

COMMUNICATIONS
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ECONOMIC DEVELOPMENTS IN INTERNATIONAL
TELECOMMUNICATIONS SERVICE AND
PRODUCT MARKETS

October 12, 1989

Seminar Notes

**MASSACHUSETTS INSTITUTE OF TECHNOLOGY
COMMUNICATIONS FORUM**

**ECONOMIC DEVELOPMENTS IN INTERNATIONAL
TELECOMMUNICATIONS SERVICE AND
PRODUCT MARKETS**

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Evan Kwerel, Federal Communications Commission

Jerry Hausman, M.I.T. (session moderator)

Antonio J. Botelho, M.I.T., Rapporteur

This session of MIT's Communication forum dealt with recent developments in international telecommunications services and products and their impact on the competitiveness of the U.S. telecommunications industry.

Professor Jerry Hausman, Economics Department, M.I.T., opened the session by introducing Evan Kwerel, Office of Plans and Policy, Federal Communications Commission (FCC). Kwerel's talk on Economic Developments in International Telecommunications Service Markets was focused on how foreign telecommunications authorities have a hold on their national markets.

For Kwerel the U.S. has been pursuing a policy of promoting competition in the provision of international telecommunications facilities and services. However its benefits to the U.S. will depend on large part on the telecommunications policies of foreign governments. Kwerel elaborated that if foreign governments choose to act as monopolists in controlling access, competitions among U.S. firms may do no more than shift profits abroad. Here, he suggested a parallel with the domestic telecommunications policy concluding that the crucial point is that the U.S. government has no jurisdiction over the end of the wire and there are two ends to the wire in telecommunications. Pursuing the previous point, Kwerel expressed his concern about when the FCC started pursuing its pro-competitive policy, fearing that it could adversely affect U.S. interests. For foreign monopolies could still control one key element, access on the other side. Yet, Kwerel believes a dramatic liberalization in telecommunications policy is occurring worldwide.

Kwerel then gave a background to these developments. He first talked about distribution of international telephone calling. Referring to Exhibit 1, Kwerel remarked that Canada and Mexico are big part of the market, constituting about 34 percent of the total minutes. The United Kingdom also has a large share of the market. One anomaly, he pointed out, is that Colombia is relatively big. He reasoned that from what he knows this was related to the drug trade. Next, Kwerel compared ATT's revenues for domestic and international services pointing out that: 1- international services constitute about 14 percent of ATT's revenues, and 2- revenues per minute are higher to other foreign countries than Canada and Mexico. He stated that the reason it is so high has to do with the cost of access.

He moved on to look at the U.S. international telephone and telex traffic and prices. Referring to Exhibit 2, he first noted that international telephone traffic is growing very rapidly, about 24 percent per year, versus 10 percent for domestic growth. The second point he made was that international telephone prices from the U.S. have been declining steadily, about over 5 percent per year. The last point he raised was that telex is basically losing out, being put out by facsimiles, but its growth is slowing down and it is becoming a falling share of the market. In relation to international digital private-line Kwerel said that it is growing very rapidly, but that the share of Intelsat's all digital International Business Service (IBS), represented in 1988 a small share of Intelsat's revenue. Kwerel's final point, referring to Exhibit 3, stressed the dramatic fall in cost per international voice

path. According to AT&T international facilities costs account for about 10 percent of revenues prior to fiber optics but with fiber optics this share has fallen to about 5 percent. Kwerel thus concluded that international links are not really important in relation to the total price of international service.

Turning to competition among international facilities Kwerel said that in 1988 the FCC ended its policy of allocating traffic between cable and satellite facilities. He reminded the audience that the FCC policy began in 1966, after the formation of COMSAT and later INTELSAT, and was intended to foster the development of a worldwide international satellite system. In anticipation of the elimination of the FCC circuit distribution guidelines, he continued, AT&T and COMSAT negotiated a long term contract. The contract resulted in significant price reductions for AT&T.

In the area of private international satellite systems, some people have seen them as the way to break the PTTs monopoly. To Kwerel things are not really going in that direction because the PTT controls the terms of access, and often owns the dishes. Moreover, there are lots of restrictions on private satellites. Furthermore, in order to satisfy U.S. treaty obligations to the INTELSAT system, the U.S. administration policy restricted international satellite systems (White Paper, February 8, 1985). The most binding restriction, he commented, was that private satellite systems cannot interconnect with public-switched message networks. Less important restrictions are that services must be provided through sale or long-term lease of capacity and that private satellite systems cannot be authorized by the FCC until they have completed their negotiations with INTELSAT under Article XIV(d) of the INTELSAT agreement to "ensure technical compatibility and to avoid significant economic harm." Kwerel concluded that in spite of all the barriers, there is already one satellite in service, the Pan-Am Sat. It services U.S. to Europe and U.S. to South and Central America. He also mentioned that a second private satellite system is pending final FCC authorization. These two satellites together could probably carry all of INTELSAT's North Atlantic traffic. INTELSAT, found there would be significant economic harm but allowed it to go in place.

