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The Politics of Global Competition in the Telecommunications Industry

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Introduction

The international politics connected with competition in the telecommunications industry centers on two main questions: 1) who will benefit from the construction of the next generation of telecommunications infrastructure—a task which will involve hundreds of billions of dollars of expenditures—and 2) how will access to foreign markets for telecommunications services providers be regulated? These two questions are connected with one another in that efforts to shelter domestic equipment manufacturers from international competition may shift the competitive opportunities away from the building of infrastructure and toward services provision. One important lesson to learn from the case of the telecommunications industry, therefore, is that there is complementarity between manufacturing and services activities and that those firms which focus on one or the other exclusively will lose out to those capable of working on both sides of the fence. This has direct implications for the global rivalry between the world's two largest firms in information technology: IBM and AT&T.

One cannot consider competition in telecommunications in isolation from the broader competition in information technology. Because telecommunications equipment producers are major purchasers of microelectronic components, one cannot promote a domestic component industry without having a clear policy toward telecom equipment. This turns out to be a crucial element, for example, in West German telecommunications policies. Because telecommunications services depend very heavily on software inputs, promotion of services will necessarily involve promotion of the software industry.

There are very important linkages between the telecommunications industry and its technology and national security policies, as well. National security agencies want to maintain the capability of listening in on conversations involving foreign nationals (and sometimes citizens when these are engaged in actions hostile to the state). Thus, they will try to influence telecommunications equipment producers and services providers to avoid practices which interfere with such a capability.

Given this *caveat*, it is still possible to proceed with a narrower focus on the politics of competition in telecommunications. The linkages with other information technology industries and with national security policies will be flagged as they arise below.

Changes in Telecommunications Technology

The telecommunications equipment and services industry are economically dynamic, thanks to major innovations in technology and increased demand for services on the part

Phase II of the telecommunications infrastructure were the invention of digital switches and the growing use of satellites and fiber optic cables for transmission. Phase II infrastructure requires extensive "digitization" of the signals carried by the system. Telephone signals had to be converted to digital information before they could be passed through digital switching systems and the new transmission media. The cost of doing this was quickly outweighed by the benefits for high-volume users of being able to transmit digital information on the same telecommunications lines as voice telephone information. In addition, the digital switching systems made it possible to use a single wire (or strand in a multi-wire cable) to send more than one voice signal. Digitized voice information could be squeezed electronically and/or packaged in bunches of data bits (called "packets") so that a given wire or circuit could be used to send much more information than previously. Indeed, the digital switches that were the most successful in the market were packet switches, capable of routing, combining, and separating packetized digital information.

Satellite and fiber optic transmission media made it possible to supplement existing wire and microwave media to provide greater carrying capacity for the infrastructure. In addition, these new media made it possible to send signals of greater "bandwidth"—so that digitized information with a larger number of bits in each data "byte" could be carried through the system. Satellites, coaxial cables, and fiber optic cables, therefore, are able to transmit the more complex video signals most commonly used in TV transmission, as well as the somewhat simpler signals used in telephony, telegraphy, telex, and facsimile transmissions. This new type of transmission is sometimes called "broadband" to distinguish it from the earlier "baseband" transmission.

The transition from Phase I to Phase II infrastructure began in the mid 1970s. The transition to Phase III will not occur until the latter part of this decade or possibly later. A major aspect of the transition to Phase II was the digitization of the telephone networks. This innovation was made earliest in the French system because of an ambitious state-subsidized modernization scheme but was quickly copied elsewhere as the advantages in terms of lower costs and increased functionality became clear to telecommunications providers.

The transition from Phase II to Phase III will be rather expensive, and it is quite likely that incompatible ISDN systems will be adopted in different regions. ISDN offers users the ability to connect terminals or computers to the public network without modems. Besides saving users the expense of purchasing modems, ISDN will allow them, in theory, to avoid purchasing expensive private lines for high-speed data communications. ISDN (Integrated Services Data Networks) will require more extensively digitized networks so as to reduce the information losses that occur in the frequent conversions of analog to digital and digital to analog signals that now occur in public networks. The cost of replacing existing analog circuits and switches with digital circuits and switches will be in the hundreds of billions of dollars over the next two decades. There will be a number of other technical problems in building ISDN systems. One, for example, will be the difficulty of writing software that can connect users via "virtual" circuits as reliably as the switched hardware circuits do now.

