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BEYOND TELECOMMUNICATIONS LIBERALIZATION: PAST PERFORMANCE, PRESENT HYPE, AND FUTURE DIRECTION

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The first American telegraph message, sent from Baltimore to Washington in 1844, was "What hath God wrought?" The same question was being asked a century and a half later about the effects of liberalization on telecommunications. Finding the answer requires looking at three issues: (1) What is the empirical record of liberalization policy in telecommunications? In the United States, it has been generally positive while in many other countries, where liberalization is only a fairly modest reality, it is too early to tell. (2) What is the record of *prognostication* of the impacts of liberalization? Here the answer is mixed, and predictions ~~are~~ were frequently at odds with the unfolding reality. The best predictive record is held by those in favor of deregulation but willing to intervene structurally to reduce monopoly power. (3) What is the future likely to hold? How will the trend of liberalization work itself out?

I argue that the central institutions of future telecommunications will not be carriers but systems integrators that mix and match transmission segments, services, and equipment, using various carriers. What will be the policy agenda in such a telecommunications environment? Liberalization of telecommunications will not mean libertarianism. There will be no "end of history" in telecommunications policy. The new issues will be those of integrating the emerging "network of networks," and the postderegulatory policy agenda will be

conceptually and politically complex. Liberalization, in fact, may prove to have been the easy part. Fashioning new tools to deal with its consequences, while protecting traditional policy goals in the new environment, will be the next and more difficult challenge.

WHAT IS LIBERALIZATION?

In the recent past, telecommunications policy debates have tried to answer such questions as: Is competition sustainable? Is it advisable? Who wins? Who loses? These questions all center on the effects of liberalization, that is, the entry into previously monopolized markets and the lowering of restrictions. In the area of telecommunications equipment, this involves the adoption of standards that do not favor any single firm or group of suppliers, simple approval procedures, nondiscriminatory procurement, and the absence of protective quotas. In the area of infrastructure, liberalization includes the opening, to new service providers, of already established markets such as long-distance telephony and of new services such as cellular telephony. In the realm of computer-based value-added service, it means access by these new services to main network and central office functions.

Liberalization should not be confused with deregulation. Deregulation is a reduction in government-imposed constraints on the behavior of firms. The term is also used to mean a reduction in red tape and government involvement. Deregulation does not necessarily lead to a diverse market. The result can be a deregulated monopoly or, conversely, a tightly regulated multicarrier system. The experiences in the United States and the United Kingdom, two of the most liberalized markets, reveal that more rather than less regulation emerged, at least initially, after markets were opened. The process of partial liberalization tends to complicate matters and can lead to a more extensive set of rules to address new problems. Partial liberalization requires that interconnection arrangements be set, access charges determined, and a level playing field secured. In some cases, cross-subsidization from monopolistic to competitive services must be prevented. Under liberalization, competitors may receive preferential treatment in order to protect competition in its infancy. All of this leads to considerable regulatory complexity; no system is more lawyer-intensive than partial liberalization.

Liberalization should also be distinguished from corporatization and privatization. Corporatization is the transformation of a state monopoly organization into an entity that is partially autonomous; such an entity may still be state owned, but it controls its own managerial and administrative functions. A company's monopoly status is not affected by corporatization as such, although once the close link to the government is severed, a process is set in motion that makes further changes more likely. Sometimes the corporatized entity is described as a "private" firm in the sense that it may be organized under

private law provisions, which determine its status in, for example, contract and labor law. But that description often confuses legal detail with the reality of control, which may still be in the hands of the government. In other instances, a minority of shares in a company may be issued to the public, although control is retained by the state. Because corporatization loosens direct administrative controls, it is usually accompanied by the creation or strengthening of a government regulatory mechanism.

Privatization involves the sale by the government of shares in the telecommunications organization to private investors. However, even a complete change in ownership may leave a company's monopoly status untouched and may therefore not achieve the gains of efficiency of a competitive system. In the United States, AT&T was both privately owned and a near monopoly for a very long time. In Canada, private regional monopolies exist, and competition over long-distance telephone rates has emerged only recently. Most of the privatizations of European telecommunications monopolies have been only partial. Privatization may encourage efficiencies of operation. But quality of service may fall if an unconstrained private monopolist seeks to reduce costs without regard to the needs of its captive customers. Privatization can also have the unintended effect of strengthening a monopoly and slowing liberalization as shareholders become a political constituency in favor of preserving a monopoly.

THE HISTORY OF LIBERALIZATION IN THE UNITED STATES

The historical experience in the United States has followed the path from relatively unbridled laissez-faire capitalism to a regulatory system that expanded steadily in the decades following the Great Depression and World War II. In the 1970s, telecommunications policy in the United States began to shift in the opposite direction toward a lessening of restrictions.

This change in policy direction was due partly to a general political and economic philosophy of limiting the role of the state, which made the public more receptive to allowing new entrants into telecommunications markets as a way of offsetting corporate power and as a substitute for direct governmental intervention. The shift back toward laissez-faire policies far antedates the conservative Reagan and Bush administrations. Inspired by Lockean principles of natural law, the classic American ideology of government seeks individualism, fragmentation of private power, limitation of government (with the major exception of its role in national security), and protection of property rights and contracts. As applied to telecommunications policy, this philosophy justified a governmental role that is far narrower than in most other countries: it centered on permitting competitive markets to limit the exercise of dominance by any single firm and in permitting users to choose among service providers. This

view was shared by many across the political spectrum, bringing together those Democrats who were distrustful of concentration of private economic power with those Republicans opposed to government interference.

The driving force for restructuring telecommunications in the United States and the other industrialized countries has been the phenomenal growth of user demand for telecommunications, which ~~in turn is~~ has been based on the shift toward service and information based economies. Electronic information transmission—that is, telecommunications—is of ever-increasing importance to the service sector. Price, control, security, and reliability became variables requiring organized managerial attention within service-sector firms. This, in turn, creates pressure from large and specialized users for services from outside the traditional, slow-moving, and redistributive monopoly network system.

To understand today's move to a liberalized environment in the United States, it is necessary first to understand the instability of the old monopoly. Telecommunications in the United States began in 1836 with Samuel Morse and his electromagnetic telegraph. In 1876, Alexander Graham Bell introduced a workable telephone. From the beginning, the U.S. telecommunications system was never the centralized state monopoly system (or PTT, for post, telephone, and telegraph) prevalent in other nations. While the Bell firm grew and prospered, its dominance was the outcome of a highly effective strategy developed by Bell's early guiding spirit, Theodore Vail. That strategy centered on Bell's control of interconnection: of rival equipment to its own network, of rival local networks to Bell local networks, and of rival networks to the Bell long-distance system.

