Telecommunications Regulation: An Introduction

By Nicholas Economides

Revised June 2004

Abstract

This paper examines the justifications, history, and practice of regulation in the US telecommunications sector. We examine the impact of technological and regulatory change on market structure and business strategy. Among others, we discuss the emergence and decline of the telecom bubble, the impact on pricing of digitization and the emergence of Internet telephony (VOIP). We briefly examine the impact of the 1996 Telecommunications Act on market structure and strategy in conjunction with the history of regulation and antitrust intervention in the telecommunications sector. After discussing the impact of wireless technologies, we conclude by venturing into some short term predictions. We express concern about the derailment of the implementation of the 1996 Act by the aggressive legal tactics of the entrenched monopolists (the local exchange carriers), and we point to the real danger that the intent of Congress in passing the 1996 Act to promote competition in telecommunications will not be realized. We also discuss the wave of mergers in the Telecommunications and cable industries, the telecom meltdown of 2000-2003, and issues that arose from the triennial review by the FCC of implementation of the 1996 Act.

Key Words: telecommunications, regulation, competition, monopoly, oligopoly, Internet, broadband, DSL, unbundling

JEL Classification: L1, D4

* The author is Professor of Economics, Stern School of Business, New York University, 44 West 4th Street, New York, NY 10012, tel. (212) 998-0864, fax (212) 995-5218, e-mail: neconomi@stern.nyu.edu., www: http://www.stern.nyu.edu/networks/, Director, NET Institute, http://www.NETinst.org , and visiting professor, Stanford University. The author thanks Richard Nelson, other participants of the "Complexities and the Limits of Organization" conference and two anonymous referees for useful comments and suggestions.

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1. Introduction

The US Telecommunications sector is going through a very significant change. A number of causes contribute and define this change. The first and fundamental reason is the rapid technological change in key inputs of telecommunications and computer-based services and in complementary goods, which have reduced dramatically the costs of traditional telecommunications services and have made many new services available at reasonable prices. For example, telecommunications cost reductions have made access to the Internet affordable to the general public.

The second reason for the revolutionary change has been the sweeping digitization of the telecommunications and the related sectors. The underlying telecommunications technology has become digital. Moreover, the consumer and business telecommunications interfaces have become more versatile and closer to multifunction computers than to traditional telephones. Digitization and integration of telecommunications services with computers create significant business opportunities, impose significant pressure on traditional pricing structures, especially in voice telephony, and threaten the fundamental features of the traditional regulatory regime, as I will explain.

The third reason for the current upheaval in the telecommunications sector was the passage of a major new law to govern telecommunications in the United States, the Telecommunications Act of 1996 ("1996 Act"). Telecommunications has been traditionally subject to a complex Federal and State regulatory structure. The 1996 Act attempted to adapt the regulatory structure to technological reality, but various legal challenges by the incumbents have so far delayed, if not nullified, its impact.

In general, as I will discuss in detail below, regulation should be used only when it is clear that deregulated markets are likely to fail even in the presence of reasonably strict antitrust enforcement. Clearly, the success or failure of a market in the absence of regulation depends crucially on the demand and cost conditions given the present technology. Technological progress and innovation in telecommunications technologies has been rapid for the last forty years and is expected to continue at a fast pace. Thus, as a result of technological change, cost conditions shift considerably over time and can, over time, transform a market that requires regulation into one that does not. This is crucial for telecommunications and has lead to progressive deregulation. For example, the market for long distance telecommunications services starting as a near monopoly in the middle 1970s was formally completely deregulated in 1995, after very strong competition in the 1980's and early 1990s emerged after the breakup of AT&T in 1984 (to be discussed below), and the opening of the long distance market to competition. However, the process of deregulating some services while other services (often produced by the same firms) remain regulated is a very complicated task with many pitfalls. Given the complex incentives of firms that participate in many markets and often face competitors who participate in just a few, it would be foolish to proceed with complete deregulation of the telecom sector without a careful analysis.

Telecommunications services are based on an increasingly sophisticated and complex network that is able to produce a rich variety of services that differ in distance traveled, quality, amount and nature of data or voice transmitted per unit of time, requirement or not of immediate ("real time") delivery, etc. Making effective use of elements of market organization in many telecommunications contexts often requires

considerable and detailed regulation. Many times, these regulations, even if they work well for existing markets, have pretty poor results when applied to markets for new products. This lack of flexibility of regulation is particularly important in modern telecommunications since new telecommunications services are continually produced helped by the availability of complementary goods and services. For example the demand for low level data transmission as required by the world wide web and the Internet would not be possible without wide availability and low prices of computers. But it would be foolish to start applying the traditional regulatory framework to the Internet, and the Federal Communications Commission ("FCC") has correctly understood this.

Finally telecommunications regulation is hampered by the various exigencies of regulation in general, such as political intervention and lobbying. The political intervention issues become much more complicated because some telecommunications services (such as access to emergency services) are essential for all, and other telecommunications services, such as basic service, are considered necessities.

Before going into a detailed analysis of the regulatory apparatus, it is important to point out the major driving forces in US telecommunications today.

1. Dramatic and continuing reductions in the costs of transmission and switching.
2. Digitization.
3. The breakup of AT&T's monopoly in 1984 resulting in a competitive long distance service sector and a monopolized local telecommunications sector.
4. Restructuring of the regulatory environment through the implementation of the 1996 Telecommunications Act coming twelve years after the breakup of AT&T.

5. Move of value from underlying services (such as transmission and switching) to interfaces and content.
6. Move toward multi-function programmable devices with programmable interfaces, such as computers, and away from single-function, non-programmable consumer devices, such as traditional telephone appliances.
7. Re-allocation of electromagnetic spectrum, allowing for expanded wireless services.
8. Interconnection and interoperability of interconnected networks; standardization of communications protocols.
9. The existence of network effects whereby connection to a large network is more valuable for each customer, and the fact that small networks unable to reach critical mass are unlikely to survive.

These forces have a number of consequences to be discussed in detail in later sections.

1. Increasing pressure for cost-based pricing of telecommunications services.
2. Price arbitrage between services of the same time immediacy requirement.
3. Increasing competition in long distance services.
4. The possibility of competition in local services.
5. The emergence of Internet telephony (Voice Over Internet Protocol, “VOIP”) as a major new telecommunications technology.

2. Why Have Telecommunications Regulation?

To answer this question, we first have to answer the question "why have regulation in general?" The logic of competition law in the United States is that efficiency (allocative, productive, and dynamic) is the desired outcome of antitrust policy (and competition is the means of achieving it). Thus, antitrust laws are to be used to guard against restrictions of competition. Economic regulation has been established as a "last resort" (i) for those markets where it is clear that competitive outcomes cannot be achieved by market forces;[1] (ii) where deviation from economic efficiency is deemed socially desirable; (iii) where the social and private benefits are clearly different, including cases where minimum safety standards increase social welfare; (iv) to allow for coordination in technical standards or market equilibria.[2] Telecommunications can qualify under all four of the above criteria as an industry where some form of regulation is appropriate.

The main reason proposed for regulating telecommunications has been that a desirable competitive outcome could not be achieved by market forces. In the last decade of the 19th century and the first three decades of the 20th century, after many of its patents had expired, AT&T faced significant competition in local telecommunications by independent telephone companies. The "independents" typically started at the local level and wired many businesses and households in small and mid-size towns, sometimes also

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[1] For example, if the production technology has such high fixed costs that it is clear that only one firm will survive in the marketplace resulting in a "natural monopoly," regulation can be used to stop the monopolist from charging the high monopoly price.