The temptation to establish incompatible ISDN systems stems from the desire to shelter domestic telecommunications equipment manufacturers from international competition. There are already as many ISDN standards in Europe as there are countries. We will discuss this issue further later on in this article.

Digitization of the infrastructure and the implementation of microwave transmission systems in the transition from Phase I to Phase II made it possible for a variety of private

had to release patents; moreover, Western Electric could only supply the Bell system and the government.

Liberalization began in the 1950s. The advent of remote data processing created demand for more lines than the Bell switched network could offer. AT&T provided private leased lines, but the large users of data communications were not satisfied and pressed for authorization to set up their own private communications. The development of microwave communications offered a suitable technology, and in its "above 890" decision in 1959 the FCC authorized the use of point-to-point microwave communications for certain frequencies above 890 megaherz. This facilitated intracorporate data communication, and the number of on-line terminals in use grew from 520 in 1956 to 646,000 in 1966 to around 2,000,000 in 1979.[2] AT&T did not give up this market, however, but introduced a competing Telpac service for data communications.

The growth of such data communications showed that there were communications needs not being met by the Bell system. For regulators this raised the question of how one could encourage the development of such services without undermining the ability of AT&T to provide a universal service. The FCC initiated its Computer I inquiry in 1966 to consider such problems. This high-level review of U.S. regulatory policy addressed all the issues that dominated the next twenty years: whether foreign (i.e., not Western Electric) equipment should be connected to the network; whether private lines leased from AT&T should be resold or shared; whether there was a need for new common carriers in addition to AT&T to meet special needs; and what were the inadequacies of the existing system. The most immediate problem, however, was how to distinguish between the private unregulated data processing services and the regulated telecommunications service. This problem was not really resolved by the FCC's fairly artificial distinction between the two markets, which were in fact a continuum.

In its Carterfone decision the FCC decided that AT&T could not block the connection of non-AT&T-supplied terminal equipment that did no harm to the network, and in 1969 MCI (Microwave Communications Inc.) was authorized to provide a full private line service (voices, data, etc.) between St. Louis and Chicago. The limitation to one link reflected the FCC's cautious policy on network and service competition in the early 1970s. Although the FCC's specialized common carrier decision in 1971 allowed other companies to compete in providing specialized services, it was still concerned to maintain a universal service, which meant limiting competition in the provision of basic services. In 1974 the FCC ordered MCI to withdraw a specialized common carrier service for business telecommunications called Execunet because it was in fact competing in the provision of basic services, but the courts later reversed this decision.

The problem of unregulated specialized common carriers migrating toward the regulated basic switch telephone market was resolved by allowing such carriers to compete. The 1976 FCC decision permitting unlimited resale of AT&T's basic network effectively ended AT&T's monopoly, but specialized common carriers reselling AT&T's capacity were made subject to regulation, so that the FCC could still ensure the survival of a universal service. The fact that resale was still subject to regulation raised problems for data processing companies. Could the FCC regulate resale of basic services but not the data processing services provided by data processing companies in their networks? This problem existed because the Computer I distinction between data processing and communications was arbitrary and open to legal challenge.

In its competitive common carrier decision in early 1981 the FCC again solved the

[2] The last figure comes from the statistical appendix to Borrus, *et al.*, 1985.

agency for AT&T products overseas), and 2) *AT&T Communications*, which included the old Long-lines division of the firm and was responsible for all long-distance telephone services. In addition, the RHCs and BOCs were required to provide "equal access" to all long distance carriers to the local networks. This meant that the local companies would have to make it possible for customers to choose a long distance carrier and not discriminate among them, for example, by requiring extra digits to be dialed. This process was supposed to be completed by September of 1986. After that date, it was possible that the RHCs and BOCs would be allowed to enter the markets for telecommunications equipment.