Once the basic Bell patents expired in the 1890s, independent competitors entered those areas not serviced by Bell concessionaires, especially in rural districts and in areas facing high prices. In 1895 alone, 199 new firms entered the market; and in 1900, 508.[1] Rival manufacturing firms provided these local carriers with equipment. In several major cities, systems competed side by side.[2] After a few years, the independents were nearly equal in customer size to Bell, and covered a much larger geographic area. The main difference between the two, however, was interconnection. While the Bell telephone system was fully interconnected on a national level through its own long-distance network, AT&T, the independents operated on a fairly limited regional scale.

Several independent companies brought antitrust complaints against AT&T in the early years of the century. As the number of lawsuits mounted, and as they were joined by Justice Department actions, AT&T entered into interconnection agreements with some independents and chose in 1913 to negotiate an agreement with the U.S. government known as the Kingsbury Commitment. The company guaranteed existing independent telephone companies interconnection to its long-distance network and agreed not to expand further geographically. It also promised to limit its activities to communications. This governmental action to constrain AT&T from total market dominance was part of a general trend of antitrust policy. Americans had become concerned about the enormous growth

in the size of many businesses in the decades following the Civil War. There has always been a strong populist current in the United States opposing domination by big firms and, in this period, the distrust of big business was shared by the political Left, farmers, small businesses, and Westerners.

This political constellation soon led to the establishment of a regulatory system of utility commissions on the state level that supervised privately owned utilities, including telephone companies. The private utilities were required to interconnect by state law. This regulatory arrangement contrasts sharply with—and is far weaker than—the system of centralized state monopoly telephone administrations prevalent in most countries.

AT&T welcomed the new and weak regulatory structures and, within this environment, its market dominance grew. By 1934, the year in which the Communications Act codified the various federal regulatory powers, AT&T built and owned 80 percent of all telephones and access lines in the United States and operated the only national long-distance network. Even so, the competing local services took a long time to disappear. In 1945, the last ~~major~~ competitive local loop service in the United States, the Keystone Telephone Company in Philadelphia, was shut down.

But AT&T's dominance remained under attack. The ~~report of the~~ so-called Walker ~~commission~~ [illegible] authored by one of the members of the new Federal Communications Commission (FCC), challenged AT&T's vertical integration. World War II delayed any follow-up to the Walker recommendations, but once the war was over, the Justice Department filed an antitrust suit against AT&T in 1949. In 1956, under a more supportive Justice Department, AT&T achieved a favorable settlement of the case. It was not forced to divest itself of its Western Electric manufacturing arm, but its activities were limited to telephony. AT&T succeeded in avoiding a possibly disastrous antitrust judgment, though it also, once again, lost its routes of expansion.

By the early 1950s, universal service provision (the extension of telephone service to all parts of the United States) had been largely completed. The telephone reached most households, and an increasingly elaborate system of transfers from business users kept residential telephone rates low. This soon led to pressures for change by those large-business users whose contributions supported low residential charges, and from manufacturers of equipment other than AT&T. In response, the United States hesitantly began a policy of liberalization of entry and interconnection. The FCC had already been authorized in the Communications Act of 1934 to mandate carrier interconnection when in the public interest. Under pressure from the electronics industry—whose importance grew in World War II, the Korean War, and in the consumer prosperity of the 1950s—the interconnection of other terminal equipment, originally more restrictive than in Europe and Japan, was permitted. The two key decisions were *Hush-a-Phone* (1956) and *Carterfone* (1968), which allowed customer-owned and non-AT&T equipment to be connected to the network.

This interconnection policy was also extended to transmission. Military research, especially in the radar field, had opened the microwave spectrum to communications. In 1959, the FCC's *Above 890* decision permitted large users to operate in-house microwave long-distance service. These users felt that they were increasingly subsidizing local service and small customers, and they sought to move at least part of their traffic off the common-carrier system. By 1969, one microwave delivery company, MCI, won a court ruling against a reluctant FCC and an adamant AT&T to permit "specialized common carriers" to provide private line service for *other* than large users. From there it was an inevitable step to interconnection. MCI soon wanted to expand beyond private line services into general public switched service. To do so successfully, it had to be able to interconnect with AT&T's local networks in order to reach customers and be reached by them. This was permitted by the FCC in its *Execunet* decision (1978), which held in essence that a common carrier such as AT&T has to provide access to all users, whether they are small residential households or AT&T's own competitors. Thus, by 1975 AT&T found itself, after a long-protected period, once again facing facilities-based competition for telephone service.

In 1974, the FCC accepted applications for "enhanced service providers," which leased transmission and switching services from common carriers and added value with computer-based features. Following this decision, the FCC in 1976 went one step further and deregulated the resale and shared use of interstate private lines, even if they did not add value. Before, the approval of resale of lines had been left to AT&T's own judgment. It prohibited the resale and shared use by some private companies, but it leased lines to others, such as the telegraph company Western Union, for resale.[3] Through the FCC's actions allowing the reselling of domestic local and long-distance transmission, such practices became widespread.

The process of liberalization eventually led to the breakup of AT&T. This momentous event—the most massive reorganization in business history—was brought about by a 1974 Justice Department antitrust suit (as well as a private antitrust action by MCI) based on unfair business practices AT&T allegedly employed to suppress its competitors. The result was a consent decree in 1982, requiring that AT&T's monopoly be broken up. The government's main argument for the breakup of AT&T was that the company was inherently incapable of reconciling the liberalized and monopolistic parts of its business. Since regulatory requirements did not work, it was necessary, the government argued and the court agreed, to split off the company's local operations, the source of its monopoly power. The divestiture agreement put AT&T's local Bell Operating Companies—approximately two-thirds of the company's assets and employees—into seven Regional Bell Holding Companies. These provided mostly traditional local exchange telephone service, but began increasingly and aggressively to seek other opportunities inside and outside the communications

field and their service territories. Today, the Regional Holding Companies are becoming global and diversified communications companies.