Next, Kwerel briefly talked about private international cables, which he believes will remain more important than private satellites in the near future because they do not face any service restrictions. He pointed out that the main difference is that private cables do not require FCC approval to construct. Moreover there are no limitations on interconnection with switched public network and they can provide common carrier service subject to FCC Section 214 approval, the same approval required for common carrier cables. He noted that there are currently two private cables, one PTAT-1 which will be going in service in October 1989 linking the U.S. to the United Kingdom, Ireland and Bermuda. The PTAT-1 has a very large capacity, slightly more than TAT-9, and that AT&T has acquired capacity on PTAT-1. The other one, the North Pacific Cable (NPC) will go into service in late 1990, pending final approval of its landing licenses. It will connect the U.S. and Japan and it has a capacity similar to PTAT-1.

Kwerel then discussed U.S. international telephone carriers. Until 1984, AT&T was the only U.S. carrier providing international message telephone service (IMTS). Now, MCI International (MCII) and U.S. Sprint have entered the market. Referring to Exhibit 4, he

noted that although these shares of the market is still relatively small, they are growing. In important markets such as the United Kingdom, 10 percent of the international market, MCI has a significant larger share as well as U.S. Sprint. He said that another way of looking at competition is to look at the elasticity of supply. In this respect, most of AT&T's international revenues are subject to competition: 9 of the top 10 countries (ranked on billed minutes in 1988), 17 of the top 20 countries and 71 of the top 100 countries. Moreover, he stressed, 77 percent of AT&T's revenues have facilities-based competition, and that in terms of profitable markets 85 percent of the revenue is at risk. Kwerel concluded that AT&T's ability to raise prices in these markets is limited because customers have choices. Still another way of looking at competition is to look at tariffs competitors are charging. Comparing direct-dial telephone calls to Japan and United Kingdom, one finds that competitors to AT&T charge less, between 10 and 15 percent.

In his discussion of developments in telecommunications abroad, Kwerel remarked that telecommunications policy has become too important to leave to the PTTs, which are rapidly losing control of national telecommunications policy abroad. Half of the countries in Europe are about to separate the provision of telecommunication services from the regulation, with the objective of providing competition at least in the value-added segment.

Telecommunications policy abroad is increasingly being made at higher levels of national governments and in regional multi-country forums, such as EEC's. An within the EEC, he remarked, there is a tension growing between the competition directorate, DG-IV, and the national governments. EEC's DG-IV argument for competitive policies is putting a lot of pressure on individual countries to liberalize their telecom policies.

Outside the EEC, Kwerel noted, a number of foreign countries are perceiving the liberalization of telecom policy as a way of keeping their industries competitive in a global market and to attract telecom intensive industries. For example, Germany is in the process of liberalizing its telecommunication policy moved by the concern that if it does not liberalize soon it will lose business. Some countries are even taking a very aggressive policy, such as Singapore which is aiming to develop itself into an international telecommunications hub and the United Kingdom which is also using the fact of being a telecommunications hub to attract telecom intensive services, such as finance. Another example he provided, was that of four countries in which there are facilities based competition: United Kingdom, with Mercury; New Zealand which is about to open facilities-based competition; Canada where there is facilities-based competition only for private lines; and Japan which has just created two additional international carriers competing with KDD. In fact, he noted, that there is new competition in Japan has already had the effect that the cost of calling from Japan to the US is already below than calling from US to Japan. In sum, he concluded, the world is changing dramatically.

Kwerel argued that the U.S. policy played a role in the liberalization of telecommunications policy abroad. First, through a demonstration effect. Secondly, made new players challenge the established order. When MCI wished to enter the German market and found itself blocked, it sought help from high levels of U.S. government to get access and ended up obtaining favorable terms of access. A similar thing happened with PAN-AM Sat.

Kwerel then debated whether the U.S. benefited from competition among its carriers and facilities. His argument was that it is too early to tell given the information available. Yet, one has to first ask what are the objectives of U.S. policy; are we concerned with domestic welfare or with a more global view? Kwerel noted that there is often conflict between these objectives. In the past, what drove things in telex international competition were profits of U.S. firms. But now, he argued, there is a lot more concern about U.S. customers. And even if we agree that the ultimate outcome will satisfactorily answer both questions we also have to think about global issues. And a question remains about what is the bargaining leverage to improve favorable access abroad and help the U.S. customers.

