

NTIA TRADE REPORT:
ASSESSING THE EFFECTS OF
CHANGING THE AT&T
ANTITRUST CONSENT DECREE



special publications

NTIA TRADE REPORT: ASSESSING THE EFFECTS OF CHANGING THE AT&T ANTITRUST CONSENT DECREE

NTIA TRADE REPORT STAFF



U.S. DEPARTMENT OF COMMERCE
Malcolm Baldrige, Secretary

Alfred C. Sikes, Assistant Secretary
for Communications and Information

FEBRUARY 1987



NTIA Trade Report Staff

Alfred Sikes
Assistant Secretary

Kenneth Robinson
Assistant Secretary's Office

Richard Firestone
Office of the Chief Counsel

William Sullivan
Office of Policy Analysis
and Development

Support Staff

Cecelia Fong

Janice L. Robinson

Acknowledgments

Information and assistance was provided by Messrs. Joseph Kellagher and Roger Stechschulte of the Office of Telecommunications, International Trade Administration, U.S. Department of Commerce.

Sources

Except as otherwise noted in the text, statistics contained in this report were developed by NTIA's Office of Policy Analysis and Development, or provided in business and proprietary submissions made by industry in 1985 in conjunction with NTIA's review of competitive conditions in the local exchange and other parts of the telecommunications industry.

February 4, 1987



UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Communications
and Information
Washington, D.C. 20230

February 4, 1987

MESSAGE FROM THE ASSISTANT SECRETARY

International competitiveness is crucial to the future of the American economy. Our telecommunications, computer, and information industries are increasingly central to any effective program aimed at fostering U.S. competitiveness. How efficiently these industries perform will in large part determine the overall success of the Administration's competitiveness initiatives. It is thus very important that we take those steps which are clearly needed today to mobilize the substantial human and financial resources which these key industries represent.

Mobilizing these national resources requires Government to reduce unneeded regulation, including any unwarranted restrictions imposed under the AT&T antitrust consent decree. Particularly relevant are limits now placed on the provision of "information services" and domestic manufacturing by the Bell telephone companies. Also significant are outmoded means of price control including much traditional rate of return regulation, an issue now under careful review in parallel NTIA and Federal Communications Commission proceedings.

In seeking to mobilize our national resources in this key high-tech sector, however, the realities of the international telecommunications marketplace must be borne in mind. Further unilateral action on our part which has the practical effect of expanding U.S. trade opportunities for foreign-based firms -- without, at the same time, taking steps to open now-closed markets overseas -- could exacerbate our current communications trade difficulties. While this NTIA report thus generally urges relaxation and elimination of many present consent decree constraints, it also calls for continued Government oversight in certain limited instances. We believe the measures proposed regarding review of joint ventures with foreign-based firms to manufacture central office switching equipment are desirable, and we will pursue appropriate means of establishing such procedures as judicial review of the AT&T consent decree restrictions goes forward.

Alfred C. Sikes

TABLE OF CONTENTS

	<u>Title</u>	<u>Page</u>
Executive Summary.....		v
Foreword.....		1
Overview of This Report.....		2
Part I. General Industry Survey and Appraisal.....		6
General Trade Concerns.....		6
Current Telecommunications Trade Concerns.....		9
Possible Contributing and Other Factors.....		15
Regulatory Restrictions Crucial.....		19
Specific Lines of Commerce at Issue.....		27
Network Equipment.....		27
Areas of Limited Competition.....		28
Area of Competitive Engagement.....		29
Major Demand Factors.....		31
Future Expansion.....		34
Customer Premises Equipment.....		36
Handset and Key System Markets.....		36
Private Branch Exchanges (PBXs).....		38
Other Terminal Equipment.....		41
Priority of U.S. Market Access.....		41
Long-distance and Information Services.....		44
Increasing Foreign-based Entry.....		44
Equipment Connections.....		46
Specialized Transmission Systems.....		47
Significant Restrictions Abroad.....		51
Demand for Export Services.....		53
Trade and Competitiveness as a Preeminent Factor.....		54
Part II. Bell Company Diversification and Forecasts.....		56
Theory and Practice of Vertical Integration....		56
Corporate Strategy Considerations.....		59
Telephone Handset Forecasts.....		62
Key Telephone Systems Forecasts.....		68
PBX Equipment Forecasts.....		72
Three Competitive Tiers.....		72

	<u>Title</u>	<u>Page</u>
Part II.	(Continued)	
	Three Competitive Factors.....	73
	International Trade Prospects.....	74
	Digital Central Office Switching Equipment.....	79
	Information Services.....	93
	Long-distance Services.....	99
Part III.	Points and Counterpoints.....	105
	Research and Development.....	105
	Foreign Agreements.....	112
	Foreign Dependency Concerns.....	119
Part IV.	Summary and Conclusions.....	124