[2] Often market interactions that can be modeled as economic games have multiple equilibria, where each equilibrium is defined by a number of firms or individuals taking the same or similar actions. Then intervention by a regulatory body can coordinate the actions of firms or individuals resulting in a more beneficial outcome. For example, cars can be driven on the left side or right side of the street, and, in principle, there is no particular advantage to an equilibrium where all cars are on the one left or all cars are on the right, but there are considerable disadvantages if some cars go on the right and some go on the left. Thus, a regulatory body can create substantial benefits by imposing a rule whereby one of the two equilibria is chosen,

creating regional long distance networks. There were periods in the first decade of the 20th century when independents had in total more local lines than AT&T, although the near monopoly of AT&T in long distance was never seriously challenged the 1970s. AT&T refused to interconnect with the independents, leading many businesses to subscribe to two telephone companies with disconnected and incompatible networks, an "independent" to reach local customers (mainly households), and AT&T to reach suppliers.[3]

AT&T stated that it was concerned with the quality standards of independents and offered to incorporate most of them in the Bell System, but clearly there were also business and strategic reasons behind AT&T's refusal to interconnect. The benefit to an independent telephone company of access to the AT&T long distance network was much larger than the benefit to AT&T of adding to its network the mostly residential customers of an independent. Although not clearly articulated in network economics terms, the issue facing the independents and AT&T was clearly a fundamental issue in network economics. Modern network economics teaches us that the incentives of firms of different sizes to interconnect differ depending on the value and size of the new demand that is created by interconnection.[4] Typically, a large and high value network has a significantly smaller incentive to interconnect with a smaller low value network than the smaller one has to interconnect with the larger one. This can easily lead to a refusal by the larger high value network to interconnect.

In summary, market incentives lead AT&T to refuse to interconnect with smaller (local and long distance) networks, while such interconnection was considered socially

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[3] Occasionally, AT&T allowed interconnection to some independent local monopolists under the guarantee that these would not interconnect with any non-AT&T exchange.

[4] See Economides (1991).

desirable. This was the first reason for which regulation at the Federal and State levels was imposed with a requirement to interconnect public switched telecommunications networks.[5] There were clearly some telecommunications service markets in the time period leading to the 1930s where only one firm could survive. Monopoly prices are predicted to be high, and AT&T's long distance prices during this period were high. This gave a further justification to regulation, since free entry was unlikely to increase the number of competitors in many service markets.

The second and third reasons for regulation (deviation from social efficiency being desirable and difference between the social and private value of telecommunications) were generally articulated after regulation was already in place. In the 1960s regulators did not let prices of basic local service rise in their attempt to achieve "universal service," *i.e.*, to include as many households as possible in the telecommunications network, on the basis that this was desirable even if it were allocatively inefficient. The ability of customers to receive calls and make emergency calls also played a role in the setting of the goal of universal service. Basic telecommunications service is now considered a necessity and its inexpensive and ubiquitous provision is guaranteed by regulation.[6]

The fourth reason for regulation, that the regulator can help the industry achieve technical compatibility and avoid fragmentation has had only limited application. Clearly, in a network industry technical compatibility is important since it allows all users to get the

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[5] However, it should be noted that the requirement to interconnect could also have been imposed by antitrust authorities since the no interconnection policy of AT&T was equivalent to a "refusal to deal," breaking antitrust law.

[6] Still, there is no convincing evidence that price for basic service is below cost, except possibly for some rural households. Moreover, adding households to the telecommunications network even at a subsidized rate may be desirable because of the network effects they produce to the rest of the consumers. Thus, it is unclear that the provision of universal service has produced a considerable allocative efficiency distortion if any.

full benefits of the combined networks rather than the benefits of only the one they subscribe to. In practice, the present *de facto* compatibility standards in voice transmission and in higher data protocols are largely because of the legacy of the pre-1984 AT&T monopoly, as well as because of the adoption of Internet protocols that were created with government subsidization with the requirement that they be made public. The regulatory requirements are typically on interconnection and at the level of voice transmission. There is no regulatory requirement of compatibility in many areas, including wireless equipment, wireless text messaging, higher data protocols, interfaces, etc.[7]

In understanding telecommunications regulation in the United States, it is very useful to keep in mind the particular reasons that made regulation the appropriate policy answer at some point in time. As technology and population densities change, some markets that may have been natural monopolies in the past, may *not* be natural monopolies any more, and it may be better to allow competition in those markets while keeping regulation in the rest. As we will see, the question of the desirability of regulation in various markets has been asked repeatedly over time, resulting in the present regime of progressive deregulation.

The public interest objective of telecommunications regulation is vague. Most economists agree that a valid objective is to increase total surplus, that is, consumers' surplus plus profits of active firms. Most economists also agree that the public interest should promote innovation and growth. Although it is difficult to quantify the exact effect of innovation and growth on income, there is wide consensus that these should be promoted and are part of the public interest. Finally, the public interest may include subsidization of

[7] Even when the FCC was auctioning spectrum and approving licenses for PCS wireless services, it did not impose the same technical standard for wireless transmission resulting in three incompatible networks in the United States, in contrast to the single-standard GSM network in Europe.

telecommunications services that are considered necessities, such as basic local service, or those which are deemed to increase productivity and growth, such as Internet access. Given the vagueness of the concept of the public interest, various groups lobby politicians and regulators to include their objectives as part of the public interest. This rent-seeking behavior and sometimes leads to telecommunications regulators imposing policies that have little to do with telecommunications markets.

Having outlined the potential benefits of regulation, we should also note that there are significant drawbacks and costs created by regulation. First, regulators generally do not have the latest technological information. In an industry with fast technological change, such as telecommunications, this can lead to significant divergence between costs and prices as costs fall much faster than prices. This has happened consistently both in the old regulated AT&T and in regulated local exchange carriers. Second, regulated firms may be able to use the regulatory setup to create barriers to entry, and thereby perpetuate their profitable existence. For example, it is worth noting that the first application of MCI to provide switched long distance service was rejected by the FCC, and MCI had to sue and was allowed in long distance service only after a court decision. Third, the regulatory setup is slow, cumbersome, bureaucratic and, in many cases, politically influenced. In practice, the regulatory system is much easier to influence by politicians than the judicial system. Fourth, because of the public interest provision, there can be significant rent-seeking activity by various groups, especially in issues relating to mergers that have very strict, externally-imposed, deadlines. Fifth, in an industry with fast technical change, it is very hard to define the appropriate array of regulated products. It is very difficult to correctly

regulate new and evolving products. Thus, regulation should be used sparingly, and only when there are no good alternatives.

A new problem in regulatory supervision has been added with the recent aggressive intervention of the competition committee of the European Union in telecommunications matters. The European Union intervened in the mergers of MCI and WorldCom and of WorldCom with Sprint. This has created a situation where large telecommunications companies contemplating a merger have to argue their case in front of (i) the United States Department of Justice; (ii) the European Union competition committee; (iii) Public Utilities Commissions ("PUCs") in fifty States; (iv) other foreign regulatory bodies. This not only adds to the complexity and the cost of the merger, but also creates the possibility that the requirements imposed by different regulatory bodies will contradict each other and it would not be feasible to meet all of them. It also creates the possibility that conditions in financial markets may change considerably between the time that a merger is announced and the time when it is consummated so that one of the merging parties may not find the merger desirable at the later date, and may use a regulatory objection to abandon the merger without penalties. This increases the incentives of private parties opposing a merger to intervene attempting to lengthen the approval process hoping that financial conditions may change during the approval process.

3. US Telecommunications Regulation

a. The AT&T Near-Monopoly Period

Telecommunications has traditionally been a regulated sector of the US economy. Regulation was imposed in the early part of this century and remains until today in various

parts of the sector.[8] The market for telecommunication services and for telecommunications equipment went through various stages of competition since the invention of the telephone by Alexander Graham Bell. After a period of expansion and consolidation, by the 1920, AT&T had an overwhelming majority of telephony exchanges and submitted to State regulation. Federal regulation was instituted by the 1934 Telecommunication Act, which established the Federal Communications Commission.

At its heyday, from the 1930s to 1981, AT&T dominated all aspects of telecommunications in the United States. It had approximately 90% market share of local access lines and over 90% of the long distance revenue. It used almost exclusively equipment of Western Electric, its equipment division. It owned a top research laboratory, Bell Laboratories which conducted both applied and theoretical research. Crucial scientific inventions of the 20th century, such as the transistor and the integrated circuit occurred at Bell Laboratories. By the 1970s AT&T had achieved "universal service," where over 90% of US households had a telephone, and kept improving the quality of its services.