Kwerel conceded that an answer is to be partially found in the facts. First, referring to Exhibit 5, he said that there does not appear to be any significant increase in the rate of decline of the average price per minute of international telephone service. Another issue is whether foreign countries are taking advantage of U.S. competition to get better, more advantageous, access arrangements. According to Kwerel, this has not been happening. Referring to Exhibit 6, he showed that from 1983 on there has been a steady decline in the cost of terminating a call abroad for AT&T. On the other hand, because of the traffic imbalance between the U.S. and other countries there has been an increase in the net settlement of U.S. carriers to foreign carriers.

As for predictions, Kwerel was relatively optimistic. He warned however about making generalizations. He remarked that it is basically in Northern Europe much more so than Southern Europe that liberalization is taking place, citing AT&T's competitive problems in Spain.

Kwerel next turned to long term objectives in international services. First, he said, we have to see what is happening domestically: cost-based access to local exchanges abroad and facilities based competition. Referring to Exhibit 6, he figured that there is still a lot of room for the price of access to come down. He reasoned that given the available information the current cost of terminating an international call, 90 cents per minute can go down.

Kwerel concluded, by asking: how do we get from here to there? He considered two possible paths. One path is to say that things are going well, price and cost of access are coming down. This would call for a continuation of the current framework arrangements. Another approach would be to move away from current institutional arrangements for international communications. One idea Kwerel raised is to unbundle international facilities from domestic termination. The problem with that is how to regulate. Another idea, he suggested, is to terminate calls the same way calls are terminated domestically. The problem with this approach, he said is that it depends on what the prices are on foreign countries, citing the example of Mexico where long-distance rates are incredibly high. Another problem he raised is that under current arrangements AT&T and other US carriers have some control over the quality of calls in terminating national markets.

To wrap up, Kwerel concluded that there is a potential danger in the US liberalization of its telecommunication policies, but in fact things seem to be working well and the world is becoming more competitive.

Responding to a question about Intelsat's agreement to allow other firms enter the satellite business, Kwerel said that he felt that Intelsat believed competition to be inevitable and that they were capable of competing. Next, Kwerel answered a question about the issue of overcapacity in international telecommunications by saying that there is gross overcapacity but one should also look at diversity. People are willing to pay extra for security because the cost of facilities is low. For example TAT-8 is not working because the French laid the fiber optics wrong on the seabed. The following question asked whether the demonstration effect works in the other direction, that is, is could the Minitel, for example, be adopted in the United States. Kwerel said to have his own reserved opinions about Minitel, and that more germane lessons were learned from the price caps in the United Kingdom and possibly lessons could also be learned from what is going on in New Zealand.

The next speaker, Jerry Hausman, Professor of Economics and director of the Telecommunications and Economics Research Program at M.I.T. opened his talk on international joint ventures in telecommunications by stating that there were two main reasons for the increasing number of joint ventures in the central office switching market. First, increasing globalization of markets, and second, the increasing importance of software vis-a-vis hardware. In the 1970s the central switches changed from being electromechanical to computer-driven. Also in 1976 there was the introduction of digital switches, initially by Northern Telecom in the US. Northern Telecom became the major supplier, unheard of until then given the dominant position of AT&T. Next, the change to stored program control switches shifted R&D from hardware to software development. Hausman and a colleague estimated that in 1985 software development costs for large central office switches were running the \$ 150 - \$ 250 million dollars per year per switch. He mentioned that industry observers place this value much higher and that companies might be spending \$ 300 to \$ 400 million dollars per year per switch in software developments for switches already in the market, just adding features and upgrades. He added that if one adds the development costs for switches, about \$ 1 billion in 1985, plus the \$ 300 million per year since then, we get closer to the \$ 2 billion per switch. He remarked that 75 percent of the development costs are in software.

Hausman went on to argue that these developments in terms of economics changed an industry from a high variable cost, in the manufacturing of electromechanical switches, into an industry with a very high fixed cost. The important point here is that according to his calculations with Kolberg no single European country is large enough to fund the development of a central office switch. In this case, he argues, the former national champion approach is no longer viable. In fact, he estimated with Kolberg that you need about 25-100 million lines to cover for the development costs. This, Hausman argued, is an important force behind the development of joint ventures. He further argued that this will be even more crucial in future developments, be they optical or digital.

Next, Hausman turned to examine the situation in the US. Referring to Exhibit 7, Hausman pointed out that AT&T and Northern Telecom have the lion's share of the market, and that GTE just formed an alliance with AT&T.