Listing of Statistical and Other Tables

<u>Table</u>	<u>Subject</u>	<u>Page</u>
T- 1	Largest U.S. Bilateral-Trade Deficits.....	7
T- 2	Total Imports as a Percentage of GDP.....	8
T- 3	World Market for Telecommunications and Computer Goods and Services.....	11
T- 4	U.S. Operating Revenues and Employment of Foreign-based and Affiliated Firms.....	13
T- 5	U.S. Trade Balance with the World in Electronics-based Products 1980-1986E.....	14
T- 6	AT&T Manufacturing Employment.....	17
T- 7	Bell Company Equipment Procurement.....	21
T- 8	R&D Expenditures in Telecommunications and Information Service Industries: 1985.....	25
T- 9	1985 Digital Lines Placed in Service Worldwide....	30
T-10	Bell Company Network Products Procurement.....	32
T-11	Foreign Company Involvement in U.S. High Technology Markets 1977-1984.....	33
T-12	U.S. Telecommunications Equipment Market, 1985 and 1990E.....	35
T-13	U.S. Key Systems Market Shares (1985).....	38
T-14	U.S. PBX Market Shares (1985).....	39
T-15	Foreign-based U.S. Market Competitors.....	42
T-16	U.S. Long-Distance Fiber Optic Networks.....	48
T-17	Electronics Industry Export Dependency.....	66
T-18	Regional Bell Operating Companies' Central Office Switch Installations and Access Lines.....	81

<u>Table</u>	<u>Subject</u>	<u>Page</u>
T-19	Relative BOC Switching System Characteristics.....	87
T-20	Selected U.S. Electronic Information Service Sales (1986).....	94
T-21	Leading Information Service Suppliers (1986).....	95
T-22	Bell Transmission System Procurement from Foreign-Affiliated Suppliers.....	102
T-23	U.S. Electronics and Related Industry R&D Expenditures (1985).....	107
T-24	Japan R&D vs. AT&T and IBM.....	108
T-25	U.S.-Japan Communications and Related Joint Activities.....	114
T-26	Bell Company Rankings Among the World's Top 100 Firms.....	117
T-27	Relative Market Valuations -- World's Top 100 Firms Also in Telecommunications Manufacturing.....	122

EXECUTIVE SUMMARY

This report examines the trade and related effects of possible changes in the 1982 AT&T consent decree. That court order places three fundamental restrictions on the Bell operating companies which were divested by AT&T in 1984. First, the Bell companies are generally forbidden from manufacturing telecommunications equipment. They are now permitted to manufacture abroad for overseas markets. They are also allowed to distribute, retail, install, and maintain communications. Under the decree, however, they cannot engage in the business of manufacturing products domestically for the U.S. communications market.

Second, the Bell companies are forbidden from offering "information services," which includes "electronic publishing." AT&T is prohibited from entering the electronic publishing field prior to 1989. Information services include new, computer-related services such as voice storage, call recordkeeping, and other communications-related offerings. Such services also are considered to include remote access database services, and new, potentially broad appeal offerings such as teletext and videotext, services which foreign telephone companies now offer overseas.

Third, the Bell companies cannot engage in "interLATA" long-distance service. The AT&T consent decree divided the former Bell System's local service territory into 164 "local access and transport areas" (LATAs). Those judicially prescribed geographic areas encompass about 80 percent of all U.S. local telephone traffic, as well as about 23 percent of long-distance calls. Under the decree, however, the Bell companies may not provide circuits between these "local" calling areas.

This NTIA report is basically in three parts. First, it discusses most of the significant communications equipment and services markets at issue, the telephone "handset" and "private branch exchange" markets, for example, as well as the long-distance and "information services" markets. The report provides a diversity of Government, industry, and commercial information showing the state of markets today, and general expectations regarding their future development.

Second, the report endeavors to forecast and estimate by product market both the positive and negative effects of changing the AT&T consent decree restrictions. The timeframe for these projections is 1986 through 1990 in most cases, although in some instances longer-term forecasts are made. The selection of this particular timeframe may affect the commercial utility of these forecasts. At the same time, using a relatively short timeframe tends to minimize the risk of errors attributable to unanticipated technological and commercial changes.

Third, the report reviews several of the trade-related contentions which have been advanced regarding possible consent decree changes. The report assesses, for example, the risks associated with possible joint ventures between Bell companies and foreign-based manufacturers to produce digital central office switching apparatus, currently the most internationally contested of telecommunications equipment markets. Possible effects on research and development activities are also discussed.

Although this report concludes that removing restrictions on the Bell companies would not generally risk significant adverse trade effects, there is a substantial concern in one situation. That situation would be if a Bell company undertook to manufacture digital central office switches in partnership with a foreign-based firm, and overseas markets (including the foreign partner's home market) remained closed to U.S. firms. It is our view that, absent appropriate safeguards, such joint venturing would likely cause significant harm to American competitive technology and trade positions, and could pose the threat of destroying this country's indigenous central office equipment manufacturing capacity.