Regulation of the U.S. telecommunications market was marked by two important antitrust lawsuits that the U.S. Department of Justice brought against AT&T and the Bell System. In the first one, *United States* v. *Western Electric*, filed in 1949, the U.S. Department of Justice ("DOJ") claimed that the Bell Operating Companies practiced illegal exclusion by buying both production equipment as well as customer premises equipment (telephone appliances and switchboards) only from Western Electric, a part of the Bell System. The government sought a divestiture of Western Electric, but the case was settled

[8] The telecommunications sector is regulated both by the Federal Government through the Federal Communications Commission ("FCC") and by all States, typically through a Public Utilities Commission ("PUC") or a Public Service Commission. Usually a PUC also regulates electricity.

in 1956 with AT&T agreeing not to enter the computer market, but retaining ownership of Western Electric.

The second major antitrust suit, *United States* v. *AT&T,* was started in 1974. The government alleged that

(i) AT&T's exclusive relationship with Western Electric was illegal;

(ii) AT&T monopolized the long distance service market;

(iii) AT&T refused to interconnect telecommunications competitors as well customers' premises equipment, thus being liable of a "refusal to deal";

(iv) AT&T used various discriminatory practices that raised the costs of competitors;

(v) AT&T abused the regulatory process and did not provide complete information to regulators;

(vi) AT&T set prices to exclude competitors, including practicing predatory pricing.

The DOJ sought divestiture of both manufacturing and long distance service from local service. Late in the Carter administration, DOJ offered to accept only the divestiture of manufacturing. AT&T refused, and had to later accept a much more onerous breakup. The case was settled by the Modified of Final Judgment ("MFJ") implanted in 1984. AT&T retained its long distance network, but seven regional operating companies ("RBOCs") were broken away from it.[9] Each RBOC was comprised of a collection of local telephone companies that were part of the original AT&T. Regional Bell Operating

[9] These RBOCs were: Ameritech, Bell Atlantic, Bell South, NYNEX, Pacific Bell, Southwestern Bell (SBC), and US West. NYNEX merged into Bell Atlantic, and subsequently Bell Atlantic merged with GTE to form Verizon. SBC bought Ameritech, Pacific Bell and an "independent," Southern New England Telephone ("SNET"). US West merged with Qwest. Thus, out of 8 large local exchange carriers (7 RBOCs and GTE) we now have only 4 large local exchange carriers: SBC, Verizon, Qwest, and Bell South. Bell South is very small in comparison to the other two and is generally considered a takeover or merger target.

Companies remained regulated monopolies, each with an exclusive franchise in its region and were not allowed to provide long distance service.

It is useful to keep in mind that microwave transmission was a major breakthrough in long distance transmission that created the possibility of competition in long distance. Microwave transmission was followed by technological breakthroughs in transmission through satellite and through fiber optic wire. By the time competition took roots in long distance, the fiber optic technology had become the dominant technology of transmission.

b. The Post-Breakup Years

The breakup of AT&T crystallized the recognition that competition was possible in long distance, while the local market remained a natural monopoly. The biggest benefits to consumers during the last eighteen years have come from the long distance market, which, during this period was transformed from a monopoly to an effectively competitive market. However, often consumers do not reap the full benefits of cost reductions and competition because of an antiquated regulatory framework that, ironically, was supposed to protect consumers from monopolistic abuses and instead sometimes protects the monopolistic market structure.

Competition in long distance has been a great success. The market share (in minutes of use) of AT&T fell from almost 100% to below 45% in 2000. See Figure 1.[10] The revenue market share of AT&T also fell dramatically, as shown in Figure 2.[11] Since the MFJ, the number of competitors in the long distance market has increased dramatically. Soon after the MFJ, two nation-wide facilities-based competitors, MCI and Sprint emerged

[10] Source: FCC.
[11] Source: FCC.

as strong competitors of AT&T. Facilities-based competitors deployed their own fiberoptic switched network. Over the last decade, a number of new strong facilities-based competitors entered with nationwide (or of very significant coverage) networks, including Qwest, Level 3, Williams, and Global Crossing.[12] There are also a number of smaller regional facilities-based carriers, as well as a large number of "resellers" that buy wholesale service from the facilities-based long distance carriers and sell to consumers. For example, currently, there are about 500 resellers competing in the California inter-exchange market, providing very strong evidence for the ease of entry into this market. At least 20 new firms entered the California market in each year since 1984.

Prices of long distance phone calls have decreased dramatically. The average revenue per minute of AT&T's switched services has been reduced by 62% between 1984 and 1996. Figure 3 shows the decline in the average revenue per minute for AT&T, as well as the average revenue per minute for AT&T net of access charges.[13] AT&T was declared "non-dominant" in the long distance market by the FCC in 1995.[14] Most economists agree that presently the long distance market is effectively competitive.

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[12] MCI merged with WorldCom that had earlier expanded its original LDDS network and had acquired the Internet backbone provided UUNET.

[13] Source: AT&T. This is on a relative scale over time, since the carriers do not disclose actual price-to-cost margins.

[14] *See* Federal Communications Commission (1995).