The new system of seven regulated regional holding companies (RHCs) under which the twenty-two Bell local operating companies (BOCs) are grouped is still in flux. These companies will face competition in a variety of telecommunications services markets just as the national AT&T network did, and the FCC will be faced with many of the same

Table 3
The Regional Holding Companies (RHCs) and Local Bell Operating Companies (BOCs)

RHCs	BOCs	Assets	Employees	1984 Revenues
NYNEX		17389	98,955	9506
	New England	5316		
	New York	11596		
Bell Atlantic		16264	80,000	8090
	Pennsylvania	4971		
	C&P, of DC	761		
	Maryland	2340		
	Virginia	2593		
	W. Va.	936		
	Diamond State	371		
	NJ Bell	4513		
Bell South		20808	98,796	9519
	S. Central	9633		
	Southern Bell	11833		
Southwestern Bell		15507	73,000	7191
Ameritech		16257	77,260	8347
	Illinois Bell	5179		
	Indiana Bell	1764		
	Mich. Bell	4361		
	Ohio Bell	3450		
	Wisc. Bell	1714		
US West		15053	73,150	7480
	Mountain Bell	7389		
	NW Bell	4621		
	Pacific NW	3663		
Pacific Telesis (Includes Pacific Tel. and Nevada Bell)		16190	83,309	7824

Sources: Borrus, et al., 1984, p. 71. 1984 Revenues come from Standard and Poor Green Sheets on CompuServe.

Table 4
Telecommunication Services Revenues, 1985, By Nation (in Billions of Dollars)

Country	Main Provider	Revenues	Millions of Circuits	Employees (1000s)
United States	AT&T, BOCs	110.0	87	950
F.R. Germany	Bundespost	13.3	29	200
France	DGT	9.9	22	165
United Kingdom	British Telecom	8.5	24	250
Japan	NTT and KDD	22.0	43	320
Italy	SIP and Italtel	4.6	—	—
Total		167.7	205	1885

Note: European revenue data is for 1980–1 and includes only public revenues. European and Japanese employee data is for 1984.

Source: See above for U.S. and Japanese data; for European data, Arthur D. Little study as cited in Michael Borrus, Francois Bar, Patrick Cogez, Anne Brit Thoresen, Ibrahim Warde, and Aki Yoshikawa, *Telecommunications Development in Comparative Perspective: The New Telecommunications in Europe, Japan and the U.S.* (Berkeley: BRIE, May 1985); Jacques Darmon, *La grand derangement* (Paris: Jean-Claude Lattes, 1985), p. 261.

In addition to the revenues for telecommunications services cited above, most of which refer to traditional telephony and telegraphy (although facsimile and other services may be included), one must also consider the market for data communications. The revenues of independent telephone, satellite and specialized carriers can be found in the following table. These revenues may include payments from AT&T and Bell and to operating companies and thus the total market for telecommunications services may be somewhat smaller than the total of revenues of AT&T, BOC and independent firms. In addition, the table below gives estimates of revenues for data base and time-sharing communications, as well as for packet switched network services. Some proportion of the costs of business time-sharing and of communicating with on-line data bases would appear above in the form of telecommunications revenues for AT&T and the RHCs, but because of the increasing use of independent VANs and other private networks, a large proportion of these revenues would *not* be included.

The total VAN market in Europe was estimated to be 176 million dollars in 1980 in a

Table 5
U.S. Revenues for New Forms of Telecommunication Services, 1984–5 (in $ millions) and Estimates for 1986

Services	1984	1985	1986
Telephone Carriers	7840	8859	9833
Satellite Carriers	1500	1634	1765
Specialized Carriers	287	388	499
Communication Expenditures for Database and Time-Sharing	448	546	585
Business Time-Sharing Costs	5375	5805	6153
Packet Switching Services	375	600	800
Total	15,825	17,832	19,635

Source: Paul R. Strauss, "1986 Market Survey: Most Sectors Strong Despite Slowdown Fears," *Data Communications* (January 1986), pp. 73–4.

Table 6

Long Distance Market Shares (in Millions of Dollars) in the United States, 1984 Actual, 1985–9 Projected

	1984	1984%	1985	1985%	1986	1986%	1989	1989%
AT&T	36244	69.3	38362	66.6	40192	62.8	45240	58.0
MCI	1464	2.8	2707	4.7	4224	6.6	8034	10.3
GTE Sprint	994	1.9	1094	1.9	1792	2.8	4368	5.6
BOCs	8839	16.9	10253	17.8	10816	16.9	13182	16.9
Ind. Local	3295	6.3	3571	6.2	4032	6.3	4992	6.4
Others	1464	2.8	1613	2.8	2432	3.8	2184	2.8
Total	52300		57600		64000		78000	

Source: Janet Guyon, "And Then There Were . . .", Wall Street Journal, February 24, 1986, p. 7d. Original data source is the Gartner Group.

industry were concerned that the effect of U.S. deregulation will be to create strong pressures for demonopolization or at least privatization of telecommunications domestically. They knew that just as AT&T had been forced to cooperate in its own deregulation in order to protect itself against firms that could now legally "interconnect" with the AT&T network if they permitted such interconnection they would soon have a different mandate. Telecommunications users, on the other hand, perceived that lower telecommunications costs and better service might be the result of domestic deregulation and thus began to lobby for this. Firms that had to telecommunicate internationally were particularly concerned that their national telecommunications agencies, if unopposed, might slow the pace of innovation and diffusion of new technology so much that they would be disadvantaged in international competition.