Turning to an international perspective discussion of the impact of these very large economies of scale on future switch development, Hausman stated that there is a large potential role for the so-called industrial policy funding of R&D. While it is not so clear that this will happen in the US he is quite confident that it will occur in France. He then stated that there is a possibility that this market will end up looking like the passenger air frame market or the jet engine market, in which you have very large subsidies flowing from countries. He added that the market will eventually rationalize, but this process may take a long period of time because of national governments.

Next, Hausman commented on recent joint ventures (Exhibit 8). He explained that the Philips-AT&T joint venture did not work out well. He next pointed out that a more interesting joint venture is that between Siemens and GTE-Plessey, since each has its own switch and manufacturing facilities.

Hausman then went on to answer the question: Will we see further joint ventures and further consolidation? First, he said, people could argue that in the computer industry the move towards open network systems will create further competition. Yet, he argued, in terms of central office switches, PBXs and most of the software-based systems you have totally closed systems, that is no one outside AT&T has ever seen the AT&T code for their switches, it is extremely non-portable. He further argued that it is likely that the central core part of the system will remain inviolate, extra services people will be able to use their own software. In short, Hausman concluded that there will not be increasing portability and competition and because of the importance of software there will be increasing consolidation.

Next Hausman addressed three main reasons for joint ventures, likely to continue in the future. First, technology transfer as exemplified by the central office switch. Second, the importance of R&D. A first example outside the central office switch market is that of Schlumberger and NTT which recently announced a joint venture to develop and make integrated circuits. Another example is the recent joint venture between Pacific Telesis (Pactel), British Aerospace and Matra to bid for the new personal communications network license in the UK. Pactel is the second largest provider of cellular communications in the US and the UK market will be the second generation of devices. Other American telecommunications firms are also forming joint ventures. A third factor is distribution and marketing, an area in which US companies are usually well developed. For example, General Electric (US) and Ericsson have set up a joint venture to manufacture cellular telephones and mobile radio systems to serve the US and Canadian markets, making use of GE's good distribution system. Lastly, US West has announced a joint venture with Northern Telecom to distribute central premise equipment throughout the fourteen western states.

Hausman proceeded to discuss other types of corporate arrangements that could compete with joint ventures, since joint ventures have a bad reputation in the US business press. Only a few companies like Corning have succeeded in joint ventures. One first alternative form is vertical integration, where service providers integrate into equipment. He reasoned that this will not happen because of the global market focus. Secondly, regulators have

basically rejected the widespread vertical integration model of AT&T. Even in places like West Germany the first areas being freed up are the equipment markets to allow more competition. Another alternative form which economists have shown great interest is integration by contract, AT&T's current favorite approach. Hausman argued that this could work but he believes that it is not well suited for R&D based projects. It is not easy to get the incentives correct for both sides ("the moral hazard problem"), there are many R&D projects with many misses and only a few hits, and there is the classic problem of appropriability of results. In short, it is hard to get the allocation of risk correct. He argued that product development in telecommunications is becoming more and more risky and uncertain, exemplified by the proliferation of technology with AT&T no longer calling the tune and well run companies like Northern Telecom pulling products off the market.

Hausman then turned his attention to the US. Referring to Exhibit 9, the structure of the U.S. telecommunications industry in the first quarter of 1989. He pointed out that the top-tier "Baby Bells" are doing a lot of joint ventures abroad. Next, referring to Exhibit 10, Hausman talked about joint ventures in the U.S. telecommunications industry. He pointed out that basically the Baby Bells are not allowed to go into joint ventures in the US, but GTE, Southern New England Tel (SNET), US Telecom, and Cincinnati Bell which are not bounded by the MFJ are all heavily involved in joint ventures at all three levels: interstate long-distance companies, equipment manufacturers and value-added networks (VANs). It therefore looks like that apart from regulation, these telecom companies are heavily involved in joint ventures. One could argue, he said, that the reason they are involved in joint ventures is that they are playing the frequently claimed old AT&T game, paying for the cost of these joint ventures through cost subsidization from their monopoly rate payers. Hausman added that the Bell Operating Companies (BOCs) are seeking relief to be allowed to enter into joint ventures. Until Judge Greene's December 1987 decision, the BOCs were allowed to be involved in basic R&D efforts. Since this decision that said that R&D was part of manufacturing the BOCs have ceased their efforts.