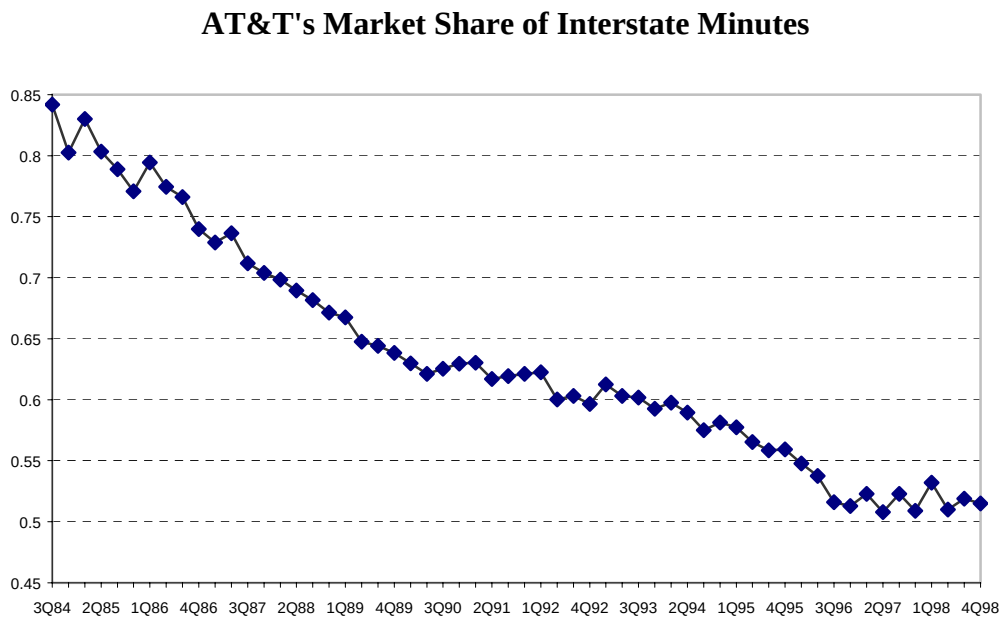

Figure 1

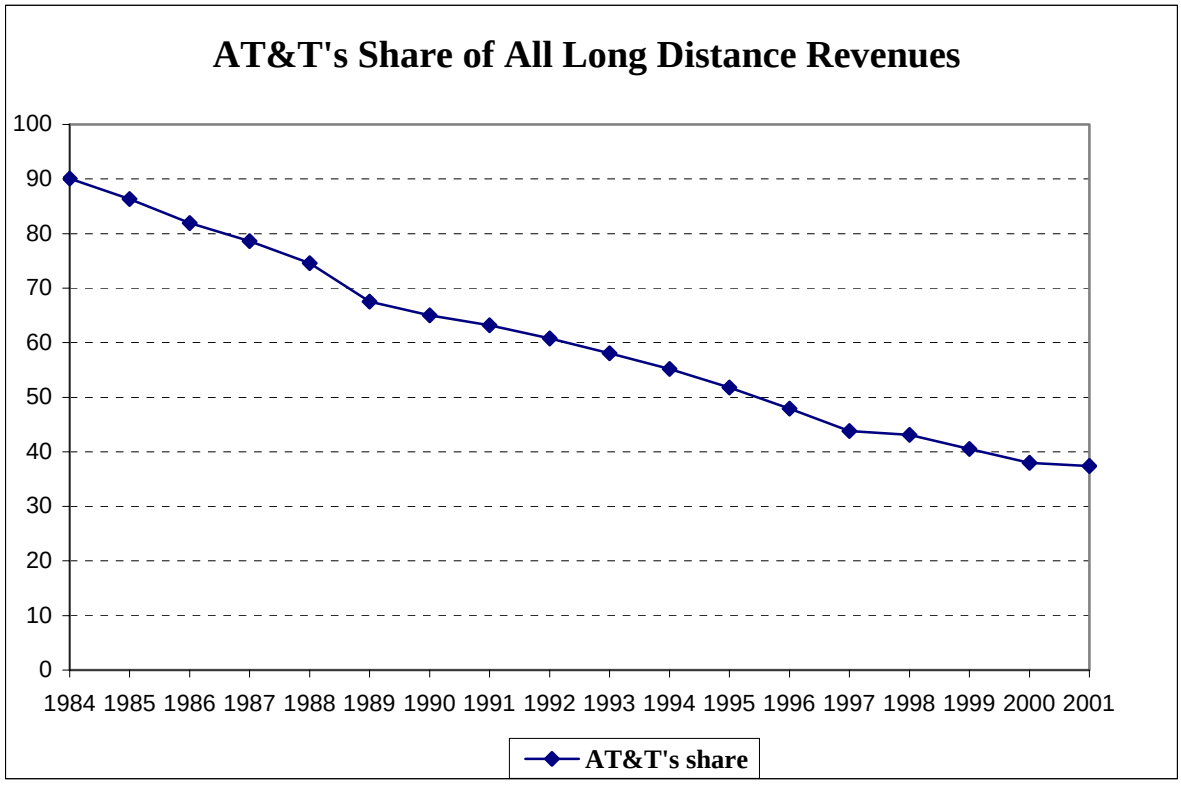

Figure 2

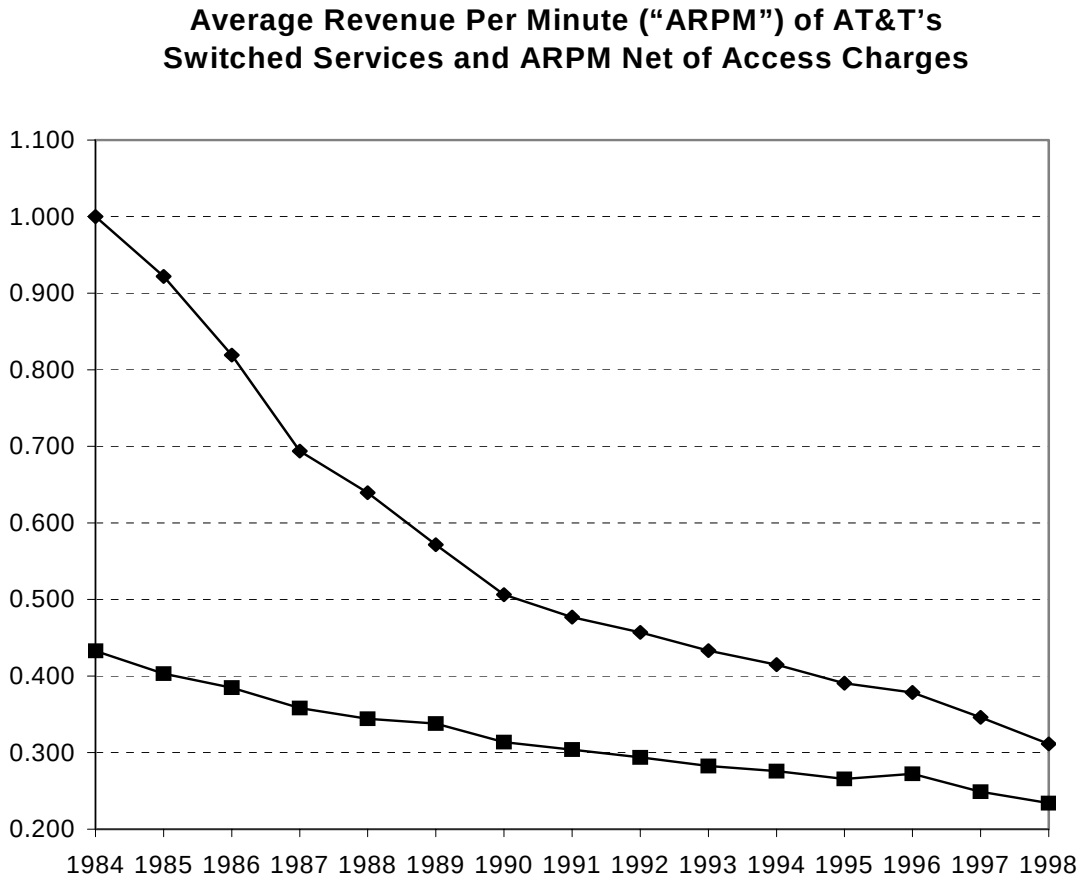

Figure 3

The MFJ did not allow RBOCs to provide "in region" long distance phone service, *i.e.*, each RBOC was prohibited from offering long distance service that originated in its local area. The main reasons for that restriction were to avoid three types of anti-competitive actions by a local service monopolist who would also own a long distance service subsidiary. These are: (i) vertical price squeeze; (ii) price discrimination against the opponents of the local monopolist's long distance subsidiary; and (iii) non-price discrimination against the opponents of the local monopolist's long distance subsidiary.

A long distance phone call is carried by the local telephone companies of the place it originates and the place it terminates, and only in its long distance part by a long distance company. Thus, "originating access" and "terminating access" are provided by local exchange carriers to long distance companies and are essential bottleneck inputs for long distance service. A local exchange monopolist sets an originating fee of $\boldsymbol{a}$ per minute paid by all long distance companies for calls originating from its region. Origination and termination fees are approved by the local PUC.[15] If the local exchange monopolist also provides long distance service, it can influence the maximum price $\boldsymbol{p}$ per minute that an independent long distance company can charge. Thus, a local exchange monopolist that has vertically integrated in long distance service can control the gross revenue $\boldsymbol{p - a}$ per minute of its long distance rivals. By setting its long distance price and influencing the access charge, the vertically integrated local exchange monopolist can squeeze or even make negative the gross revenue $\boldsymbol{p - a}$ of the long distance rivals so that they are marginalized or even driven out of business. This is called a "vertical price squeeze." A local exchange monopolist with a long distance subsidiary can also use price and non-price discrimination against long distance competitors to disadvantage them. Thus, to insulate long distance competition from leveraging in the long distance market of the RBOC monopoly power in the local exchange and to protect the public interest, the MFJ restricted the RBOCs from providing "in region" long distance service.[16]

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[15] Origination and termination of calls are extremely lucrative services. Access has an average cost (in most locations) of $0.002 per minute. Its regulated prices vary. The national average in 2001 was $0.0169 per minute. Such pricing implies a profit rate of 745%. Access charges reform is one of the key demands of the pro-competitive forces in the current deregulation process.

[16] However, non-RBOC local exchange monopolists, such as GTE, had been traditionally allowed to provide long distance service, and were not restricted by the MFJ.

Local telephone companies that came out of the Bell System (Regional Bell Operating Companies, "RBOCs") actively petitioned the U.S. Congress to be allowed to enter the long distance market. To a large extent in response to this pressure, Congress passed the Telecommunications Act of 1996. The great success of competition in long distance allowed US Congress to appear "balanced" in the Telecommunications Act of 1996 by establishing competition in local telephony, while allowing RBOCs into long distance after they had met certain conditions. However, the transition of local markets to effective competition will not be as easy or as quick as in the long distance markets. This is because of the nature of the product and the associated economics.

Many telecommunications companies are presently trying to be in as many markets as possible so that they can bundle the various products. Companies believe that consumers are willing to pay more for bundled services for which the consumer receives a single bill. Bundling also discourages consumers from migrating to competitors, who may not offer the complete collection of services, so that consumer "churn" is reduced.