Regulatory Systems and Markets in Other Countries

Given this general statement of the consequences of the shift in the U.S. regulatory regime, it is possible to focus now on the evolving markets and regulatory regimes in specific other countries. For the purposes of this study, we have chosen to look most carefully at the following cases: Britain, France, Japan, Germany and Brazil. The British case demonstrates that at least one country has chosen to imitate the United States by fostering competition in basic telecommunications services through a combination of privatization and deregulation. The French and Japanese cases show the possible benefits of maintaining a regulated monopoly in the basic infrastructure while deregulating value added services somewhat. The German case, unfortunately for the Germans, so far illustrates the hazards of sticking obstinately to the use of public monopolies to provide basic and enhanced telecommunications services. The Brazilian case illustrates yet another possibility: the use of telecommunications regulatory regimes as part of a general policy of fostering high technology industries by insulating them from international competition.

The Case of Britain

In 1981, shortly after the election of the Thatcher government, British Telecom (henceforth BT) was separated from the British Post Office with the intention of introducing competition into the markets for telecommunications services and equipment. BT was given five years to convert itself into a private, competitive telecommunications firm. In 1984, the British government sold 50.2 percent of the stock of the firm to private investors for 4.8 billion dollars, in an effort to "privatize" the ownership of the firm. Also in 1981, a new private firm called Mercury was licensed to compete with BT for telecommunications services. Mercury would establish a fiber optic transmission system along the tracks of the British Railways, along with a set of microwave transmission systems to service the larger urban markets. Originally a joint venture of Cable & Wireless (40%), British Petroleum (40%), and Barclays Bank (20%), Mercury is now wholly owned by Cable & Wireless. An office of telecommunications (OFTEL) was established to monitor the process of deregulation and privatization.

Mercury's strategy appears to be one of servicing business markets, taking advantage of its use of digital broadband transmission through the fiber optic and microwave systems. BT, like AT&T in the United States, must use its existing infrastructure, not all of which is digitized much less broadband-capable, to service a mix of business and residential customers. But BT's position with respect to Mercury is not unlike AT&T's

The decision to loan the simplest Minitel terminals to users at no charge was made by Jean Paul Maury, head of videotex development for the DGT. This was probably the single most important reason for the tremendous success of the Minitel/Teletel system.

The French packet-switched network, TRANSPAC, is a subsidiary of the DGT. The collapse of TRANSPAC during the summer of 1985 was due to a surge in the usage of Minitel terminals, and was widely perceived to be the result of DGT mistakes and mismanagement. The DGT opposed the integration of satellite systems into the telecommunications network, and preferred fiber optics for new ground lines. This preserves their power to distribute funds of importance to local communities and local political forces. The broadband capability of satellite transmission may end up threatening DGT's monopoly status with regard to TV transmissions.

The Case of Japan

Prior to 1985, the Japanese telecommunications market was built upon the foundation of regulated monopolies controlled by quasi-autonomous state agencies. All domestic telecommunications services were the province of Nippon Telegraph and Telephone (NTT), and all international telecommunications services were handled by *Kokusai Denshin Denwa* (KDD). Neither NTT nor KDD were authorized to produce telecommunications equipment. Instead they contracted with a small number of diversified electronics firms, most notably with NEC, Hitachi, Fujitsu, and Oki (the so-called *Denden* family). The relations between NTT and these four firms had a great deal to do with the success of the VLSI and related projects in the 1970s in bringing Japanese companies to the technological frontier in semiconductor components. Nevertheless, there was some dissatisfaction with the quality of services made available by NTT and KDD in the 1970s, and especially to the more sophisticated business users.