Liberalization in the United States did not stop with domestic services. The FCC, in its 1974 *Domestic Satellite Decision*, set an "open-sky policy," which prevented AT&T from owning satellites, while encouraging other companies to enter this market. In the spirit of initiating increased international competition, the FCC in 1983 began to approve the entry of other companies into international satellite communications, and soon thereafter into submarine cables. In the 1990s, the FCC's focus shifted from a liberalization within sectors to a removal of barriers among the sectors of the communications field. Together with several states, the FCC also promoted rivalry in the provision of telecommunications services. Following the lead of the New York Public Service Commission in 1989, establishing interconnected local competition, the FCC in 1992 extended these principles nationally for those services under its jurisdiction, although its efforts were slowed by an unfavorable court decision in 1994. Other decisions, including those by federal courts, lowered the barriers between the telephone sector and cable television carriers, setting the stage for competitive entry and leading to a series of corporate mergers in the telecommunications field.

In 1993, the Clinton administration took office. Vice President Albert Gore, in particular, took a lead in advocating a national information infrastructure (NII). However, despite much excitement and an extension of the concept to the global information infrastructure, little concrete change actually took place during the first two years of the administration. Congress, in the meantime, worked on fashioning a compromise liberalization bill satisfactory to the various parties with interests at stake. The House of Representatives passed—nearly unanimously—bills sponsored by Representatives Markey and Fields, and by Representatives Brooks and Dingell. These bills further opened local competition in those states that had not yet liberalized. They also opened cable television service to local exchange companies, and long-distance service to the Bell companies under some safeguards. A 1995 Senate bill by Sen. Pressler proceeded in the same direction.

PROGNOSTICATING THE IMPACT OF LIBERALIZATION: REVIEWING THE RECORD

That liberalization would have an overall positive impact was not a foregone conclusion, as reflected in the vigorous political and academic disagreements that accompanied it. Who was right in predicting the impact of liberalization? To analyze this question, it is helpful to organize the ~~economic~~ perspectives on telecommunications ~~regulation~~ policy along two dimensions—~~control of~~ market structure and regulation.

Along the market structure dimension, classic economic analysis suggested that a telecommunications monopoly would lead to incentives to set prices

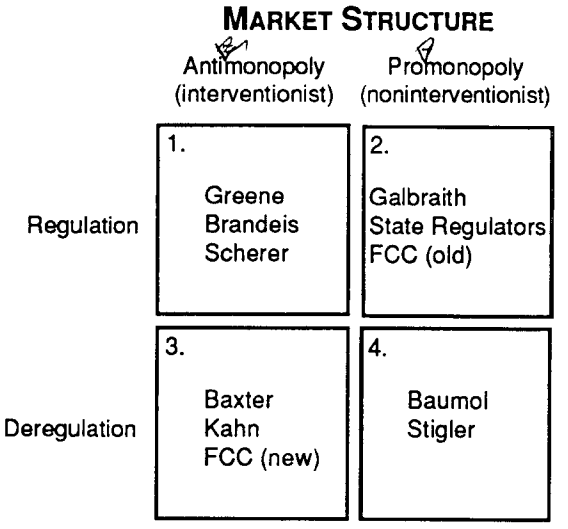
above marginal costs (unless constrained by regulation), and a failure to offer service and equipment options that met user needs. Others argued, however, that in certain situations a natural monopoly was efficient, and that as long as a market was *contestable* (that is, if new entrants could appear if the monopolist became inefficient), a monopolist would behave *as if* competition existed in order to protect its position. As a result, a monopoly was not inefficient per se. Yet even such contestability could be less than optimal under certain circumstances described by economists as "nonsustainability" in a multiproduct setting.

The second dimension along which economists differed was that of regulation versus deregulation, with the advocates of regulation arguing that the public interest needs to be protected, and advocates of free markets pointing to the efficiency costs of unconstrained regulation and to the anticompetitive entry barriers that protected AT&T.

These two dimensions can be mapped into four distinct positions (Figure 1). Figure 1 includes several names representing academics or policymakers associated with these positions.

Category 1: Proregulation, Antimonopoly. This category includes, in the United States, traditional "good government" advocates and populists in the style of Justice Louis Brandeis or Judge Harold Greene (who presided over the AT&T case), as well as those economists who believe that market forces may need to be curbed by both structural and regulatory intervention. In their view, while the power of AT&T was reduced, its successor companies would be free

FIGURE 1
POSITIONS ON MARKET STRUCTURE AND REGULATION



to operate either with or against the public interest. Those in this category predicted large residential rate increases, reductions in service quality, attempts to create new monopolies horizontally and vertically, and continued control of the equipment market by AT&T through its technical dominance and traditional ties to operating companies.

Category 2: Proregulation, Promonopoly. This category includes traditional state regulators and those economists who believe in the necessity of large firms and who dismiss structural antitrust policy in favor of regulation, such as John Kenneth Galbraith. In their view, the efficient and socially redistributive AT&T system was dismantled by zealots, who are now letting its successor companies run wild. This group expected cost increases, price increases, technical incompatibilities, a reduction in the universality of service, and a reduction in research and development. They also predicted that competition in long-distance rates and equipment provision would be unlikely due to AT&T's continued predominance.

Category 3: Proderegulation, Antimonopoly. This group includes procompetition centrists (such as Alfred Kahn) and free-market advocates who believe that competition requires intervention (such as William Baxter, the government's chief advocate of the AT&T divestiture). This group's expectation was that once the monopoly—and its attendant inefficiency—was broken, market forces and competition would assert themselves. The results would be falling costs, cost-based pricing, innovation, higher productivity, and faster modernization.

Category 4: Proderegulation, Promonopoly. This category includes many, but not all, members of the Chicago and Princeton schools of economic thought. The former believe that competition rather than bureaucrats should have served to reduce AT&T's power if it was failing to meet demand efficiently. The latter opposed any attack on a natural monopoly, if it was operating efficiently. Both views ~~groups~~ expected government policy to lead to a reconcentration of the industry, a loss of productivity, and a drop in research and development funds.

Which of these four assessments of the likely impact of liberalization has proved correct? Answering this question requires looking at the empirical record regarding universality of service, prices, equity, service quality and reliability, productivity, research and development, competition, equipment prices and trade, and employment.