Hausman predicted that the Administration is about to come forward with its policy, mainly a transfer of authority to the FCC over manufacturing and information services. The FCC has announced a number of times that under regulatory control it would allow much more interaction and perhaps even joint ventures. He also mentioned that even if there is a regulatory solution to this problem, one has to look at the US telecommunications trade balance (Exhibit 11). This has led to the emergence of two new sets of arguments in Washington. The first argues, the foreign trade argument, which is if increasing joint ventures are allowed the BOCs will do so with foreign companies worsening the trade balance. The other set of arguments is that there are a number of firms that have called for relaxation of the restrictions, DEC, Northern Telecom, arguing that they would become more competitive. He added that unfortunately the labor unions are now getting involved and calling for clause in the legislation stating that all the manufacturing has to be done in the U.S. with U.S. labor. That could make things difficult to compete on an international scale. Hausman concluded by addressing possible alternative types of regulatory solution. There are two contrasting interpretations of pre-divestiture AT&T. First, vertical integration is a good thing but nobody could regulate AT&T. Second, as long as you lack competition you cannot allow firms to vertically integrate because there are all these incentives to cross subsidize. He then mentioned that an interesting thing suggested by

Kwerel, is the import of regulation from the U.K., that is price caps. He noticed that California which has become one of the most progressive regulatory states is about to adopt price caps for GTE and Pactel, and there is also a good chance that FCC will do that in the next year. There are no incentives to cross subsidize in a correct price caps scenario. Otherwise, he sees an increasing number of joint ventures with foreign companies.

Lastly, Hausman said that countries like West Germany are doing exactly what the U.S. did. They are giving away a certain frequency for cellular to the second carrier. In the UK it is different because you will have to develop a new technology, which is risky. In response to a comment about the demise of national markets and AT&T's entrance in the Italian market, Hausman, said that firms like AT&T want to get a toehold in Europe, betting that with 1992 it will be able to get into other European countries from Italy.

DISTRIBUTION OF INTERNATIONAL TELEPHONE CALLING, 1987
(MILLIONS OF MINUTES)

	ORIGINATING IN U.S.	TERMINATING IN U.S.	PERCENTAGE OF TOTAL MINUTES
CANADA AND MEXICO	1,326	1,121	34
TEN LARGEST MARKETS OUTSIDE NORTH AMERICA			
UNITED KINGDOM	421	305	10
GERMANY	307	136	6
JAPAN	180	108	4
FRANCE	119	83	3
ITALY	112	56	2
COLOMBIA	95	31	2
KOREA	92	25	2
DOMINICAN REPUBLIC	90	21	2
AUSTRALIA	56	51	1
TAIWAN	73	30	1
TOTAL TOP TEN	1,545	846	33
REST OF WORLD	1,623	739	33
TOTAL INTERNATIONAL	4,494	2,706	

SOURCE: FCC, INTERNATIONAL ACCOUNTING RATES, DECEMBER 1988, P. 15.

AT&T REVENUES FROM SWITCHED SERVICES, 1987

	REVENUES (\$ BILLION)	PERCENT OF TOTAL	REVENUE PER MINUTE
CALLS TO CANADA AND MEXICO	0.9	3%	\$0.68
CALLS TO OTHER FOREIGN COUNTRIES	3.4	11%	\$1.16
INTERSTATE CALLS	19.6	62%	\$0.23
INTRASTATE CALLS	7.8	24%	N.A.
TOTAL	31.7	100%	

NOTE: REVENUES ARE AMOUNTS BILLED BY AT&T TO ITS CUSTOMERS AND DO NOT INCLUDE PAYMENTS TO AT&T FROM FOREIGN CORRESPONDENTS.

SOURCE: FCC, INTERNATIONAL ACCOUNTING RATES, DECEMBER 1989, P. 10.

TRANS-ATLANTIC CABLE SYSTEMS, 1956-1992

SYSTEM	YEAR	COST (MILLIONS)	TOTAL CAPACITY: VOICE PATHS	INVESTMENT COST PER VOICE PATH	INVESTMENT COST PER VOICE PATH IN 1982 DOLLARS
TAT-1	1956	\$49.6	89	\$557,303	\$1,983,286
TAT-2	1959	42.7	98	435,714	1,433,271
TAT-3	1963	50.6	175	289,143	892,416
TAT-4	1965	50.4	138	365,217	1,080,525
TAT-5	1970	70.4	1,440	48,889	116,402
TAT-6	1976	197.0	8,000	24,625	39,025
TAT-7	1983	194.6	8,400	23,167	22,297
TAT-8	1988	335.4	37,800	8,873	7,333
TAT-9	1991		75,600		
US-UK				4,000	
US-FRANCE				5,200	
US-SPAIN				5,600	

NOTE: INVESTMENT COST DOES NOT INCLUDE COST OF CIRCUIT MULTIPLICATION EQUIPMENT.