4. The 1996 Telecommunications Act And Its Impact

a. Goals Of The 1996 Act

The Telecommunications Act of 1996 attempts a major restructuring of the US telecommunications sector. The 1996 Act will be judged favorably to the extent that it allows and facilitates the acquisition by consumers of the benefits of technological advances. Such a function requires the promotion of competition in all markets. This does not mean immediate and complete deregulation. Consumers must be protected from monopolistic abuses in some markets as long as such abuses are feasible under the current

market structure that was in many ways determined by the legacy of regulation. Moreover, the regulatory framework must safeguard against firms exporting their monopoly power in other markets.

In passing the Telecommunications Act of 1996 ("1996 Act") Congress took radical steps to restructure U.S. telecommunications markets. These steps had the potential to result in very significant benefits to consumers of telecommunications services, telecommunications carriers, and telecommunications equipment manufacturers. But the degree of success of the 1996 Act depends crucially on its implementation through decisions of the Federal Communication Commission and State Public Utility Commissions and the outcome of the various court challenges that these decisions face.

The 1996 Act envisioned a network of interconnected networks that are composed of complementary components and generally provide both competing and complementary services. The 1996 Act used both *structural* and *behavioral* instruments to accomplish its goals. The Act attempted to reduce regulatory barriers to entry and competition. It outlawed artificial barriers to entry in local exchange markets, in its attempt to accomplish the maximum possible competition. Moreover, it mandated interconnection of telecommunications networks, unbundling, non-discrimination, and cost-based pricing of leased parts of the network, so that competitors can enter easily and compete component by component and service by service.

The 1996 Act imposed conditions to ensure that *de facto* monopoly power is not exported to vertically-related markets. Thus, the 1996 Act *required* that competition be established in local markets *before* the incumbent local exchange carriers are allowed in long distance.

The 1996 Act preserved subsidized local service to achieve "Universal Service," but imposes the requirement that subsidization is transparent and that subsidies are raised in a competitively neutral manner. Thus, the 1996 Act lead the way to the elimination of subsidization of Universal Service through the traditional method of high access charges.

The 1996 Act crystallized changes that had become necessary because of technological progress. Rapid technological change has always been the original cause of regulatory change. The radical transformation of the regulatory environment and market conditions that is presently taking place as a result of the 1996 Act is no exception.

b. Logic Of The 1996 Act

The basic logic behind the 1996 Act is to break the network into components and let everyone compete in every part, as well as in end-to-end services. To achieve this, the 1996 Act mandates (i) interconnection; (ii) unbundling; and (iii) non-discrimination. Moreover, it takes away some of the incumbent's advantages that arise purely from historical reasons by (i) mandating the lease of unbundled network elements at cost; (ii) mandating wholesale provision of any service presently provided by the Incumbent Local Exchange Carriers ("ILECs"); and (iii) imposing number portability. To preserve the competition in long distance, the Act attempts to ensure that monopoly power arising from historical or other reasons in the local exchange is not exported in other markets. Finally, the 1996 Act attempts to impose nation-wide standards for competition and take some power away from the States.

The 1996 Act allows entry of RBOCs in long distance after they open their local exchange network to competition. Thus, from the point of view of an RBOC, long distance

entry was supposed to be the reward for allowing competition in the local exchange and losing its local exchange monopoly. The 1996 Act was based on the belief that the individual private incentives of the RBOCs would be sufficient to drive the process. Thus, the 1996 Act did not impose penalties for delay or non-compliance. This has proved to be a very serious deficiency of the 1996 Act. Congress thought that the "carrot" of entry in long distance would be sufficient reward for RBOCs to open their local network. Events have shown that Congress erred in this; RBOCs' behavior showed that they preferred not to open their local network and pay the price of staying out of long distance for a while.

c. Entry In Local Services As Envisioned By The 1996 Act

At the time of writing, the "last mile" of the telecommunications network that is closest to the consumer (the "local loop") still remains a bottleneck controlled by a local exchange carrier ("LEC"). The Telecommunications Act of 1996 boldly attempts to introduce competition in this last bottleneck, and, before competition takes hold, the Act attempts to imitate competition in the local exchange.

To facilitate entry in the local exchange, the Act introduces two novel ways of entry other than through the installation of owned facilities. The first way allows entry in the retailing part of the telecommunications business by requiring ILECs to sell to entrants at wholesale prices any retail service that they offer. Such entry is essentially limited to the retailing part of the market.

The second and most significant novel way of entry introduced by the Act is through leasing of unbundled network elements from incumbents. In particular, the Act requires that ILECs (i) unbundle their networks and (ii) offer for lease to entrants network

components (unbundled network elements, "UNEs") "at cost plus reasonable profit."[17] Thus, the Act envisions the telecommunications network as a decentralized network of interconnected networks.

Many firms, including the large interexchange carriers AT&T and MCI-WorldCom attempted to enter the market through "arbitration" agreements with ILECs under the supervision of State Regulatory Commissions, according to the procedure outlined by the Act. The arbitration process proved to be extremely long and difficult, with continuous legal obstacles and appeals raised by the ILECs. To this date, over six years after the signing of the Act by President Clinton, entry in the local exchange has been limited in most residential markets.

The latest statistics, collected by the FCC,[18] as of June 2003, entrant competitive local exchange carriers ("CLECs") provided service to 14.7% of the approximately 183 million nationwide local telephone lines, but only 3.4% of end-users were served over CLEC-owned facilities. 42% of all CLEC lines served medium and large business, institutional, and government customers.[19] For services provided over leased facilities, the percentage of CLEC service which is total service resale of ILEC services declined to 19% at end of December 2002, while the percentage provisioned over acquired UNE loops grew to 55%.

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[17] The FCC and State Regulatory Commissions have interpreted these words to mean Total Element Long Run Incremental Cost ("TELRIC") which is the forward looking, long run, (minimized) economic cost of an unbundled element and includes the competitive return on capital.

[18] See, *Trends in Telephone Service*, Federal Communications Commission, August 2003, http://www.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/IAD/trend803.pdf , Section 8. The nationwide (14.7%) overall market share of CLECs come from table 6 in *Local Telephone Competition: Status as of June 30, 2003*, December 2003, Federal Communications Commission, Wireline Competition Bureau. The nationwide percentage of end-user lines served over CLEC-owned facilities (3.4%) is derived by dividing the number of CLEC owned lines nationwide, found in Table 10 of *Local Telephone Competition*, by the total number of lines nationwide, found in Table 6 of the same report.

[19] In contrast, 22% of reported ILEC switched access lines served such customers.

d. Entry Of RBOCs In Long Distance Service

In 1996, RBOCs had 89% of telephone access lines nationwide. Most of the remainder belonged to GTE and independent franchise holders. Competitive access providers (who did not hold a franchise monopoly) had less than 1% of residential access lines nationwide. Besides providing access to long distance companies, local exchange carriers also provide lucrative "custom local exchange services" ("CLASS"), such as call waiting, conference calling, and automatic number identification. Basic local service provided by LECs is considered not to be particularly profitable.

The Act allowed for entry of RBOCs in long distance once a list of requirements has been met, and the petitioner has proved that its proposal is in the public interest. These requirements can be met only when the market for local telecommunications services becomes sufficiently competitive. If the local market is not competitive when an incumbent LEC monopolist enters into long distance, the LEC can leverage its monopoly power to disadvantage its long distance rivals by increasing their costs in various ways, and by discriminating against them in its pricing. If the local market is not competitive when an incumbent LEC monopolist enters into long distance, an LLEC would control the price of a required input (switched access) to long distance service while it would also compete for customers in long distance. Under these circumstances, an ILEC can implement a *vertical price squeeze* on its long distance competitors whereby the price to cost ratio of long distance competitors is squeezed so that they are driven out of business.[20]

In allowing entry of local exchange carriers into the long distance market, the Act tries not to endanger competition that has developed in long distance by premature entry of

[20] Avoiding a vertical price squeeze of long distance competitors, such as MCI, was a key rationale for the 1981 breakup of AT&T in the long distance division that kept the AT&T name, and the seven RBOCs that remained local monopolists in local service, as discussed above. Also see Economides (1998), (1999).