The report finds that positive U.S. international trade gains are most likely to result from removing the current consent decree restrictions on the offering of "information services." In the case of customer premises terminal equipment, removing restrictions on manufacturing would have fewer positive trade consequences during the 1986-90 period, though larger gains might be achieved in out-years. Removing consent decree restrictions on Bell company provision of interLATA long-distance services, the report concludes, would essentially prove a "wash" from an international trade standpoint, except to the degree that existing commercial rivalry between AT&T and the Bell companies might be heightened and AT&T's ability to compete effectively against foreign-based companies thus impaired.

The report notes that the AT&T consent decree restrictions and dissolution of the former Bell System are only some of the factors, albeit important factors, bearing on the current severe U.S. telecommunications trade deficit situation. It would be unrealistic, the report concludes, to assume that simply eliminating these restrictions could promptly turn around the present undesirable trade situation. Further Congressional and Executive branch initiatives may still be required. In many instances, however, eliminating these judicial restrictions on the companies which comprise half of America's human and financial resources in this key high-tech sector could yield positive results, particularly over time.

The conclusion of the report contains a summary of principal findings and also makes certain recommendations for future Government action in the telecommunications and information services area.

FOREWORD

The U.S. telecommunications industry, together with much of the American economy, is experiencing fundamental commercial and technological changes. Capitalizing on the opportunities presented, while safeguarding the major contributions which this core industry makes to the national welfare, constitutes a major public policy challenge.

Commencing in the mid-1970s, the Federal Communications Commission (FCC) and Federal judiciary radically altered the traditional regulatory landscape. Competitive supply and demand forces were injected into an economic system long characterized by rigid barriers to competitive entry, and sole-source provision of goods and services by persuasively regulated firms to largely captive customers. In 1982, the Government announced a settlement of the antitrust litigation launched in 1974 targeting the size, practices, and vertically integrated structure of the former Bell System. Pursuant to that court-approved agreement, the then-dominant U.S.-based telecommunications firm, AT&T, was comprehensively restructured in 1984. A principal nontariff trade barrier to further foreign penetration of U.S. communications markets also ceased in large part to exist.

Contemporaneous with these telecommunications industry developments came major and accelerating changes throughout the U.S. economy generally. Particularly beginning in the 1970s, the difficult process of more fully integrating the U.S. and world economies commenced, with adverse effects on a number of basic American industries. While the United States held its domestic markets open, and generally sought to ensure foreign-based firms full and fair competitive opportunities, too many markets overseas remained tightly closed to American entrepreneurs. One obvious result was widening U.S. trade deficits, and the substantial public and political concerns those deficits continue to engender.

At the same time both the telecommunications industry and the U.S. economy were experiencing a complicated and sometimes painful transition, reliance by U.S. business, industry, and government on telecommunications was steadily growing. Increasingly a pivotal component of our national economic infrastructure, the efficient performance and potential of the telecommunications sector thus became more critical. The risk that unsound telecommunications policies might adversely affect the industry's performance, then ripple throughout our economy, grew as well.

OVERVIEW OF THIS REPORT

This NTIA report assesses some of the more significant effects of past and present U.S. communications policies on the performance potential of our telecommunications industry. It endeavors to forecast likely future results if certain of these policies are altered. A principal focus is the limits that the Federal courts now place on the commercial activities of the Bell companies, and the implications of those limits from an international trade and national competitiveness standpoint. The fundamental time horizon for the forecasts here is from 1986 through 1990, though some estimates are made through the end of the century. The discussion falls into three basic parts.

First, the particular telecommunications lines of commerce at issue are surveyed, and pertinent U.S. market developments briefly reviewed. Government statistics, commercially developed market share, and non-proprietary information on the industry and its players are provided.

Part II of this report then discusses why some or all of the Bell companies might choose vertically to integrate and expand their commercial repertoires, if the AT&T consent decree restrictions were relaxed or eliminated. This part also contains a number of relatively discrete communications submarket forecasts.

Three lines of commerce currently are foreclosed to the Bell companies by the AT&T consent decree: (1) "interLATA" long-distance or toll communications services; (2) communications equipment manufacturing; and (3) provision of "information" services. Waivers of some of these restrictions have been granted; foreign manufacturing of equipment for offshore markets, for example, is now allowed. In general, however, the judicial regulatory regime represented by the AT&T decree continues to rest on basic assumptions that the Bell companies should be "contained," restricted to providing only local telephone exchange services, and barred from these three ostensibly competitive, partly deregulated communications markets.