SOURCES: FCC, INTERNATIONAL ACCOUNTING RATES, DEC. 1989, P. 10.; TAT-9 DATA BASED ON CONVERSATION WITH GEORGE LI OF FCC, COMMON CARRIER BUREAU, OCTOBER 11, 1989; GNP DEFLATOR IS FROM CEA, ECONOMIC REPORT OF THE PRESIDENT, JAN. 1989, P. 312.

MARKET SHARES OF U.S. INTERNATIONAL TELEPHONE CARRIERS
ALL OVERSEAS POINTS

(PERCENTAGE OF GROSS IMTS REVENUE)

<u>CARRIER</u>	1985	1986	1987	1988
AT&T	98.6	95.0	92.9	89.7
MCI	1.1	3.8	4.8	6.9
US SPRINT	0.2	1.2	1.9	3.0
TRT COMMUNICATIONS	0.0	0.0	0.1	0.3
OTHERS	0.0	0.0	0.3	0.1

U.S. TO THE UNITED KINGDOM

(PERCENTAGE OF REVENUE BILLED U.S. CUSTOMERS)

<u>CARRIER</u>	1985	1986	1987
AT&T	95.1	87.5	84.5
MCI	3.6	9.1	9.9
US SPRINT	1.4	3.4	5.1
TRT COMMUNICATIONS	0.0	0.0	0.5
OTHERS	0.0	0.0	0.0

NOTE: OVERSEAS POINTS EXCLUDE CANADA AND MEXICO.

SOURCES: FCC, TRENDS, OCT. 1988, PP. 24-25; CONVERSATION WITH
KENNETH STANLEY, FCC, COMMON CARRIER BUREAU, OCT. 11, 1989.

AVERAGE PRICE PER MINUTE OF INTERNATIONAL TELEPHONE SERVICE

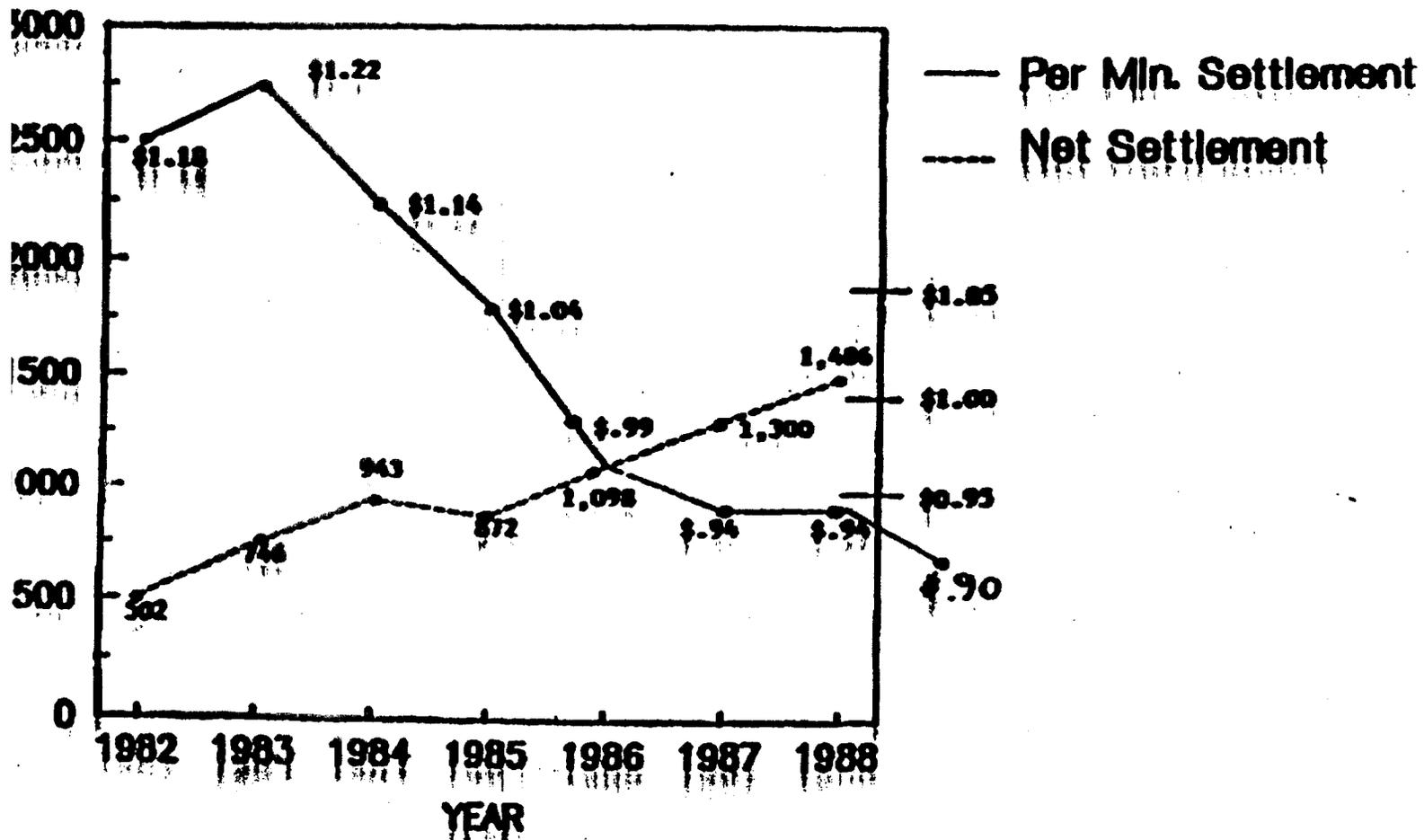
YEAR	PRICE PER MINUTE (\$)	PERCENTAGE CHANGE
1975	2.25	
1976	2.22	-1.3
1977	2.20	-0.9
1978	2.12	-3.6
1979	1.78	-16.0
1980	2.01	12.9
1981	1.66	-17.4
1982	1.39	-16.3
1983	1.36	-2.2
1984	1.29	-5.1
1985	1.23	-4.7
1986	1.16	-5.7
1987	1.16	0.0