UNIVERSALITY OF SERVICE

Overall telephone penetration did not decline with liberalization but actually increased, from a national average of 91.4 percent in 1983 to 93.6 percent in 1991.[4] This was due partly to subsidized "lifeline" service for needy individuals and other safeguards, and partly to the low-demand elasticity for telephone service with respect to price. Although the rate of change has slowed, one

would expect this to occur as the 100 percent level of penetration is approached.[5] For the middle class ($30,000 annual household income), penetration was 98 percent and higher.[6] For the poor (those with incomes of $5,000 to $7,500), it rose from 82.7 percent to 84.9 percent in 1989, before sliding back to 82.8 percent in 1991.[7] For poor blacks and Hispanics (incomes of $5,000 to $7,500), telephone penetration has historically been lower than that of the population as a whole or for whites with the same income. For blacks in this income bracket, penetration rose from 74.7 percent in 1983, to 80.0 percent in 1988, and then slid back to 74.3 percent in 1991. For Hispanics at the same income level over the same period, it rose from 71.1 to 72.6 percent in 1989, before falling to 70.2 percent in 1991.[8] Senior citizens are actually, in terms of telephone penetration, above the national average. Penetration among those aged sixty-five to sixty-nine was at 96.9 percent in 1991, and an even higher 97.3 percent for those over age seventy.

Nor do rural telephone subscribers seem to have been forced off the network as a result of liberalization. Rural states such as Iowa, Nebraska, and North Dakota have telephone penetration well above the national average (95.6 percent, 96.0 percent, and 96.6 percent, respectively, in 1991, compared to the 93.6 percent national average). On average, 95.0 percent of all farms have telephones, according to the Rural Electrification Administration. Telephone rates for rural areas are often (but not always) lower than in urban areas because flat rate service is cheaper for small exchanges due to various subsidy mechanisms and lower overheads.

PRICES

One of the major questions raised by liberalization was its likely impact on residential subscribers, with a tripling of rates frequently predicted. But the reality has been different. Nationwide since the AT&T divestiture, the consumer price index (CPI) for all telephone service rose just over half as fast as the CPI for all goods and services in the same period. Telephone service climbed from 99.8 in 1983 to 119.5 in 1991 (based on an index of 100), a rise of 19.7 percent, while the CPI for all goods and services during that time rose about 34.0 percent. Local telephone service increased from 98.3 in 1983 to 153.6 in 1991, an increase of 56.2 percent. During the same period, interstate toll service fell from 101.3 to 67.5, a decline of 33.8 percent. ~~(The greatest gains for consumers have been in long-distance, which is not surprising, given its earlier above-cost pricing.)~~

Reversing the trend, between 1991–94 the CPI rose 10%, local rates were flat (+2%), while toll rates rose 12%.

In absolute terms, the nationwide average for local monthly residential rates for unlimited local calling increased from $11.58 in 1983 to $17.78 in 1990, a change of $6.20, or 53.5 percent, over seven years. When the lowest available rates are considered (not including lifeline low-income assistance

rates), monthly rates rose $4.42 in the same period, from $5.93 to $10.35, a rise of 74.5 percent.[10]

If, however, we examine trends in real consumer price indices over a longer period (1964-89), it is clear that costs had been declining through most of that period and thus were not purely a function of liberalization. Between 1977 and 1983, the index for residential telephone services declined at an average rate of 3.7 percent, whereas after divestiture, from 1983 through 1989, it declined at only 0.9 percent. The index for local service, which had a negative 2.5 percent average annual percent change from 1977 through 1983, reversed itself and began to climb at an annual rate of 3.1 percent through 1989. The index for intrastate tolls continued to decline, although slightly more slowly (-5.6 percent compared to -4.2 percent), while the CPI for interstate tolls, which had been dropping between 1983 and 1989 at an average annual rate of -5.0 percent, accelerated to -9.8 percent in the years from 1983 to 1989.[11]

Throughout the period 1980-89, an average household's annual expenditures on telephone service as a percentage of its total expenditures remained remarkably constant at 2.0 percent.[12]

EQUITY

The benefits of liberalization and the AT&T divestiture were not shared equally. Among residential subscribers, the extent of benefits enjoyed as a result of telephone repricing was correlated positively with income. Robert Crandall, calculating both the direct and indirect effects of these shifting patterns in telephone prices, concluded that the overall effect has been "mildly regressive."[13] By assigning values to the indirect benefits when business users enjoy lower telecommunications costs, he finds that the lowest-income households paid approximately $16.00 more per year due to telephone service repricing, while the wealthiest saved close to $15.00 per year.

SERVICE QUALITY AND RELIABILITY

Another projected impact of competition was a decline in service quality. The FCC's measures for national quality trends show that dial-tone delay has been kept reasonably constant; that technical transmission quality has generally risen; that the on-time service performance for residential orders has suffered a steady if minor decay since 1987; and that regional ("intra-LATA") calls have maintained an admirably high level of call completions (over 99.5 percent), while inter-LATA completion rates have climbed steadily since 1986.[14] As for customer satisfaction, large businesses seem to have benefited the most, with 93.5 percent of these customers reporting satisfaction in mid-1989, up from 91.5 percent in 1985. During the same period, customer satisfaction among

small businesses rose from 92.3 percent to 93.5 percent, and among residential consumers from 93.5 percent to 94.0 percent.[15]

The above measures of quality address regular, ongoing performance, but the question of reliability in the face of shocks to the system are another issue. Here we find that the vulnerability of the network has grown in recent years. There have been a series of major service outages that have affected millions of users. Furthermore, with most financial and other transactions conducted electronically, society's vulnerability to outages has grown. (For example, when a fire gutted a central office in Hindale, Illinois, it brought down a national florists' network—on Mother's Day.)

PRODUCTIVITY

Productivity measures for the U.S. telecommunications sector throughout the 1980s show steady improvement. For example, labor productivity for the seven Baby Bells, when measured in terms of lines per employee, show a cumulative gain from 1983 to 1988 of 34.9 percent.[16] The number of access lines per telco employee grew from 66.0 telephone employees per 10,000 access lines in 1984 to 44.4 in 1991.[17] At the same time, revenue per employee grew from $115 in 1985 to $144 in 1990, a gain of 25.2 percent. Annual average total factor productivity (TFP) growth between 1971 and 1983 in U.S. telecommunications, using total deflated real revenues for output, was estimated as 3.8 percent. Following divestiture (1984–88), the Bell system's TFP growth slowed to 3.13 percent, while the TFP growth for the total sector grew at 3.94 percent.[18] A Morgan Stanley report measured annual productivity gains among the Regional Bell Operating Companies in terms of annual growth in expense per line, adjusted for inflation. It found an average of 2.4 percent compound annual growth for the Regional Bells in the years 1984-88, and a jump to 4.7 percent productivity growth for 1989.[19]