An intense trade dispute with the United States over the purchase of advanced switching systems and other telecommunications equipment led to the resignation of the President of NTT in 1981 and his replacement by an executive from the business sector, Hisashi Shinto. Mr. Shinto was reportedly given a mandate to increase the level of foreign procurement of telecommunications equipment, but five years later there was little sign of progress on this front. NTT purchased only 14 million dollars worth of equipment from U.S. firms in 1982, 45 million in 1983, and 130 million in 1984 and 1985.[11] In any case, frustration with efforts to change NTT practices from within and by changing its leadership, along with a widely perceived need to respond more effectively to the challenge posed by the deregulation of telecommunications in the United States, led to the passage of Nippon Telephone and Telegraph Law and the Business Communication Law in 1985.

Under the 1985 NTT Law, which went into effect on April 1, 1985, the new NTT will be 100 percent owned by the Japanese government, but up to 49 percent of the equity could be sold gradually to private owners if the Diet approved. No foreigners would be permitted to buy the stock unless they did so through joint ventures with at least 50 percent Japanese ownership. Other firms would be allowed to compete with NTT for basic telecommunications services so long as they were at least 30 percent Japanese owned.

The Business Communication Law established two categories of telecommunications

[11] Report by Martha Harris, p. 5.

According to the Business Communications Law of 1985, two types of VANs may be offered via the Class I services: General and Special. General VANs are mostly unregulated. They include most small VANs established for internal business communications as well as some larger VANs (as long as they do not involve interfirm communications). The legal basis for the regulation of General VANs was established under a law passed in October 1982. This law was buttressed by ministerial ordinances put forward by the MPT before the 1985 Business Communications Law. VANs operated by large computer firms like Fujitsu and IBM Japan were authorized and left relatively unrestricted as long as they confined themselves to intrafirm communications or they did not offer advanced information processing beyond merely store and forward capabilities. Under this regulatory schema, most forms of electronic mail were considered General VANs.

Special VANs, in contrast with General VANs, can offer information processing and can provide communications across firms. They are subject to stricter regulations. For example, they must publish their charges and they must apply to the MPT for licenses. Only eight applications have been made for Special VANs: Intec, Fujitsu, Nippon Information Service, NEC, Hitachi Information Network, Kyodo VAN, Japan ENS, and Oki Net Services. Intec and Kyodo VAN are the only Special VAN operators aiming at both business and residential markets (on the model of CompuServe and the Source); the rest are all aimed at business information service markets. The relatively loose interpretation of General VANs and the fewer regulatory restrictions connected with them has meant that a much larger number of firms have registered their VANs in that category. As of July 4, 1985, fifty companies had registered General VANs with the MPT.[12]

The main point of this brief summary of recent events is to highlight the growing competitiveness of Japanese telecommunications services, particularly in VANs, which may allow U.S. firms to get a place in the market which until now they have been effectively denied by the rigidity of NTT procurement policies. The alliances that seem to be emerging are as follows:

- NTT and IBM (a joint VAN and an attempt to reconcile NTT's DCNA with IBM's SNA)[13]
- Mitsubishi and IBM (a joint VAN offering)
- Intec and GTE/Telenet (use GTE for international gateway)
- Hitachi and Tymnet (international gateway)
- NEC and General Electric/Geisco (access to GE global network)
- Japan ENS and AT&T (access to AT&T networks and international gateways)[14]

Japan, partly because of this rapid deregulation of enhanced telecommunications services, is likely to remain very competitive in international markets for telecommunications equipment and services. Thus, it will be very important for major U.S. competitors to obtain better access to the Japanese domestic market. The general thrust of U.S. communications trade policy has been to focus somewhat too much on sales of telecommunications equipment. The problem with that thrust was that NTT and the MPT were not willing to forego the benefits to Japanese firms from sheltered procurement policies. The

[12] *Nikkan Kogyo Shimbun*, (October 1985), p. 25; Michael Borrus and John Zysman, *The New Media, Telecommunications, and Development: The Choices for the United States and Japan* (Berkeley, CA: Berkeley Roundtable on the International Economy, August 1984).
[13] "IBM Japan,"*New York Times*, (December 19, 1985), p. D4.
[14] "AT&T Enters Japanese VAN Market," *Electronic News*, (July 8, 1985), p. 20.

inclusion of broadband transmissions (so that TV and other video images will be able to be transmitted through the system). Siemens has been especially closely involved in the design and implementation of the *Bundespost's* ISDN system. Siemens is developing an entire line of products from components to mainframe computers and central office switches to take advantage of its experience in setting up the German ISDN.