NOTES: DATA DO NOT INCLUDE MEXICO AND CANADA.

SOURCE: FCC, TRENDS, OCT. 1988, P. 12.

INTERCONTINENTAL NET SETTLEMENTS (excluding Canada & Mexico)

\$ Millions



**CENTRAL OFFICE SWITCH
SUPPLIER MARKET SHARE IN U.S.**

	MARKET SHARE* %
AT&T	43
NORTHERN TELECOM	33
NEC	1
GTE	12
ALCATEL	2
SIEMENS	1
ERICSSON	1
STROMBERG CARLSON	1
OTHERS	6

* Central office market share in local digital lines installed, 1988.

AT&T has supplied approximately 95% of the local analog lines installed.

RECENT JOINT VENTURES IN WORLDWIDE TELECOMMUNICATIONS MARKETS

- **ITT-CGE: FRANCE**
- **ERICSSON-CGT: FRANCE**
- **AT&T and NV PHILIPS: NETHERLANDS**
- **AT&T and ITALATEL: ITALY**
- **SIEMENS and GTE-PLESSEY: UNITED KINGDOM**
- **AT&T and GTE: UNITED STATES**

STRUCTURE OF THE U.S. TELECOMMUNICATIONS INDUSTRY

(First Quarter - 1989)

		<u>REVENUE</u>	----- (millions) -----	<u>LINES</u>
		2,501	AMERITECH	15.5
		2,776	BELL ATLANTIC	16.5
<u>REVENUE</u> (millions)	8,659	3,368	BELL SOUTH	16.4
	4,699	3,235	NYNEX	14.9
	1,613	2,343	PACIFIC TELESIS	13.1
	750	2,058	SOUTHWESTERN BELL	11.3
	507	2,390	US WEST	11.9
		4,123	GTE	14.2
		407	SNET	1.8
		223	CINCINNATI BELL	0.8