RESEARCH AND DEVELOPMENT

Liberalization also raised the specter of a technological decline, based on fears that AT&T's research arm, Bell Labs, might be curtailed by profit-minded corporate management. In fact, the opposite has occurred. Total research and development (R&D) employment rose from 24,100 in 1981 to 33,500 in 1985 (for AT&T and the Regional Bells' joint R&D firm, Bellcore, combined).[20] By 1988, the regional companies were adding their own laboratories, and total R&D employment rose to an estimated 35,600. According to a 1991 *BusinessWeek* survey, the telecommunications industry's average R&D spending per employee for the years 1986-90 ($9,858), or when figured as a percentage of 1990 sales (3.6 percent), outpaced the all-industry figures in those categories ($7,053 and 3.4 percent, respectively). Bell Lab's R&D budget increased from $2 billion to $2.7 billion, of which about 10 percent went to basic research.[21]

LONG-DISTANCE COMPETITION

Between 1984 and 1991, AT&T's long-distance rates were reduced about 45 percent in real terms.[22] AT&T's share of inter-LATA long-distance service (all minutes) dropped from 84.2 percent in late 1984 to 62.9 percent by 1990.[23] As a percentage of all users, however, AT&T's share is higher because it has more small subscribers. If short-haul interexchange service is included in the market definition (by including the local exchange companies' regional [intra-LATA] service), AT&T's share is about 60 percent.

Interstate switched access minutes grew from 37.5 billion minutes in 1984 to 79.1 in 1991, a very substantial increase of 111 percent. AT&T's volume increased 57.9 percent, but that of its competitors rose almost 400 percent from their much smaller base. Americans make substantially more telephone calls per capita than users in other countries—for example, 1,700 in 1988, two or three times as many as the British (800), Japanese (550), Germans (500), and French (400).

The number of competitors to AT&T (long-distance service providers with an FCC identification code) increased from 42 in 1982 to 451 in 1987 to 611 in 1990, before subsiding to 597 in 1991.[24] Of these, most are only resellers rather than facilities-based carriers, and many concentrate on business customers. By 1993, MCI, the strongest of AT&T's rivals, had grown to a $12 billion company offering an ever-increasing line of services. (After divestiture, its revenues had grown at an initial rate of 27 percent a year.) Since divestiture, US Sprint has successfully completed the construction of a $3 billion network, and was granted 40 percent of the large contract for the federal network, FTS-2000. Carrier profits looked healthy, and prices increased slightly in 1993, leading to complaints about a long-distance oligopoly.

LOCAL COMPETITION

Local competition for business customers is emerging principally through fiber-optic-based metropolitan area networks (MANs), also known as alternative local telecommunications systems (ALTS) or competitive access providers (CAPs). CAPs' revenues have been growing at a rate of about 22 percent per year. Residential competition in the local loop is likely to emerge from access based on cable television infrastructure, from cellular and microcellular telephony, and from other local telephone companies.

EQUIPMENT PRICES

Rates for telephone equipment declined between 1984 and 1991, by an average of 8.2 percent annually in real terms, whereas between 1972 and 1983, the decline averaged only 2.7 percent annually.[25] In the past, the U.S. market for network equipment had been fairly closed. The vast Bell system and its customers—comprising 80 percent of the total market—were effectively closed

to other suppliers because of the existence of AT&T's manufacturing subsidiary, Western Electric. As a result of the divestiture, the Bell Operating Companies no longer have any incentive to increase AT&T's profits, since none of those profits are returned to Bell. Equipment prices fell as the Bell Operating Companies and end users gained the freedom to shop around. AT&T's national market share for central office switches dropped from 70 percent in 1983 to 51 percent in 1990, with Northern Telecom reaching 40 percent. While comparisons are always difficult, central exchange equipment costs declined from approximately $325 per digital line in 1984, on an industrywide basis, to $244 in 1990, and to less than $100 in 1992, with the steepest declines after 1989.[26]

EQUIPMENT TRADE

Liberalization has led to lower equipment prices; however, it has also meant the loss of market share for U.S. firms. The U.S. trade balance for telecommunications equipment, which had been positive although shrinking in 1981 and 1982, became a $1.15 billion deficit in 1984. By 1989, this had grown to a $2.3 billion deficit. The deficit improved slightly to $2.1 billion in 1991, and official trade statistics suggest a small improvement to $2.0 billion in 1992. Imports increased from $1.6 billion in 1983 to $4.7 billion in 1991, while exports grew markedly from $0.8 billion to over $3.3 billion, a fourfold increase.[27] The amount of foreign equipment imported, particularly from Asian suppliers, continued to be a dominant factor in this equation; in 1992, 52 percent of total telecommunications imports were from Asian suppliers, with Japan accounting for about a third.[28] With the trade deficit in communications equipment, liberalization has created an unanticipated problem that may become a major political issue for U.S. policymakers.

EMPLOYMENT

The number of employees at AT&T and its successor companies fell as a result of liberalization. By 1990, AT&T had reduced its workforce by 90,000 jobs, 25,000 of which were eliminated in 1989 alone, from a predivestiture total of about 370,000. The Regional Holding Companies fell from 583,332 employees at divestiture to 542,170 by 1991, a loss of 41,162 jobs, or about 7 percent. The most dramatic Regional Holding Company cuts were made in 1984 and 1985 (2.8 percent and 3.1 percent, respectively). In 1990 and 1991, Regional Holding Company cutbacks continued,[29] and the trend toward a shrinking workforce is likely to persist.

Many of these employment losses have been in manufacturing and are part of a more general decline of U.S.-based electronics manufacturing. But if equipment is defined more broadly to include computers, "smart" office equipment, and so on, the number of jobs has increased as the total pie becomes larger. Many of these new jobs, however, are in the area of marketing

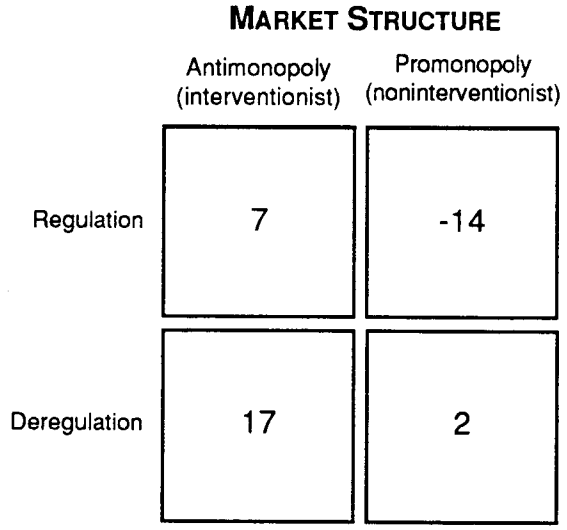
and similar nonmanufacturing activities, and are often not unionized. Thus, traditional telecommunications job categories, as well as labor unions, suffered as a result of liberalization.