RBOCs in the long distance market. However, on this issue, the Act's provisions guarding *against premature entry* may have been insufficient. Hence, to guard against anti-competitive consequences of premature entry of RBOCs in long distance there is a need of a deeper analysis of the consequences of such entry on competition and on consumers' and social welfare. The FCC has not demanded significant competition before allowing RBOCs to enter long distance. Thus, currently, RBOCs have been approved for long distance service in all states. [21]

[21] The history of the approval process is summarized in the following table.

State	Filed by:	Status	Date Filed	Date Resolved
AZ	Qwest	Approved	9/4/03	12/03/03
IL, IN, OH, WI	SBC	Approved	7/17/03	10/15/03
Michigan	SBC	Approved	6/19/03	Due By 9/17/03
MN	Qwest	Approved	2/28/03	06/26/03
Michigan	SBC	Withdrawn	1/15/03	04/16/03
NM, OR & SD	Qwest	Approved	1/15/03	04/15/03
Nevada	SBC	Approved	1/14/03	04/14/03
DC, MD, WV	Verizon	Approved	12/18/02	03/19/03
CO, ID, IA, MT, NE, ND, UT, WA, & WY	QWEST	Approved	09/30/02	12/23/02
California	SBC	Approved	09/20/02	12/19/02
FL, TN	BellSouth	Approved	09/20/02	12/19/02
Virginia	Verizon	Approved	08/01/02	10/30/02
MT, UT, WA, & WY	QWEST	Withdrawn	07/12/02	09/10/02
NH, DE	Verizon	Approved	06/27/02	09/25/02
AL, KY, MS, NC, SC	BellSouth	Approved	06/20/02	09/18/02
CO, ID, IA, NE, & ND	QWEST	Withdrawn	06/13/02	09/10/02
New Jersey	Verizon	Approved	03/26/02	06/24/02
Maine	Verizon	Approved	3/21/02	6/19/02
Georgia/Louisiana	BellSouth	Approved	2/14/02	5/15/02
Vermont	Verizon	Approved	1/17/02	4/17/02
New Jersey	Verizon	Withdrawn	12/20/01	3/20/02
Rhode Island	Verizon	Approved	11/26/01	2/24/02
Georgia/Louisiana	Bellsouth	Withdrawn	10/02/01	12/20/01
Arkansas/Missouri	SBC	Approved	08/20/01	11/16/01
Pennsylvania	Verizon	Approved	6/21/01	9/19/01
Connecticut	Verizon	Approved	4/23/01	7/20/01
Missouri	SBC	Withdrawn	4/4/01	6/7/01
Massachusetts	Verizon	Approved	1/16/01	4/16/01
Kansas/Oklahoma	SBC	Approved	10/26/00	1/22/01
Massachusetts	Verizon	Withdrawn	9/22/00	12/18/00
Texas	SBC	Approved	4/5/00	6/30/00
Texas	SBC	Withdrawn	1/10/00	4/05/00
New York	Verizon	Approved	9/29/99	12/22/99
Louisiana	BellSouth	Denied	7/9/98	10/13/98
Louisiana	BellSouth	Denied	11/6/97	2/4/98
South Carolina	BellSouth	Denied	9/30/97	12/24/97
Michigan	Ameritech	Denied	5/21/97	8/19/97
Oklahoma	SBC	Denied	4/11/97	6/26/97
Michigan	Ameritech	Withdrawn	1/02/97	2/11/97

e. Universal Service

Traditionally, the United States has adopted a policy to maximize the subscribership of the Public Switched Telecommunications Network ("PSTN") commonly called "Universal Service." Because universal service requires that some consumers be provided with basic telephone services below cost, from an efficiency standpoint, there is over-consumption of those services. Since most studies report very small price elasticities of demand for access, the over-consumption effect may be small, and most of the distortion caused by Universal Service may be a wealth transfer effect. However, depending on how universal service is structured and provided, a host of other inefficiencies may also be created.

Historically, attaining the goal of the universal service has focused on keeping basic local exchange telephone service rates low. To achieve this goal, the funds required to subsidize service were extracted from inter- and intra-LATA long distance service. Thus, rates for carrier access and certain other services were set at artificially high levels to provide implicit subsidies to support the universal service objective.

The historical method of promoting subscribership raised subsidies through taxing of traffic-sensitive services through the imposition of the federal, and, in some cases, a State, Common Carrier Line Charges ("CCLCs"), and was based on implicit and hidden subsidies. The historical method of raising subsidies for universal service compares very poorly with the economically efficient method for a number of reasons. First, the historical subsidy is not explicit. Therefore, it is unclear who is subsidizing whom. For example, in the traditional regime, a rural customer who makes a significant amount of toll calls in a high cost area may not be subsidized in net terms. Second, the traditional mechanism is not

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Source: FCC, http://www.fcc.gov/Bureaus/Common_Carrier/in-region_applications/ .

targeted to those subscribers who require the subsidy. Instead, the LEC receives the subsidy for serving all consumers regardless of their ability to pay the full cost, even if they live in an area where costs do not exceed revenues. Third, instead of being funded broadly, the burden of universal service is borne by inter- and intra-LATA toll users thereby introducing inefficiencies to the provision of those services. Fourth, the traditional system is not competitively neutral because the benefits of the current system inure only to the incumbent LECs and not to any of their potential competitors. This system not only inhibits the introduction of competition in the local exchange (because the subsidies flow to the incumbent LEC instead of to the carrier chosen by the consumer) but also may bestow unwarranted benefits on the incumbent LEC to the extent the subsidies are inflated above amounts necessary to provide basic universal service at cost.

The 1996 Act introduced fundamental changes in the structure of telecommunications markets in the United States. The most important thrust of the Telecommunications Act is its goal of establishing competition in all telecommunications markets. Competition generally drives prices closer to cost and imposes a strict discipline. As a result, and once competition takes hold, the prior implicit method of subsidization would no longer be viable, and the Act explicitly rejects such a process by requiring universal service support to be explicit, § 254(e), and by forbidding the continued use of universal service subsidies to cross-subsidize competitively provided services, § 254(k).

The 1996 Act aims to "preserve and advance universal service [254(b)]. This means:

(1) High quality at low rates.

(2) Access to advanced services in all States.

(3) Access in rural and high cost areas at comparable prices to other areas.

(4) Supported by "equitable and nondiscriminatory contributions" by "all providers of telecommunications services."

(5) Specific and predictable mechanisms to raise the required funds.

(6) Access to advanced telecommunications services for schools, health care, and libraries.

Regulatory policy which explicitly deviates from the market outcome in the market for subscription creates a number of complex questions. Among them are who will be subsidized, by how much, by whom, and how will the money actually flow from the subsidizers to the subsidized. If these issues are not resolved in an efficient manner, there may be resulting economic distortions ("secondary distortions") that may be more significant than their original cause. For example, if the subsidy is extracted from subscribers of a single service, demand for that service will necessarily be impacted in ways which would not be consistent with the goals of the 1996 Act. On the other hand, an efficient solution to these questions can guarantee that no further distortions are created by universal service, *i.e.*, no distortions over and above the original distortion created by the decision to maximize subscribership.

Funding for universal service should be achieved in a manner that is both efficient and competitively neutral. An economically efficient universal service fund should conform to the following criteria:

(1) All subsidies to promote universal service should be made explicit.

(2) Universal service should be funded broadly.

(3) Universal service subsidies should be targeted narrowly.

(4) Universal service should be achieved in a competitively neutral fashion.

(5) The existence and operation of any universal service fund should minimize distortions to other telecommunications services.

(6) Subsidized consumers should be served in the most efficient way possible.

These characteristics are embodied in the 1996 Act. The 1996 Act specifies that universal service subsidies should be made explicit (§ 254(e)), funded broadly (§ 254(d)) and achieved in a competitively neutral fashion (§ 254(b)). This framework will minimize to the maximum extent possible the problem of secondary distortions that I identified earlier.

f. The Failure Of The 1996 Act And The Current Wave of Mergers

Congress made a crucial miscalculation of the incentive of RBOCs to open their local networks to competition so that they would be rewarded with entry in long distance. In the summer of 1996, the RBOCs decided to delay entry of their local networks to competition as much as possible even if that would lead to delay of their entry in long distance.

