
- In New York, competitors began acquiring the numbering codes that are necessary to route calls over their networks in the second quarter of 1994 (Figure 19). The number of competitors operating in New York has grown quickly since then. Competitors began entering other states in earnest only after the 1996 Act was passed.

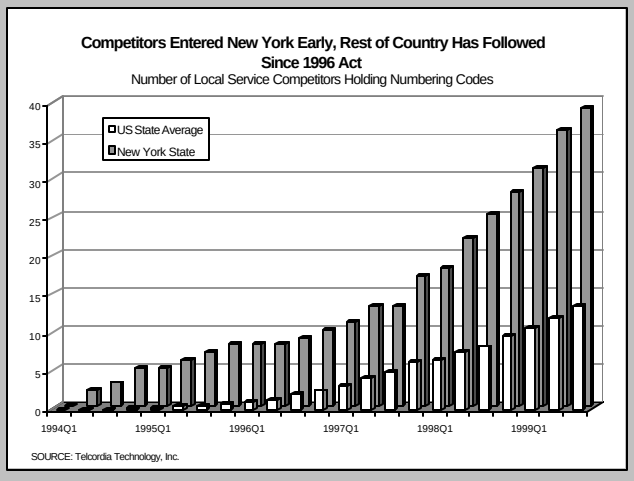

Figure 19

requiring local telephone companies to interconnect with new entrants and by establishing the ground rules for those interconnection agreements. These have made more competition possible in both mobile and fixed wireless networks.

In 1994, most Americans could choose between, at most, two competitors for their wireless service. Today, 94 percent of Americans have three or more providers in their home market, and over 75 percent have at least five operators competing for their business (Figure 20). With dramatic price decreases and quality improvements in mobile telephone services, more people are beginning to see wireless telephones as substitutes for their wireline services. Along with the growth in the number of mobile telephone users, the average number of minutes each customer talks has more than doubled from approximately 100 minutes per month to between 200 and 300 minutes per month. This usage growth has helped increase the wireless industry's share of the overall voice market. In 1995, wireless voice minutes represented less than two percent of all voice traffic. By 1999, this had increased to more than seven percent, with the expectation that wireless will account for over 10 percent of all voice traffic during 2000.

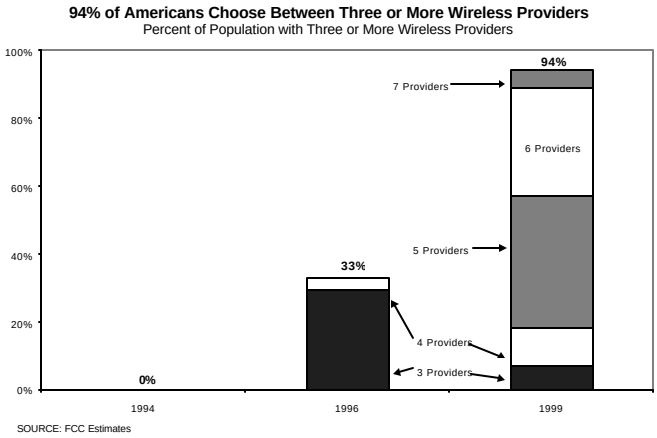

Figure 20

The Act has changed the way people look at spectrum.

The Act, by opening the local market to competition, has turned spectrum into a third way to get into homes and businesses for video, voice, and data. Two CLECs, WinStar and Teligent, are already providing a full range of voice and data service to small and medium sized businesses using their spectrum in most of the largest markets. A third CLEC, Nextlink, is in the process of launching similar technologies and services in 25 markets during 2000. Others operators (such as Sprint, and MCI/Worldcomm) are converting wireless one-way video systems to two-way networks to provide voice and high speed Internet access services to the residential market

The Bottom Line

In 1996, Congress and the Administration envisioned that the Telecommunications Act would be a sweeping update of our communications laws that would usher in a new competitive era in telecommunications. That era has indeed arrived. Consumers are beginning to reap significant benefits unleashed by the Act by enjoying an array of new services at lower prices.