How can the predictive record of the four categories introduced in Figure 1 regarding the impact of deregulation and market structure policies be assessed? One way is to assign "box scores" to the quality of predictions of the four categories for the eleven dimensions just discussed and aggregate these dimensions into an overall score of prediction. To do so, the following rather simplistic assumption must be made: first, the predictions are ranked from +2 (substantially correct) to -2 (substantially incorrect); second, each dimension has been given equal weight. This results in the summary score given in Figure 2 below.

As Figure 2 shows, the predictions of those holding a promonopoly, noninterventionist position were basically incorrect. The lost benefits of the monopoly seem to have been small. And the extent of lowered barriers of entry due to AT&T's restructuring was larger than predicted by those pure free-market advocates that expected eventual entry. While they might be right in the long term, the divestiture gave entry a jump start.

Along the regulation-deregulation axis, deregulators were more often correct in their predictions than the regulators. However, the latter were also correct in a number of instances, such as service quality or the protection of the safety net. Their alarm often led to policies, such as lifeline service for the poor, which provided some of the safeguards that made deregulation successful.

FIGURE 2
SUMMARY OF PREDICTION QUALITY



LIBERALIZATION IN OTHER COUNTRIES

While much of the developed world embraced liberalization in the 1980s, such change had its limits. A monopoly in infrastructure still exists almost everywhere in both the developed and developing world. Only the United States, Japan, the United Kingdom, Sweden, and New Zealand permit alternative domestic fixed infrastructure of any consequence. In almost every other country, the monopoly in voice service remains strong, and even resale is rarely available.

Often, the extent to which monopoly has been reduced tends to be exaggerated. An official Danish political agreement on liberalization illustrates the doublespeak: "There will be competition within all spheres of telecommunications in the next few years, apart from telex, ordinary telephony, radio-based mobile services, satellite services, the infrastructure and the use of the telecommunications network for broadcasting radio and television programmes."[30] Similarly, although the European Union instituted the right in principle to offer value-added services in any member country, the detailed legislation in many countries continues to be restrictive. Similar restrictions are likely to weaken the European Union's directive of opening some of the infrastructure to competition by 1998.

Another check on liberalization is the slow pace of its implementation. After eight years of participation in the U.K. market, Mercury still has less than 3 percent of total market share and its core activity remains serving firms in London's financial center as a secondary source for data transmission capacity and as a carrier of trunk calls for businesses. Mercury's residential service has failed to gain even 1 percent of the national market.[31] Where no entrenched incumbent exists, competition is more fully developed. For example, ~~British Telecom's~~ BT's competitor in the cellular service duopoly, Racal Vodafone, holds over 50 percent of market share.

To secure a head start for their national monopolies, the launch of second cellular carriers in competition with the national PTTs (renamed PTOs or TOs, for [public] telecommunications organizations) has been delayed in Germany, Italy, and Spain. The European Union has likewise suffered numerous delays in its efforts to implement liberalized rules for service provision. Thus, where competition against a monopoly exists, it is often a contest between David and Goliath.[32] In some situations, deregulation has actually strengthened the PTOs because restrictions on them were lifted at a time when competition remained embryonic.

For the most part, PTOs have not been divided up. Several countries, such as Denmark, Italy, and Portugal, have even increased barriers to competition by consolidating carriers.

In the equipment market, the liberalization of procurement sources also enhanced the power of the monopoly PTOs. By opening the public procurement process to additional vendors, PTOs are less tied to the technology developed by national champion equipment firms and thus are in a better bargaining position to obtain favorable contract terms and dictate technical specifications.

Only in the liberalization of terminal equipment have powers of PTOs been reduced, but such liberalization was largely an accommodation to reality. This market had already effectively liberalized itself, as numerous consumers—simply but illegally—bought cheaper and more varied equipment outside the official PTO distribution networks.

Where liberalization has taken place, what has been the impact of changes in ownership and control? Here, too, reforms have increased the power of the PTOs. Corporatization substituted managerial and financial autonomy for direct governmental control of PTOs' operations and the political accountability that came with it. At the same time, the government ministries that assumed regulatory power have tended to be ineffective. These ministries have only a handful of experts with which to confront the huge telephone organizations. In Sweden, for example, after liberalization, Televerket had forty-two thousand employees, while the ministry charged with regulating it had a telecom staff of only six, most of whom perished in a single plane crash in 1989.

Privatization, too, has strengthened the PTOs. The existence of shareholders to whom the PTO must answer has added new incentives for improved performance that were largely absent in the past. Privatization also curbed some efforts at market liberalization by creating a large constituency of shareholders who oppose sweeping reforms. In the past, this was the case only with AT&T; now it is also true for Spain's Telefonica and ~~British Telecom.~~ Britain's BT. Similarly, the remaining shares of Japan's NTT have not been sold by the government in order to avoid depressing the share price and hurting millions of investors.

The international strategies of PTOs, such as the pursuit of transnationalization and building of alliances, have further strengthened their position. Several of the PTOs are becoming far-reaching global organizations, involved in numerous activities that cease to be transparent to governments. Competitors assert that these activities often are supported by the monopoly profits from basic service. At the same time, many PTOs have also formed alliances among themselves, often as a market-sharing arrangement.

Such cooperation is also found among governments in harmonization of their policies, contributing to a continuation of the traditional stability of the telecommunications sphere. While harmonization may eliminate restrictive national rules, it is just as likely to be used to prevent competitive behavior by establishing a policy cartel.

Thus, the modest liberalization that has taken place in most countries has not harmed the traditional telecommunications organizations; indeed, it has even worked to the benefit of many of them. PTOs have been energized and modernized by the recent changes, but continue to enjoy a dominant position in the market. Their competitors are still tiny, their regulatory authorities are frequently underperforming, and their role has been enhanced by national industrial policies. (This is not to say that some users and competitors have not also benefited. Telecommunications is a growth field rather than a zero-sum game.)[33]

But, given the dynamic forces of a liberalized telecommunications market, it is unlikely that the present dominance of the national near-monopolies will last. In time, PTO market share will decline as competitors grow in size and gain interconnection rights; presently unprepared regulators will become more effective; the PTO's national role in industrial development policies will be shared with other firms; and PTO cartel collaboration will evolve into more head-to-head competition, sometimes prodded by antimonopoly agencies. New domestic entrants, including cellular companies, cable television providers, and value-added networks, will seek opportunities in specialized and general markets, as will foreign entrants, some of them PTOs themselves. Liberalization at home will become critical to PTOs seeking reciprocal market access abroad.