One major weakness has already appeared in this scenario. Siemens (and therefore the *Bundespost*) is extremely vulnerable to competition from firms that have chosen different technological paths. Siemens has been weak traditionally in distributed processing (like most other large mainframe computer firms). It was late in developing network architectures. Apparently it has nothing to offer customers to match the networks of DEC, IBM, Wang, and others, and is therefore counting heavily on using gateways to other companies' computers to deal with interconnection problems until the ISDN is up and operating. That makes Siemens a major supporter of Open Systems Interconnection (OSI) standards and hence a major opponent of efforts by firms like IBM to make interconnection an expensive option for users. Siemens computers are notorious for being highly incompatible.

But Siemens is also a cash rich firm which has been able to purchase smaller firms when it needs to add new technological capabilities. It has a 20 percent equity holding in American Microelectronic Devices (AMD), one of the leading U.S. semiconductor firms, an 80 percent share in Litronix, and is full owner of Microwave Semiconductor, Databit, and Threshold Technology. Siemens is a coproducer of fiber optics in a joint venture with Corning Glass called Siecor.[17] Siemens also has a major alliance with Fujitsu, including an agreement to market Fujitsu mainframes in Europe.[18]

The *Bundespost* itself has come under increasing criticism for putting roadblocks in the way of German-based businesses wishing to take advantage of new telecommunications technologies. At the low end, the *Bundespost* policy of maintaining a monopoly on the sale of modems and forbidding the sale of computers or terminals with internally mounted modems has angered telecommunications users. The *Bundespost* sells rather primitive modems for double or triple their cost in other countries. At the high end, German laws governing transborder data flows require that a certain percentage of data processing involved in any telecommunications transaction must be performed in Germany. This limits the ability of advanced users to access on-line data bases outside Germany or to take advantage of certain types of sophisticated VAN services. The Germans, therefore, despite their generally favorable stance toward liberalization in domestic and international markets frequently are put in the position of defending monopolization and restrictions on transborder data flows in international negotiations. The irony of this does not escape them, and an increasing number of telecommunications users are beginning to see a need to put an end to this aspect of the German tradition.

Just to make this same point in a somewhat more concrete way, consider the plight of one of our informants who works for the largest German bank, Deutsche Bank. While Deutsche Bank has one of the world's most sophisticated internal computer networks, it is unable to place terminals for accessing international business information services offered by other firms in its German offices. Like all other German users, it has to pay for a modem for each terminal connected to its system (making even internal interconnection much more expensive than it would be for one of its U.S. or Japanese competitors who are free to use PBXs to do the same without modems). Our informant was much happier

[17] "West Germans Drop Optical Fiber Venture," *Electronic News*, (July 16, 1984), p. 38.
[18] "Down to Earth," *The Economist*, (February 4, 1984), p. 8.

For international telecommunications, the Brazilian system uses INTELSAT, GTE/Telenet, and its own cable operator, BRACAN, established in 1973 to link Brazil with Grand Canary Island and PENCAN (a Spanish owned cable carrier firm). There is also a cable connection to St. Thomas in the Caribbean which is the result of a joint venture with AT&T and other firms. Brazil has two public data communications networks, TRANSDATA and SICRAM, which came into service in the early 1980s. The government became involved in promoting packet switching through its establishment in 1978 of the Research and Development Center of TELEBRAS. Just as in the cases of France, Germany and Japan, TELEBRAS has a policy of preferential procurement for equipment: only if Brazilian firms cannot act as suppliers does TELEBRAS turn to foreign suppliers. The Brazilian procurement policy is embodied in Directive No. 622 of the Brazilian Ministry of Communications. Thus, foreign firms wishing to enter the Brazilian market for telecommunications equipment are obliged to form joint ventures with Brazilian partners. Even so, while 90 percent of the purchases of equipment by TELEBRAS involved affiliates of foreign firms in 1978, by 1980 the percentage declined to 41 percent and may have declined still further in later years.[20]