Though projections are made throughout this second part of the report, no claim is made nor implied that only those developments discussed will materialize. Forecasting in fields so technologically and commercially dynamic as telecommunications obviously entails exercise of informed judgment and broad perspective. Such forecasts inevitably are subject to risk of wide error. Were the consent decree's restrictions relaxed or removed, moreover, not all Bell companies likely would enter all three lines of commerce, much less do so simultaneously. Indeed, some Bell companies already have indicated that management has no

present intention to diversify into certain areas, such as facilities-based long-distance service, regardless of Government constraints.

The short-run and long-term trade consequences of Bell company diversification are also especially hard to assess because the technological and commercial capabilities of AT&T and other principal market players inevitably would change while any such diversification might be underway. In particular, forecasts beyond the basic 1990 time horizon employed throughout this report are likely to be flawed if assumptions are made that either technology -- or AT&T's competitive abilities -- will remain relatively constant.

The present consent decree restrictions, furthermore, are in certain regards interdependent and reinforcing. Removing restrictions on expanded long-distance operations and information services, for example, probably would stimulate demand in certain equipment sectors. Similarly, permitting manufacturing of certain categories of equipment but not others could affect how individual telephone companies engineer or operate their networks, and hence demand for network switching and transmission equipment.

Finally, in Part III some of the common, recurrent contentions regarding possible Bell company diversification are discussed. In its relatively brief life, the AT&T consent decree has proven a fertile source of general confusion and misapprehensions regarding the initial goals and objectives of that landmark antitrust litigation. Both opponents and proponents of changes in the decree increasingly attribute greater purpose and effect to the current restrictions than objective facts warrant.

It is often contended, for example, that the AT&T case was aimed at curtailing some ill-defined, innate proclivity to monopolize on the part of regulated local exchange companies, or to limit "vertical integration," and that the decree's restrictions are a logical consequence of these objectives. Leaving aside the obvious fact that AT&T emerged from the settlement as a vertically integrated, rate base regulated carrier, as the FCC correctly stated in its 1982 comments to the judgment court:

The restrictions apparently are based upon the premise that any company having a local exchange franchise is likely to engage in predatory practices in any other market it enters. If the restrictions are not based upon that theory, it is difficult to imagine any rationale for these sweeping restrictions.

This decree theory bears little resemblance to any theory of the D.C. case that was described in the Justice Department's response to the Rule 41(b) motion to dismiss or the court's opinion denying that motion. The Justice Department did contend that vertical integration into telecommunications manufacturing by a firm with local exchange franchises is inherently anticompetitive; but apparently it did not extend that claim to other markets.

The Justice Department also presented evidence with respect to alleged cross-subsidization by AT&T, primarily among interstate services regulated by the Federal Communications Commission. The Department proceeded on the theory that a firm subject to overall rate of return regulation and an aggregate revenue requirement for all the regulated services has an incentive to underprice the relatively more competitive regulated services and to recoup the difference from the regulated services that face little or no competition. The Department claimed that AT&T in fact followed that course while the Commission was endeavoring to develop enforceable cost allocation rules.

If the court had entered a judgment of liability on that claim, such a judgment would lend no support whatsoever to the theory that a regulated firm has any special capacity or incentive to subsidize unregulated activities with profits from regulated services. It certainly would not support a theory that a regulated local exchange business is a likely source of subsidization.

Even if it would be appropriate to adopt consent decree relief that is designed to guard against dangers that never have been alleged, it would not be appropriate to do so if there is no reason to believe that the dangers are real. We do not perceive any reason to believe that the dangers are real. We do not perceive any reason for concluding that a properly regulated firm providing local exchange telephone service is more likely to monopolize an unrelated business than any other firm that participates in more than one market.

There may well be valid policy reasons today to limit or preclude diversification on the part of Bell companies. But such reasons should not necessarily be premised on unfocused assertions that repetition of "illegal" corporate conduct along the lines previously challenged by the Government is at risk.

The common argument that allowing Bell companies expanded commercial discretion risks undesirable "foreign entanglements" which could exacerbate our trade deficit also merits close analysis. The trade implications of the initial AT&T divestiture were generally understood when the Administration debated proposals to dismiss that litigation in 1981. Most appreciated that restructuring the Bell System would affect America's international trade posture.

Government, however, underestimated the velocity with which telecommunications trade deficits would subsequently mount. It did not take adequately into account the extent to which a strong dollar would affect U.S. sales. At the same time, the Government overestimated the ability of U.S.-based firms (including AT&T) to compete -- and the pace with which foreign barriers to U.S. entry would be removed. Trade deficits in this key sector have grown far more quickly than expected, and too many major markets abroad also remain closed. Consequently, care should be exercised today to develop maximum possible understanding of the current communications environment and thus hopefully minimize future unanticipated problems.