JOINT VENTURES IN THE U.S. TELECOMMUNICATIONS INDUSTRY

AT&T

MCI

US SPRINT

EQUIPMENT
MANUFACTURING

VANG

AMERITECH

BELL ATLANTIC

BELL SOUTH

NYNEX

PACIFIC TELESIS

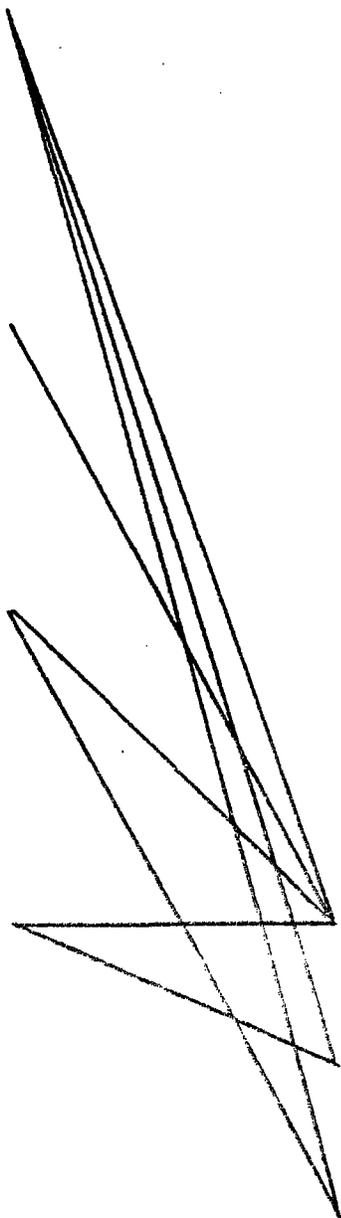
SOUTHWESTERN
BELL

US WEST

GTE

SNET

CINCINNATI BELL



U. S. TELECOMMUNICATIONS TRADE BALANCE

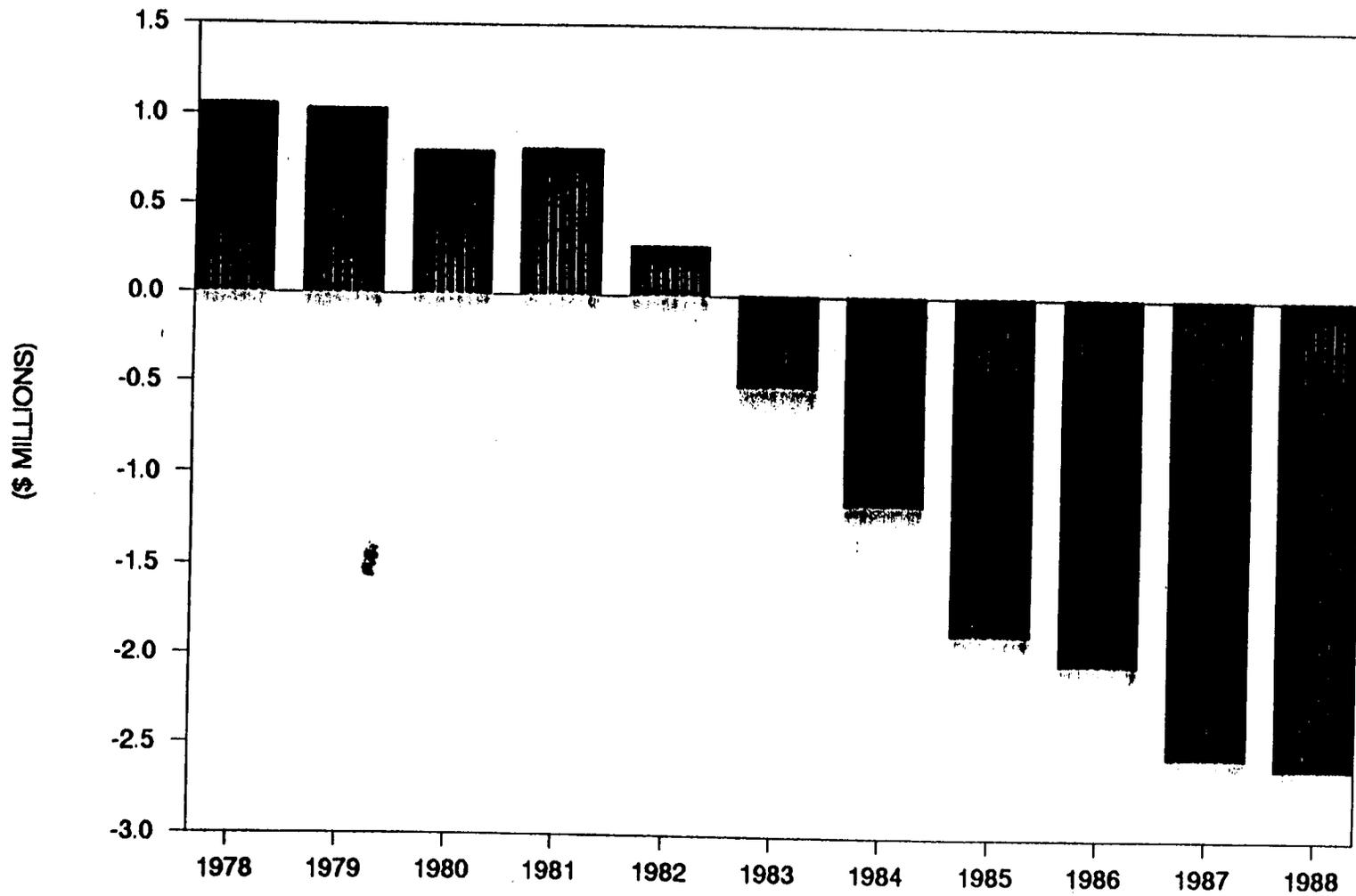


EXHIBIT II