Brazil also has a policy for "informatics" through an agency called the Coordinating Commission for Data Processing Activities (CAPRE), created in 1972 under a Presidential Decree. In 1976 CAPRE was given responsibility to create local technological capabilities in information technology that would reduce Brazil's dependence on imported technology. Import controls and the founding of a state enterprise called COBRA (Computadores Brasileiros) were CAPRE's primary policy instruments along with tariff barriers for peripherals producers and mini- and microcomputer firms. The rapid growth in CAPRE's responsibilities led to the formation of an office under the National Security Council called the Special Secretariat of Informatics (SEI) which was to coordinate all activities in the computer and microelectronics industries. SEI amplified the system favoring domestic firms for both government procurements and in government approval for technology imports. The actions of SEI, CAPRE, and TELEBRAS were widely supported domestically by the Brazilian producers and nationalist political groups. In October 1984, the Brazilian Congress passed legislation excluding foreign firms from producing micro- and minicomputers in Brazil while allowing them to make or sell imported mainframes.[21]

Foreign firms were not entirely excluded by these policies, however. IBM managed to control over 50 percent of the computer park in Brazil as of 1980; Burroughs slightly less than 15 percent. Brazilian firms controlled a little more than 7 percent. Foreign firms are not excluded from offering telecommunications services, especially if these cannot be offered by domestic firms or if they do not challenge the monopoly of EMBRATEL over domestic services. Gateways like GTE/Telenet can operate in Brazil; so can closed user networks like SWIFT (an international financial network) and SITA (the international airline reservation system). But all leased lines and international VANs must be authorized by the government; there is virtually no intellectual property protection for software, and access to foreign data bases is restricted unless needed for national security purposes in order to encourage the development of local data bases.

While there are some pressures for policy reforms in Brazil, mainly from intensive users of telecommunications and subsidiaries of foreign firms (like IBM do Brasil), it

[20] UNCTC, p. 56.
[21] Alan Riding, "Brazil's Protected Computers," *New York Times*, (September 16, 1985), p. 32.

Table 9
International Record Carriers

Name of Firm	Name of Service
RCA	Globecom
ITT	Worldcom
MCI	Western Union International
Teleglobe	Teleglobe (Canada)
TRT	

increased to provide adequate services for international data communications. In 1972, AT&T was authorized to provide its Datel service, which was the international equivalent of the French packet-switched network, TRANSPAC. In 1976 the IRCs were also given more scope to compete.

Real international competition, however, would require cooperation from the PTTs controlling interconnection at the other end of the international link. The European PTTs were not interested in connecting their single monopoly carrier to a whole series of specialized common carriers in the United States. In 1976 the FCC floated the idea of extending competition to international services by authorizing resale on international private leased lines, as it had just done for domestic private lines. As in the national networks, international private leased lines were used for such services as data communications between branches of international companies. The FCC proposal thus represented a direct threat to the European PTTs' monopoly of their half of the international communications market. In response, Italy, in the name of the other European PTTs, indicated that FCC authorization would be met by a shift from flat-rate tariffs to time- or volume-related tariffs, which would ensure the PTTs lost no revenue and substantially increased the costs of such services. Kuwait also threatened disconnection of private lines. For U.S. multinational enterprises, which had long been dependent on private leased lines, the threat of increased costs through usage-sensitive tariffs, or even disconnection, was of great concern. They made their views known to the FCC, which retracted its proposal in 1977.

Two years later, however, the FCC again gave notice of its intention to authorize resale and shared use of private international leased lines. Other countries considered this an FCC attempt at unilaterally changing the international rules of the ITU, which stipulated, in Recommendation D1 of the Consultative Commission on International Telegraphy and Telecommunications (CCITT), that no resale or shared use of international leased lines is permitted. The CCITT rules are not embodied in any treaty obligations but operate instead by consensus. The United States could not therefore introduce new provisions unilaterally. As the chairman of the CCITT put it, Recommendation D1 entitles administrations (PTTs) "to take all appropriate steps. . . . to ensure the provisions governing the lease of international circuits are respected." In other words they could retaliate.[23] While the new and smaller U.S. users of international communications were interested in competition, the large users were again alarmed at the prospect of increased costs through usage-sensitive tariffs. Together with the executive branch, they again prevailed on the FCC not to attempt to liberalize international telecommunications unilaterally.

Satellite communications provide another example of the efforts of U.S. companies

[23] See statement by Robert E. Conn, executive vice president of Western Union International, Appendix B, *International Telecommunications Deregulation Act of 1982*.