While analytical care thus is needed, it is important to bear in mind that the telecommunications industry -- both here and abroad -- is increasingly as internationalized as other businesses including the automobile, aerospace, and computer industries. Except for the Bell companies, virtually all U.S. and foreign-based participants in our telecommunications markets, including AT&T, have extensive foreign commercial relations. There are, moreover, no restrictions on Bell company procurement of foreign products today. Indeed, existing "open procurement" requirements in the AT&T decree obligate Bell firms to consider foreign purchases. The issue, therefore, is not whether more foreign joint ventures or foreign sales to the Bell companies might occur. Rather, it is whether the incremental change in the number and character of such activities poses appreciably new public policy risks, or offers significant opportunities -- and what, if any, reasonable measures Government might take to maximize upside gains while minimizing downside risks.

PART I. GENERAL INDUSTRY SURVEY AND APPRAISAL

General Trade Concerns

The United States today confronts serious -- and, in certain fields, seemingly intractable -- international trade difficulties. Overall, the U.S. merchandise trade balance last showed a surplus in 1975, and has been in deficit all but four of the last 19 years. 1986 Economic Report of the President at 370, Table B-102. In the first six months of 1986, the U.S. trade deficit amounted to about \$83.9 billion, 21 percent above 1985's record levels, and this deficit has been forecast to reach as high as \$176 billion. The U.S. deficit with respect to Japan alone increased 18 percent, reaching \$28.7 billion during just the first six months of 1986. The Japan Finance Ministry recently reported that exports to the United States were up 23 percent in 1986 to a total of \$80.46 billion, and that Japan's 1986 trade surplus with the United States was \$51.48 billion, compared to \$39.47 billion in 1985. See Table T-1.

In some respects, the U.S. trade problem today is not necessarily that "imports are taking over." Overall, the United States today remains less dependent on imports than virtually any other developed country. See Table T-2. While imports represent a relatively small percentage of U.S. Gross Domestic Product, however, the rapidity with which imports have grown and the impact of import competition on certain relatively discrete lines of commerce -- traditional core industries, for example -- have caused legitimate political and other concerns.

Table T-1

Largest U.S. Bilateral-Trade Deficits
(\$ Millions)

<u>Country</u>	--- Deficit ---		U.S. Dollar Change vs. Foreign Currency <u>9/85-12/86</u>
	1986 <u>9 Mos.</u>	1985 <u>9 Mos.</u>	
Japan	\$43,871	\$34,659	-34.0%
Canada	18,803	16,474	+0.3
W. Germany	11,415	8,367	-32.0
Taiwan	10,716	9,085	-12.0
S. Korea	4,788	2,926	-3.0
Italy	4,549	3,711	-29.0
Hong Kong	4,303	4,150	-0.2
Mexico	4,013	4,326	+135.0
Britain	3,534	2,540	-7.0
Brazil	2,516	3,622	-109.0
Switzerland	2,485	1,026	-31.0
France	2,455	2,656	-25.0
Indonesia	1,981	2,898	+47.0
Sweden	1,886	1,751	-19.0
Venezuela	1,659	2,025	0.0
Nigeria	1,591	1,568	x
Algeria	1,042	1,473	x
Singapore	1,017	635	-0.9
South Africa	891	631	-17.0
Denmark	712	671	-28.0
Ecuador	639	886	+34.0
India	633	602	+8.0
Malaysia	512	513	+4.0
Philippines	493	590	+11.0
Angola	438	629	x

x = No quotes available -- insufficiently traded.

Source: U.S. Commerce Department.

Table T-2

Total Imports as a Percentage of GDP

	<u>1952</u>	<u>1960</u>	<u>1970</u>	<u>1978</u>	<u>1981</u>	<u>1984</u>
Austria	17.5	22.5	24.5	27.5	31.8	30.5
Canada	17.1	15.3	17.1	22.5	24.5	24.1
Denmark	26.9	30.6	27.9	26.1	30.4	30.2
France	10.9	11.6	13.6	17.2	21.1	31.1
Germany	11.9	10.5	13.6	18.9	23.8	25.4
Italy	12.6	12.7	14.9	21.5	26.0	24.2
Japan	11.7	10.4	9.3	8.3	12.6	11.4
Netherlands	37.8	40.7	42.4	39.1	48.0	50.7
Norway	30.2	28.9	33.1	28.2	27.3	27.8
Sweden	20.7	20.8	21.2	22.7	25.6	27.8
UK	22.1	18.2	17.9	23.9	20.6	25.4
US	3.4	3.3	4.3	8.7	9.5	10.5

Source: International Monetary Fund, 1986.

Employment concerns have risen considerably in the past few years. Escalating import competition and persistent foreign trade barriers have most seriously affected domestic employment in core industries such as steel, footwear, textiles, industrial chemicals, and other established capital or labor intensive sectors. According to a recent U.S. Labor Department report, in 1970, manufacturing employment amounted to 33 percent of the nation's nonfarm payroll. By 1985, however, the proportion had dropped to 26 percent. During the same period, the service industry's share of the nonfarm workforce advanced from 67 percent to 74 percent. Although the economy created 29 million jobs over the last 15 years -- 9.6 million of them between 1980 and 1986 -- most of the employment growth was concentrated in the service sector.