The concept of the single territorially defined carrier for an entire country's electronic information flows is not sustainable in the long run. The strategies followed in the 1980s and 1990s have set forces in motion that will assert themselves over time. What we are witnessing today in these nations is the golden age of the traditional telecommunications organizations, but it will not last, as it did not in the United States or in Japan.

THE FUTURE OF LIBERALIZATION: THE SHAPE OF THE NEW MARKET STRUCTURE

What will be the forces of change in the coming decade? The conventional scenario for the evolution of telecommunications, offered by traditional state monopoly carriers around the world as their vision of the future, was the *integrated single superpipe* that would merge all communications links into a single conduit that they controlled and that was interconnected internationally with similar territorially exclusive superpipes. This scenario of technological integration did not take into account ongoing liberalization, which was accompanied by considerable organizational centrifugalism. Instead of consolidating, the network environment is growing ever more diversified.

The various physical network elements are being linked with one another through various interconnection arrangements, forming what can be described as a "network of networks." Yet this is not the end of the story. Competition begets diversity; diversity begets complexity; and complexity leads to efforts at simplification. In order for the user of telecommunications to handle this fragmented environment—so at odds with the technologists' model of the single superpipe—the numerous network pieces must be integrated into a usable whole. There are several ways to do this, but the most promising relies on the emergence of a new category of "systems integrators," which provide the end user (whether corporate, governmental, or otherwise) with access to a variety of services in one place.

Systems integrators assemble packages of various types of services and equipment and customize these packages to the specific requirements of their customers. The characteristics of "pure" systems integrators—for there will be

various hybrids—is that they do not own or operate the various subproduction activities; rather, they select optimal elements in terms of price and performance, package them together, manage the bundles, and offer them to customers on a one-stop basis. This relieves customers of the responsibility of integration, which requires a great deal of expertise.

Today, systems integrators exist only for large customers and customer groups. The next step is for systems integrators to emerge that assemble individualized networks for personal use and offer them directly to end users. One can envision a future of individually tailored "virtual" network arrangements that serve individualized communications needs, providing access to frequent personal and business contacts, data sources, transaction programs, video and audio publishers, data processing and storage, bulletin boards, and personal information screening. As these networks develop, they will access and interconnect with one another and form a complex, interconnected whole that sprawls across carriers, service providers, and national frontiers. The telecommunications environment will evolve from the "network of networks," in which carriers interconnect, to a "system of systems," in which systems integrators link up with one another.[34]

In such an environment, the structure of telecommunications, as far as end users are concerned, will change significantly. Instead of dealing with *carriers*, users will transact with *systems integrators*. In this world, what will happen to traditional regulation? How will consumer protection and universal service be affected? What regulatory safeguards will be necessary?

In telecommunications, government regulation existed in part to affect the balance of power between huge monopoly suppliers on the one hand and small and technically ignorant users on the other hand. Regulation relied on the political and administrative process to alter unconstrained market outcomes that might negatively affect consumers and competitors. In return, the dominant carriers received protection from competition. Even where competition emerged in the form of rival carriers, customers still had no expertise in dealing with a complex set of services and products.

In a system of systems, however, this balance will change dramatically. Systems integrators, competing with one another for customers, will act as users' agents vis-a-vis carriers. They can protect users against carriers' underperformance and power, and secure for them the best deal available. The emergence of systems integrators should resolve many of the problems of price, quality, market power, security, even privacy, that have traditionally plagued the telecommunications field. Business communications will become more effective than ever. Technological innovation is likely to be accelerated by knowledgeable buyers and marketers of services. Assuming (1) that users will have a choice among systems integrators, (2) that systems integrators will have a choice among noncolluding suppliers of underlying services, and (3) that market power by carriers and systems integrators is checked by competition, the need for government intervention can be expected to decline substantially.

On the other hand, not all traditional policy goals will be fully resolved in a system of systems. Special attention must be paid to the following:

1. *Universal service.* The emerging systems of systems will exert competitive pressures on cost and therefore on many prices, making telecommunications more affordable. But it will be impossible to maintain the traditional redistributive system of generating subsidies and transferring them internally within the same carrier from one category of users to another. Several factors will disrupt this arrangement. In a network of competing carriers, internal redistribution from some customers to other customers is not sustainable once other carriers target those profit-generating users. Furthermore, residential users may end up paying a proportionally higher share than large users because cost shares may end up allocated to an economic "Ramsey" pricing rule, inverse to demand elasticity. Large users have more options and hence greater elasticity and would therefore pay less than residential customers. Thus, the trend that at present is described as a "rebalancing" of prices toward cost would go much further than that, burdening the more inelastic customers. Nor can one expect to continue to rely on a system of access charges to provide the source of subsidies, since these charges imply access into "the network." Access to the network will be a meaningless concept once alternative transmission is easily available.

Yet these changes need not spell the end of support schemes. If policymakers choose to support some categories of users, such as rural Americans or the poor, either for reasons of social and regional policy or for the benefits their participation offers to others who can reach them, it is still possible to do so; only it must be done in different ways from what is done now.[35] One alternative is to eliminate the present invisible tax system and replace it with a visible charge system, drawing on general government revenue or specialized communications charges, such as communications sales tax or value-added fees. The funds raised could go to a "universal service fund" that would be used to support certain network providers, as well as categories of users, providing them with a choice among carriers. This charge would replace the present opaque system, making it transparent and accountable. It would also decouple discussions of optimal industry structure from those addressing optimal social policy.

The advantage of systems integrators is that they pay competing carriers a price based only on the latter's short-term marginal costs and can pass this low cost on to their customers. Yet a significant part of cost in a capital-intensive industry such as telecommunications networks is fixed and would not be adequately compensated under such an arrangement. The long-term result might be either a gradual disinvestment in networks or the reestablishment of monopoly, price cartels, and oligopolistic pricing. None of these scenarios would be desirable; all of them will prove to be a challenge to future regulators.