The various legal challenges have derailed the implementation process of the Act and have increased the uncertainty in the telecommunications sector. In the absence of reasonable final prices, given the uncertainty of the various legal proceedings, and without final resolution on the issues of non-recurring costs and of the electronic interface for switching local service customers across carriers, entry in the local exchange through leasing of unbundled network elements has been slow. Moreover, entry in the retailing part

of the business through total service resale has been minimal, since the wholesale discounts have been small.

In the absence of entry in the local exchange market as envisioned by the Act, the major long distance companies are buying companies that give them some access to the local market. For example, MCI has merged with WorldCom, which had just merged with Brooks Fiber and MFS, which in turn also own some infrastructure in local exchange markets. MCI-WorldCom has focused on the Internet, having acquired Internet backbone provider UUNET as part of MFS, and in the business long distance market.[22] WorldCom proposed a merger with Sprint. The merger was stopped by both the United States Department of Justice and by the Competition Committee of the European Union. USDOJ had reservations about potential dominance of the merged company in the market for global telecommunications services. The EU had objections about potential dominance of the Internet backbone by the merged company.[23] In June 2002, WorldCom filed for Chapter 11 bankruptcy protection after a series of revelations about accounting irregularities; as of this writing, the full effects of these events on the future of WorldCom and the entire industry are still open. MCI (WorldCom having reverted to its old name) has

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[22] The MCI-WorldCom merger was challenged by the European Union Competition Committee, the Department of Justice and GTE on the grounds that the merged company would have a large market share of the Internet "backbone" and could sequentially target, degrade interconnection, and kill its backbone rivals. Despite (i) a lack of an economically meaningful definition of the Internet "backbone"; (ii) the fact that MCI was unlikely to have such an incentive because any degradation would also hurt its customers; and (iii) that it seemed unlikely that such degradation was feasible, the Competition Commission of the European Union, ordered MCI to divest of *all* its Internet business, including its retail business where it was never alleged that the merging companies had any monopoly power. MCI's Internet business was sold to Cable and Wireless, the MCI-WorldCom merger was finalized, and MCI-WorldCom is using its UUNET subsidiary to spearhead its way in the Internet.

[23] The merged company proposed to divest Spring's backbone. Thus, objections of the EU were based on WorldCom's market share of about 35% in the Internet backbone market. The EU used a very peculiar theory that predicted that "tipping" and dominance to monopoly would occur starting from this market share because WorldCom would introduce incompatibilities into Internet transmission and drive all competitors out of the market. Time proved that none of these concerns was credible.

emerged from bankruptcy and competitors are concerned that MCI will be a formidable competitor with no debts.

AT&T acquired TCG, which owned local exchange infrastructure that reached business customers. AT&T unveiled an ambitious strategy of reaching consumers' homes by using cable TV wires for the "last mile." With this purpose in mind, AT&T bought TCI and with the intent of converting the TCI cable access to an interactive broadband, voice, and data telephone link to residences. AT&T had also entered in an agreement with Time Warner to use its cable connection in a way similar to TCI's, and in April 1999 AT&T outbid Comcast and acquired MediaOne, the cable spin-off of US West.

TCI cable reached 35% of US households. Together with Time Warner and MediaOne, AT&T could reach a bit more than 50% of US households. Without access to UNEs, to reach all residential customers, AT&T had to find another way to reach the remaining US households. The provision of telephony, Internet access, broadband, data, and two-way video services exclusively over cable lines in the "last mile" requires significant technical advances, significant conversion of the present cable networks, and an investment of at least $5 billion (and some say $30 billion) just for the conversion of the cable network to two-way switched services. Moreover, there is some inherent uncertainty in such a conversion, which has not been successful in the past. Thus, it was an expensive and uncertain proposition for AT&T, but, at the same time, it was one of the few remaining options of entry in the local exchange.

Facing tremendous pressure from financial markets, slow cable conversion, and a steep reduction in long distance revenues AT&T decided on a voluntary breakup into a wireless unit, a cable TV unit, and a long distance and local service company which

retained the name AT&T and the symbol "T" at NYSE. Before the breakup, financial markets tended to underestimate the value of AT&T by looking at it only as a long distance company. After the breakup, the cable part of AT&T was bought with Comcast, and Comcast has generally not tried to attract new cable telephony customers since.

Attempts by the RBOCs to maximize their foothold, looking forward to the time when they would be allowed to provide long distance service in all states, include SBC's acquisition of Pacific Bell and Ameritech, and Bell Atlantic's merger with NYNEX, despite some antitrust objections. SBC also bought Southern New England Telephone ("SNET"), one of the few companies, which as an independent (not part of AT&T at divestiture) was not bound by MFJ restrictions and had already entered into long distance. Bell Atlantic has merged with GTE, creating Verizon. Thus, the 8 large local exchange carriers of 1984 (7 RBOCs and GTE) have been reduced to only 4: Verizon, Bell South, SBC, and US West. US West recently merged with Qwest. The smallest one left, Bell South, is widely reported to be a takeover or merger target.

A crucial cross-media merger occurred with the acquisition of TimeWarner by AOL at the height of AOL's stock price. The merger was achieved with the requirement that AOL/TimeWarner will allow independent ISPs to access to its cable monopoly for broadband services. Synergies and new joint products failed to materialize at AOL/TimeWarner. AOL has already been dropped from the trading symbol of the merged company and there is wide speculation that AOL will be divested.

g. The Telecom Meltdown of 2000-2003

The present crisis in telecommunications arose out of an incorrect prediction of the speed of expansion of the Internet and therefore of the size of the demand for all the new markets "living" on the Internet. It was widely believed that the Internet would grow at 400% in terms of transmitted bits per year. In retrospect, it is clear that for the years 2000 and 2001 only 100% growth was realized. Of course, it is always difficult to pin down the growth rate in early stages of an exponential network expansion, and the Internet was growing at 400% per year when the original predictions were made. However, the rate of growth slowed down in the number of new hosts connected. And since no new "killer application" that required a lot of bandwidth was unveiled, the rate of growth in bits transferred also slowed down. This is despite the very fast growth of transfers of bits in peer to peer ("P2P") transfers of files among computers, mainly songs in MP3 format, popularized by Napster and still going strong even after Napster has been practically closed down.[24]

Based on the optimistic prediction of Internet growth, there was tremendous investment in Internet transport and routing capacity. Moreover, since capital markets were very liberal in providing funds, a number of companies invested and deployed more telecommunications equipment than would be prudent given their present market share. This was done for strategic reasons, essentially in an attempt to gain market share in the process of the rapid expansion of the Internet.

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[24] Clearly, the Internet provides a superior way of distribution of music in digitized form. However, the recording industry is avoiding using this distribution process because of concerns that the music will be freely downloaded, and is currently suing hundred of individuals for allowing digitized music to be downloaded from their computers. Distribution of music and video in digitized form could significantly increase the amount of bits traveling on the Internet, but the present copyright dispute makes it unlikely to allow this to happen in the short run.

Once the growth prediction was revised downwards, the immediate effect was a significant reduction in orders and in investment in fiberoptic, switching, and router equipment. Before making significant new investments, telecommunications service companies are waiting for higher utilization rates of their existing capacity as the Internet expands. There is presently a temporary but very significant overcapacity of Internet transmission capacity in the United States. And, as mentioned earlier, since it is easy to run the Internet backbone as a long distance network, the very significant overcapacity of the Internet backbone, combined with new investment and overcapacity of traditional long distance networks has lead to very significant pressure and reductions of long distance prices. Thus, the incorrect prediction of the Internet expansion has had very negative repercussions not only in Internet-based business, but also in the long distance business and in the market for telecommunications equipment.

5. Internet Telephony and Regulatory Breakdown

The Telecommunications Act of 1996 did not legislate any framework for the most revolutionary of all current innovations in telecommunications, Internet telephony, or more precisely Internet Protocol ("IP")-based telephony which is more generally known as "voice over IP" or "VOIP." This is despite the fact that IP telephony emerges as the favorite mode of operation of new telecommunications networks, such as those built by Qwest and Level3, as well as the required conversion of traditional telecommunications networks, such as the one of AT&T.