Between 1973 and 1985, service sector employment rose to some 51 million jobs from 21 million. Partly because the service sector generally is less unionized than manufacturing, however, average wages are lower. Gross average weekly cash earnings in manufacturing were about \$386 in 1985, for example, but only \$261 a week in the services sector. The changing employment mix in the U.S. workforce is shown by the fact that from 1972 to 1985, average hourly earnings were down 6 percent and average weekly earnings down 14 percent. Indeed, some demographic experts maintain that the shift toward services as a dominant part of the U.S. economy is the chief reason for a decline of almost 6 percent in inflation-adjusted median household income between 1973 and 1985, a decline which occurred despite rapid increases in two-income households during that same period.

In the next decade, the discrepancy between service sector and manufacturing earnings may narrow. Among other things, the supply of younger workers should continue to decline as a consequence of low post-1960 birth rates. Scarcer labor implies higher wages overall. Nevertheless, there is legitimate concern regarding the current apparent loss of high paying U.S. manufacturing jobs, and the substituting of relatively low paying service sector employment. Such a change has significant negative implications in terms of aggregate demand as well as the ability of Government to finance essential services. And, it also has obvious political ramifications which are having increasing impact on overall U.S. trade policies generally.

Current Telecommunications Trade Concerns

The overwhelmingly prevalent notion regarding telecommunications trade today is a concern on the part of many policymakers that we are seeing in this "sunrise," "high-tech" sector the unfortunate beginnings of problems comparable to those which have

affected other lines of commerce. To determine whether this general concern is warranted, however, it is first necessary to sketch out some of the telecommunications sector's baseline facts.

No single delineation of the telecommunications marketplace today is universally accepted because existing classifications tend to be both under- and over-inclusive. Standard Industrial Classification (SIC) 3662, for example, includes both microwave transmission products used by the telephone companies and the transmission equipment used to broadcast television. The convergence of communications and computer technologies has also blurred traditional product lines in the telephone services and equipment fields.

Some U.S. trade experts define "telecommunications products" to include all of SIC 3661 and about 30 percent of SIC 3662. Because relevant technologies are increasingly interchangeable, moreover, and many firms involved in one market are active in the other, experts hypothesize an overall "information goods and services" market. It encompasses both traditional telecommunications, most office equipment, and many computer industry products.

According to AT&T's chairman, the "information" field accounted for about \$620 million in worldwide sales in 1986, and it is forecast to total more than \$1 trillion a year by 1990. Current estimates are that the United States and Canada, Western Europe, and Japan account for about 93 percent of this electronics-based economy, with the United States market alone representing more than 40 percent of the world market. However defined, all experts agree this overall field should grow more rapidly than the economy generally. Telecommunications equipment and services should experience inflation-adjusted annual growth rates of about 8 and 9 percent, respectively, in the United States for the balance of this decade. Related computer products are forecast to experience average annual growth of about 12 percent during this same period. See Table T-3, below.

Table T-3

World Market for Telecommunications
and Computer Goods and Services
(\$ Billions)

	1985		1990E		Annual Growth Rate 1985
	<u>Worldwide</u>	<u>U.S.</u>	<u>Worldwide</u>	<u>U.S.</u>	
Telecom Equipment (SIC 3661, 3662)	65	26	96	36	8%
Computer Equipment (SIC 3573)	93	50	195	105	16
Telecom Services (SIC 4811, 4821)	290	118	446	165	9
Computer Services (SIC 737)	<u>50</u>	<u>30</u>	<u>147</u>	<u>394</u>	<u>24</u>
TOTAL	498	224	884	394	12

Source: NTIA (estimates not adjusted for inflation).

In 1986, total U.S. telecommunications services employment amounted to about 1.1 million jobs -- about the same level as during the preceding two years. Notwithstanding rapid introduction of labor-saving technologies and equipment throughout the 1973-85 time period, moreover, telecommunications services employment increased, by slightly less than 1 percent a year.

These small employment gains may be misleading. Established telephone industry employment, for instance, generally declined throughout this period, especially following the AT&T divestiture. Including domestic job cuts announced in December 1986, AT&T, for example, will have reduced its total employment to about 290,000 from 384,000 on January 1, 1984 when divestiture took place. Indeed, AT&T eliminated some 47,000 U.S. jobs in 1986 alone. The Bell companies have reduced their combined workforces by more than 40,000 from a total of about 587,000 at

the time of the breakup. An estimated 8,000 jobs in the "Independent" telephone sector have also been eliminated during this period.