Table 10
Largest Telecommunications Firms/Agencies Revenues (Millions of Dollars, Rank Ordered by 1984 Revenues)

Name of Firm	Country	1982	1983	1984
AT&T	USA	65866	70319	33188
NTT	Japan	17507	19166	20472
ITT Corporation	USA/Europe	21201	20249	19553
Matsushita	Japan	14583	15937	19350
Hitachi	Japan	15190	16230	17470
Siemens	Germany	13586	13335	15500
N.V. Philips	Netherlands	12148	12993	15019
GTE	USA	12066	12944	14547
Deutsche Bundespost	Germany	—	—	13300
Toshiba Corporation	Japan	9376	9604	10828
DGT	France	—	—	9900
NYNEX	USA	—	—	9507
BellSouth Corp.	USA	—	—	9519
British Telecom	UK	—	—	8500
Ameritech	USA	—	—	8347
Bell Atlantic	USA	—	—	8090
Pacific Telesis	USA	—	—	7824
U S West, Inc.	USA	—	—	7280
Southwestern Bell	USA	—	—	7191
NEC Corporation	Japan	5000	5800	7100
GEC	UK	5196	5696	5925
Motorola	USA	3786	4328	5534
Hughes Aircraft Co.	USA	4386	4938	4925
North American Philips	USA	3168	3800	4325
Thorn-EMI	UK	3021	3368	3498
Thomson-CSF	France	4041	3831	3296
Ericsson Telephone Co.	Sweden	2163	2805	3264
Northern Telecom	Canada	2216	2411	3196
Harris Corporation	USA	1646	1809	1996
MCI Communications	USA	506	1073	1959
Ford Aerospace	USA	1418	1496	1691
Plessey	UK	1221	1338	1553
Racal Electronics	UK	798	947	1011
KDD	Japan	707	829	—
Mitsubishi Electric Corp.	Japan	330	470	876
M/A-Com	USA	588	637	768
TIE/Communications, Inc.	USA	—	—	501

Source: Electronic News, Section Two, August 19, 1985; 1982–3 figures for NNT and KDD are from Report on Present State of Communications in Japan Fiscal 1984 (Tokyo: Japan Times, 1984), p. 8; 1984 figure for NTT is from Nikei Sangyo Shimbun, (September 3, 1985); figures for RHCs are from Standard and Poor Green. Pages accessed through CompuServe, February 1986.

Table 12
Major CO Switch Firms and Switches Under Development

Firm Name	Switch Name	Allied/Partner Firms
N. America		
AT&T	5ESS	Philips, Alcatel
GTE	5EAX	Italtel
Northern Telecom	DMS10-300	Mercury (UK)
Digital Switch	DEX-400/600	
DSC/Motorola	EMX2500(cellular)	
Europe		
ITT	System 12	
Siemens	EWSD	Fujitsu
Ericsson	AXE10	Thorn-EMI
Alcatel-Thomson	E10	AT&T
British Telecom	System X	Plessey, STC
Italtel/Telettra	UT10/3	
Japan		
NEC	NEAX61	
Fujitsu	Fetex150	
Hitachi	HDX-10	

Sources: Michael Borrus, Francois Bar, and Ibrahim Warde, with James Millstein and Patrick Cogez, The Impacts of Divestiture and Deregulation: Infrastructural Changes, Manufacturing Transition, and Competition in the U.S. Telecommunications Industries (Berkeley, CA: BRIE, September 1984); Interviews with Robert Taylor, European Research Associates, Brussels, October 1985.

International Policy Issues

The international telecommunications industry is very large in terms of revenues and employees. It has undergone a series of transitions connected with technological changes in transmission techniques, switching, and digitization of networks. The future of telecommunications technology is likely to be ISDN (Integrated Services Data Networks), but each major industrial country is likely to want to implement a different variety of ISDN, thus reducing somewhat its attractiveness as a tool for international communications.

While international trade in telecommunications services is still fairly limited, even a small percentage of the very large global revenues of telecommunications services can be an important source of trade revenues. In any case, certain types of new services, notably VANs, are likely to be more tradeable than traditional services, especially if major trading nations continue the current trend toward liberalizing their internal markets for value-added telecommunication services. The very strong interdependence between the health of telecommunications services and equipment manufacturing suggests that efforts to reinforce the existing trends toward liberalization of trade and investment flows will be very much in the U.S. national interest. As in data processing, information services, and software, U.S. firms are relatively well positioned to compete in international markets for telecommunications services.

Public policy makers in the United States appear to be quite concerned and confused

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