2. *The free flow of information.* In the traditional network environment, the granting of access, nondiscrimination, and content neutrality is required of the

public networks by common carriage regulation and by law. The institution of common carriage, historically the foundation of how telecommunications are delivered, will not survive in a system of systems. "Common carriers"—that is, telephone companies—will continue to exist, but the status under which they operate—offering service on a nondiscriminatory basis, neutral as to use and user—will not.[36]

The blows to traditional common carriage do not come from rival telecommunications carriers such as MCI, but from two new directions. The first is the increasing overlap between the common-carrier system and well-developed mass media, private contract carriers. The most important of these are cable television networks, which in a remarkably short period have wired the nation with a second and powerful network system, and which are on the verge of entering point-to-point, switched, and mobile telecommunications services. The other challenge to common carriage are systems integrators. Common carriage requirements providing for the free flow of information do not apply to systems integrators. Systems integrators will be able to institute restrictions on their systems and exclude certain types of information, subjects, speakers, or destinations.

In head-to-head competition between a common carrier and a private contract carrier or systems integrator, the former is at a disadvantage:

- A common carrier cannot use differentiated pricing due to its nondiscrimination obligation and because it cannot prevent arbitrage. Common carriers' rivals can offer services to some customers at a low enough price to induce them to sign up, and can use this contribution to their revenues to underprice a common carrier for low-elasticity customers.

- A common carrier must serve a contract carrier or systems integrator, but not vice versa. There is no reciprocity; competitors can use valuable parts of a common carriers' operations, but need not share their own unique features.

- A common carrier cannot choose its customers.

- A common carrier cannot manage the competition among its customers and benefit from it.

- In assembling a service package, the systems integrator can pick and choose among the lowest-price component providers, while the common carrier is likely to offer only its own.

- Competition for transmission and other services will lower their price for systems integrators to marginal cost, which is likely to be lower

than the average cost for both common and contract carriers of providing it.

As a result of these factors, a systems integrator may be able to provide services more cheaply than a common carrier, even though the systems integrator is using the carriers' underlying transmission facilities.

It is unlikely that the common carriers will simply tolerate such a situation. They will operate their own systems integrators and move to contract carriage themselves, including price differentiation of customers. And that is, indeed, what is starting to happen. If it continues, the "de-averaging" of prices will become standard and negotiated rates will spread to many noncommodity services.

What are the implications? The system of systems may have the capacity for a large number of voices, yet it may result in a narrower spectrum of information because systems integrators and carriers may not want to be identified with certain types of uses and users. The need for the various systems to have access to one another, and for information to travel over numerous interconnected carriers, means that the restrictiveness of any one of the participants would require everyone else to institute content and usage tests before they can hand over or accept traffic—alternatively, they could agree to the most restrictive principles. Information travels across numerous subnetworks until it reaches its destination, and nobody can tell one bit from another bit. If each of these networks and systems integrators sets its own rules about which information can be carried and which cannot, information will not flow easily. Common carriage can be substituted for by an alternative system—such as third-party-neutral interconnection—but this, too, is not self-enforcing.[37]

3. *Interconnection and compatibility.* The economic reasons for the tension between integrative and pluralistic forces is most pronounced on the front where they intersect: the rules of interconnection of the multiple hardware and software subnetworks and their access into the integrated whole. As various discrete networks grow, they must interoperate in terms of technical standards, protocols, and boundaries. Yet interconnectivity is not normally granted by incumbent firms. That is the lesson of decades of experience in the United States. Regulatory requirements of the late 1980s and early 1990s, such as open network architecture, comparably efficient interconnection, or collocation were part of the evolution toward competition. In effect, these provisions regulated in order to deregulate.[38]

4. *International asymmetry.* The system of systems works as long as it is competitive in each of its stages, or as long as regulation establishes nondiscrimination. However, in an international setting, neither of these conditions is likely to be met. Most countries lag behind the United States and Japan in the evolution of their networks. The traditional monopoly carrier is still

almost always firmly entrenched and active in all stages of communications. As a result, systems integrators cannot truly compete against these PTOs in terms of systems integration. This might be considered an internal issue for these countries, except that it has an anticompetitive impact globally. This is because some of these PTOs are aggressively pursuing international systems integration themselves, while at the same time holding gatekeeper powers over entry into their own home markets. For example, the PTO of an important European country could restrict the effectiveness of a U.S. systems integrator to offer global services, while at the same time entering the more liberalized environment in the United States.

Of course, other countries' PTOs can play the same game, and, as a result, a new trend of international carrier collaboration has emerged in which major PTOs enter into joint ventures of systems integration. Potentially at least, these alliances of dominant national carriers could create international cartels and barriers to competitive entry of other systems integrators, whether in their home countries or internationally. This has the anticompetitive potential of "whip sawing" in which a one-sided liberalization across frontiers permits the remaining monopolist to appropriate fully the previously shared monopoly profits. To prevent this, it is essential to reach international nondiscriminatory access, lease, and interconnection arrangements that are neutral as to the nature or the nationality of the systems integrator. The United States, being the largest and most interesting market for systems integrators, can exercise leadership in pressing for such reciprocity.

POLICY IMPLICATIONS

The preceding analysis leads to the conclusion that liberalization will not be the "end of history" as far as telecommunications regulation is concerned and that government is not likely to disappear from this arena. In the 1980s, telecommunications policy was centered on liberalizing entry. This was correct, then and now. The empirical evidence provided above demonstrates the generally positive trends in telecommunications during the phase of liberalization. But in the 1990s, second-generation liberalization and issues involving the integration of the various partial networks and services will be at the forefront. Liberalization leads to network pluralism, which in turn generates the incentives for systems integration. Systems integration resolves many of the traditional regulatory issues of traditional telecommunications market structure. But it leaves others unresolved, and it creates new ones. Thus, a new set of regulatory questions may be upon us, many of them requiring new approaches.

Although some of the developments anticipated in this article are already under way, none will take place over night. But this should not lead us to ignore them. The present policy efforts in Washington and Brussels still deal largely with liberalization. The Markey-Fields and Brooks-Dingell legislative initiatives in the House and their counterparts by Senators ~~Hollings~~ and ~~his colleagues~~ are Pressler Hollings

efforts at dismantling some barriers to entry and competition. As useful as these changes are, the main issues for the future still need to be tackled. The FCC's (and the New York Public Service Commission's) open network rules were one such effort. The White House's "Title VII" proposal for switched digital broadband services is another. But this is only the beginning. Technical convergence leads to business and global overlap, and both require legal integration.

Liberalizing telecommunications competition will prove to have been the easy part. Developing the tools to deal with its consequences, while protecting traditional policy goals in the new environment, will be the next and more difficult challenge. To paraphrase Thomas Jefferson, "The price of liberalization is eternal vigilance."

CHAPTER 1

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