New competitors have generated domestic employment opportunities, although insufficient jobs to compensate for the approximately 15 percent workforce shrinkage experienced in the established, regulated sector. In most instances, moreover, these new, competitive sector jobs are lower paying positions, partly because new entrants and the unregulated subsidiaries of phone companies are less unionized. Jobs lost may thus not compare with jobs gained in this sector. Despite this, average hourly compensation rates in telecommunications services overall have risen somewhat faster than prevailing inflation rates.

Total telecommunications manufacturing employment in the United States stood at about 130,000 jobs in 1986. About 83,000 were classified as production workers. Here, total employment over the 1973-85 timeframe declined, though by less than 3 percent yearly. Because demand for telecommunications products manufactured in the United States appears to track the overall state of the economy, however, there seem to have been broader swings in equipment manufacturing employment year by year than in the regulated telecommunications services sector.

Compensation rates in communications manufacturing have generally kept pace with productivity gains and, as in the case of services, also outstripped the rate of inflation. The U.S.-based workforce of Japan, Canada, and Europe-based telecommunications firms active in the U.S. market also appears to have grown. See Table T-4. Available employment figures, however, again may be somewhat misleading. Not all U.S. employees, for example, are necessarily engaged in manufacturing telecommunications products. These foreign-based firms also produce other electronics-based products here. Not all U.S. employees, moreover, are necessarily engaged in producing for the U.S. market. Nevertheless, there does appear to be some slight gain in U.S. telecommunications manufacturing employment attributed to foreign-based firms.

Table T-4

U.S. Operating Revenues and Employment
of Foreign-based and Affiliated Firms
(\$ Millions)

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
<u>Japan-Based Firms</u>				
Operating Revenues	\$10,941	\$10,568	\$12,398	\$13,198
U.S. Employees (000s)	8,236	9,188	10,645	11,332
<u>Europe-Based Firms</u>				
Operating Revenues	\$ 4,930	\$ 5,744	\$ 6,677	\$ 7,770
U.S. Employees	58,568	70,087	72,735	84,650

Source: Bureau of Economic Analysis; NTIA.

The computer equipment and software business, which is linked in part with traditional telecommunications and sometimes included in the "information economy," accounted for about 404,000 U.S. jobs in 1986, of which about 148,000 were classified as production workers. Total employment opportunities in this sector have grown 4 percent annually on average in recent years, again despite rapid introduction of labor-saving processes. The number of U.S. production workers has remained relatively flat, however, and compensation rates have grown less rapidly than in telecommunications, possibly reflecting the fact the computer industry is generally considered more competitive.

While the available employment and compensation figures for the broadly defined "information" sector do not necessarily reflect a precipitous drop in U.S. jobs, trade statistics suggest significant public policy problems. Traditionally, the United States enjoyed modest to large trade surpluses in virtually all relevant markets and submarkets. That is no longer true, however, especially in telecommunications.

A 1982 trade surplus of about \$580 million in the communications equipment category, for example, is now projected to deteriorate to a \$1.7 billion trade deficit for 1986. In the broader "electronics-based products" category, results have been more severe. A \$4 billion U.S. trade surplus in this field in

1982 plunged to a \$10.4 billion deficit in 1985. It is expected to reach \$16 billion -- or 9 percent of the total U.S. merchandise trade deficit -- for 1986. See Table T-5, below.

Table T-5

U.S. Trade Balance with the World
in Electronics-based Products 1980-1986E
 (\$ Millions)

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986E</u>
All Communi- cations	968	722	580	56	-608	-1,504	-1,695
Computers	6,409	7,005	6,822	6,207	5,936	5,690	2,199
Components	625	231	-281	-919	-2,968	-2,371	-2,625
Consumer Products, Office Products & Instruments	-526	-1,923	-2,140	-4,178	-8,520	-12,244	-13,942
TOTAL BALANCE	7,376	6,035	4,091	1,166	-6,160	-10,429	-16,063
TOTAL MERCHANDISE TRADE BALANCE	-36,354	-39,675	-42,691	-69,392	-123,312	-148,493	-168,300

Source: NTIA.^{1/}

^{1/} The International Trade Administration (ITA) recently made adjustments in its trade accounting with the result it reported a slightly higher deficit for 1986. We have retained the traditional methodology here, however, to avoid affecting historical sequences.

Given how trade statistics are developed, some revenues derived by U.S.-based firms in the broad "information" sector may not be reflected, or fully reflected, in these figures. Royalties collected from licensing U.S. technology abroad, for instance, may offset losses incurred in the hardware parts of this sector. The very substantial net contribution made by U.S. companies engaged in exporting video programming also tends not to be reflected in conventional communications trade statistics. Many of the imports reflected in these statistics, moreover, were products brought into this country by leading U.S. firms and marketed under an American logo. Nevertheless, it is indisputably true that the United States has recently suffered substantial trade losses in telecommunications, and there appears to be no quick, short-run solution.