Digitization of telecommunication services imposes price arbitrage on the bits of information that are carried by the telecommunications network, thus leading to the

elimination of price discrimination between voice and data services. Elimination of such price discrimination can lead to dramatic reductions in the price of voice calls precipitating significant changes in market structure. These changes were first evident on the Internet, a ubiquitous network of applications based on the TCP/IP protocol. Internet-based telecommunications are based on packet switching. There are two modes of operation: (i) a time-delay mode in which there is a guarantee that system will do whatever it can to deliver all packets; and (ii) a real-time mode, in which packets can in fact be lost without possibility of recovery.

Many telecommunications services do not have a real time requirement, so applications that "live" on the Internet can easily accommodate them. For example, there are currently a number of companies that provide facsimile services of the Internet, where all or part of the transport of the fax takes place over the Internet. Although the Internet was not intended to be used in real-time telecommunications, despite the loss of packets, presently telecommunications companies use the Internet to complete ordinary voice telephone calls. Voice telecommunications service started on the Internet as a computer-to-computer calls. In 1995, Internet telecommunications companies started offering termination of calls on the public switched network. In 1996, firms started offering Internet calling that originated and terminated on the public switched network ("PSTN"), *i.e.*, from and to the regular customers' phone appliances. The last two transitions became possible with the introduction of PSTN-Internet interfaces and switches by Lucent and others.

Traditional telephony keeps a channel of fixed bandwidth open for the duration of a call. Internet calls are packet-based. Because transmission is based on packet transport, IP

telephony can utilize more efficiently bandwidth by varying in real time the amount of it used by a call. But, because IP telephony utilizes the real time mode of the Internet, there is no guarantee that all the packets of a voice transmission will arrive to the destination.

Internet telephony providers use sophisticated voice sampling methods to decompose and reconstitute voice so that packet losses do not make a significant audible difference. Since such methods are by their nature imperfect, the quality and fidelity of an Internet call depends crucially on the percentage of packets that are lost in transmission and transport.

This, in turn, depends, among other factors, including (i) on the allocation of Internet bandwidth (pipeline) to the phone call; (ii) on the number of times the message is transmitted; and the number ("hops") of routers over which the phone call passes. Internet-based telecommunications services pose a serious threat to traditional telecommunications services providers, including long distance service, international service, and local service providers. In the present US regulatory structure, a call originates from a computer to an Internet service provider ("ISP") (or terminates to a computer) is not charged an "access charge" by the local exchange carrier. This can lead to substantial savings due to the inflated access fees charged by LECs.

Computer-to-computer Internet telephony has been available since 1998, but has not been widely utilized except for international calls, especially in countries where international rates are astronomical.[25] However, recently a number of competitors, including AT&T have entered the VOIP telephony market attempting to substitute traditional local telephone service with IP telephony over a cable TV or DSL Internet

[25] See Garcia-Murillo (2003).

connection. These companies provide appliances that look and feel like traditional phones, and since they deliver all calls over the Internet, have low prices.

In summary, although the Internet was not created for real-time interaction, its UDP mode has been used for voice telecommunications (Internet telephony). Internet telephony will mature as (i) the quality of routers improves; and (ii) as the meshing of the IP database with the US numbering system improves. As Internet telephony improves in quality and Internet phone calls become widely available, artificially high prices of voice calls will not be sustainable because of arbitrage in the bits, as explained above. This will cause a major problem of regulatory breakdown in which it is likely that major telecommunications companies will ask for regulation of the Internet so that voice calls prices do not collapse.

6. The Coming World

The intent of the 1996 Act was to promote competition and the public interest. It will be a significant failure of the US political, legal, and regulatory systems if the interests of entrenched monopolists rather than the public interest as expressed by the US Congress dictate the future of the US telecommunications sector. The market structure in the telecommunications sector two years ahead will depend crucially on the resolution of the LECs legal challenges to the 1996 Telecommunications Act and its final implementation.[26] At the time of this writing in June 2004, the prospects for competition in the local exchange

[26] In one of the major challenges, GTE and a number of RBOCs appealed (among others) the FCC (1996) rules on pricing guidelines to the 8th Circuit. The plaintiffs won the appeal; the FCC appealed to the Supreme Court, which ruled on January 25, 1999. The plaintiffs claimed (among others) that (i) the FCC's rules on the definition of unbundled network elements were flawed; (ii) that the FCC "default prices" for leasing of UNEs were so low that they amounted to confiscation of ILEC property; and (iii) that FCC's "pick and choose" rule allowing a carrier to demand access to any individual interconnection, service, or network element arrangement on the same terms and conditions the LEC has given anyone else in an approved local competition entry agreement without having to accept the agreement's other provisions would deter the "voluntarily negotiated agreements." The Supreme Court ruled for the FCC in all these points, thereby eliminating a major challenge to the implementation of the Act.

in the manner anticipated by the 1996 Act are very bleak. The Appeals Court in Washington DC has thrown out[27] very substantial parts of the triennial review order of the FCC which defined a framework for continuing leasing of UNEs by RBOCs.[28] The Solicitor General and FCC have decided not to appeal this decision to the Supreme Court. If the Supreme Court does not intervene, cost-based leasing of UNEs is very likely to be quickly phased out, and the RBOCs will be allowed to charge monopoly prices for unbundled network elements resulting in a classic vertical price squeeze of entrants in the local exchange who lease UNEs. If such strategies are pursued by the ILECs, entrants in the residential and small business market are likely not to be able to break even. Thus, the vision of the 1996 Act of competition in the local exchange through leasing of unbundled network elements will have died. As wireless service is still not of the same quality as traditional fixed service, the only significant challenge to the RBOC dominant (and in many states near monopoly) position in the residential and small business market is VOIP, and there is much uncertainty over the viability of competition based on VOIP.

Already, we have seen a series of mergers leading to the re-monopolization of local telecommunications. As the combinations of former RBOCs have been approved for long distance in all states, we see a re-constitution of the old AT&T monopoly (without the present AT&T). We have also seen significant integration in the cable industry as a result of the acquisitions and eventual divestitures of cable companies by AT&T.

Whatever the outcomes of the legal battles, the existence of arbitrage and the intensification of competition necessitate cost-based pricing and will create tremendous pressure on traditional regulated prices that are not cost-based. Prices that are not based on

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[27] Court of Appeals decision XXX

[28] See FCC (2003c).

cost are likely to be proven unsustainable. This includes access charges that LECs charge to IXCs, which have to become cost-based if the vision of a competitive network of interconnected networks is to be realized.

As explained in detail above, the local telephone companies have already entered the long distance market without earlier significant decreases of their market shares in local markets. Local telephone companies have merged to expand their customer base footprint and become stronger competitors in the next battle among carriers that sell both local and long distance services. Twenty years after the government broke up the longstanding MA Bell monopoly, the re-monopolization of telecommunications is almost here.

Computers are likely to play a bigger role as telephone appliances and in running intermediate size networks that will compete with LECs and intensify the arbitrage among IXCs. Computer-based telephone interfaces will become the norm. Firms that have significant market share in computer interfaces and computer operating systems, such as Microsoft, may play a significant role in telephony.[29] Hardware manufacturers, especially firms like Cisco, Intel, and 3Com, that make switches and local networks, will play a much more central role in telephony. Internet telephony (voice, data, and broadband) is expected to grow fast.

Finally, I expect that, slowly but steadily, telecommunications will drift away from the technical standards of the signaling system seven ("SS7") established by AT&T before its breakup. As different methods of transmission and switching take a foothold, and as

[29] Microsoft owns a share of WebTV, has made an investment in Qwest and AT&T, and has broadband agreements with a number of domestic and foreign local exchange carriers but does not seem to plan to control a telecommunications company.

new interfaces become available, wars over technical standards are very likely.[30] This will further transform telecommunications from the traditional quiet landscape of regulated utilities to the mad dash world of software and computer manufacturing. This change will create significant business opportunities for entrants and impose significant challenges on traditional telecommunications carriers.

[30] A significant failure of the FCC has been its absence in defining technical standards and promoting compatibility. Even when the FCC had a unique opportunity to define such standards in PCS telephony (since it could define the terms while it auctioned electromagnetic spectrum), it allowed a number of incompatible standards to co-exist for PCS service. This lead directly to a weakening of competition and higher prices as wireless PCS consumers have to buy a new appliance to migrate across providers and are unable to setup service with more than one provider using the same appliance.

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