Possible Contributing and Other Factors. NTIA in July 1985 issued a comprehensive review of domestic telecommunications policies.² It stressed the adverse impact on U.S. international trade performance of regulatory and other constraints placed by Government on the established telephone industry including the Bell companies. That report recognized, however, that other factors, may have contributed to the present serious trade situation.

Between 1980 and 1985, for example, the U.S. dollar rose some 75 percent in value relative to other world currencies. Cf. Table T-1, above. Consequently, imported telecommunications products may have been particularly attractive to U.S. customers, while abroad, U.S. exports may have been priced out of those few markets which are now open. Perhaps compounding the effect of currency imbalances was the fact special U.S. tax preferences -- accelerated depreciation and investment tax credits -- were available in the early years of this decade. They gave U.S. business customers incentives to purchase customer-premises products that, in many instances, were made by foreign-based firms. The decline in the U.S. dollar's value does not appear to have affected the U.S. communications trade deficit yet. It continues to grow. There is ordinarily some lag under such circumstances, however, and positive results of this currency realignment may become evident next year.

Persistent foreign tariff and nontariff trade barriers are another explanation for some present U.S. telecommunications trade problems. While the United States rapidly opened large parts of its telecommunications market to competition commencing

² Issues in Domestic Telecommunications: DIRECTIONS FOR NATIONAL POLICY (NTIA Special Publications 85-16, GPO No. 003-000-00643-3).

in the early 1970s, most markets overseas remained largely closed. Not until the early 1980s did foreign barriers to U.S. competitive entry begin to erode at the margins. Even today there remain substantial institutional, political, and other trade impediments to U.S. communications firms, notwithstanding procompetitive "privatization" initiatives undertaken in countries including Great Britain and Japan. Denial of foreign market access unquestionably is a major factor contributing to U.S. communications trade problems.

U.S., indeed, world business cycles offer yet another plausible explanation for U.S. communications trade deficits, as may certain effects of the AT&T breakup on telephone company purchases. The AT&T settlement was announced January 8, 1982, for example, and there is evidence some of the Bell companies promptly placed a freeze on some planned major system procurements. In late 1981 and early 1982, moreover, the U.S. economy generally was softening, as the United States headed into what proved one of the more severe post-World War II economic downturns.

Business investment, particularly in producer durables, ordinarily declines during recessionary periods. Both business and consumers also tend to defer planned major projects and expenditures. Statistics do not show that U.S. consumption of all telecommunications products declined commensurate with the general economy. Between 1982 and 1985, total consumption of all telephone and telegraph equipment, for example, increased from \$13.2 billion to \$18.1 billion, representing an 11 percent compound annual growth rate. Much of this growth, however, was in the "low-end" part of the market -- customer premises terminal equipment. Certainly demand for "high-end" products produced for the U.S. market by firms such as AT&T, fell sharply during the 1982-83 timeframe. One of two principal labor unions which organize AT&T's manufacturing facilities has provided statistics regarding levels of manufacturing employees at the AT&T plants it represents. These figures reflect a sharp drop in production about the time divestiture was announced, and when the economy was slowing, followed by rapid pickup thereafter. See Table T-6.

Table T-6

AT&T Manufacturing Employment

<u>Date</u>	<u>CWA Manufacturing Membership</u>
June 1981	24,997
June 1982	23,968
June 1983	20,494
June 1984	22,265
June 1985	27,875
May 1986	26,876

Source: Communications Workers of America,
AFL-CIO.

The pace with which the U.S. economy recovered from the severe 1982-83 downturn may also partly explain the apparent surge of telecommunications imports experienced in the 1984-1986 period. During periods of rapid economic recovery, imports often increase rapidly. This is usually because domestic producers are unable to expand their output as rapidly as demand grows. Unsatisfied domestic demand thus calls into production unused capacity worldwide and the result is an imports surge.

In telecommunications, deferral of major purchases by Bell companies, as well as some business communications users, presumably resulted in pent-up demand. When general economic conditions improved, and did so rapidly, that may have unleashed demand suddenly and, in the process, stimulated imports. Compounding this problem may have been production problems AT&T encountered in its electronic switch manufacturing operations. The details of AT&T's switch production problems in the months immediately following divestiture are not well known. What is relatively clear, however, is that just as Bell company switch demand was returning to its prior levels, AT&T was not effectively meeting all of those requirements.

It is also possible, as some suggest, that part of the current U.S. telecommunications trade deficit reflects the overall difficulties that the leading U.S. manufacturer, AT&T, experienced adapting to a competitive environment. The ongoing integration of the U.S. and world economy has resulted in increasingly intense competition both in this sector and generally. It is no secret that large U.S. corporations have not

always proven successful when confronted with aggressive foreign-based -- and sometimes governmentally subsidized -- competition. Some attribute this to problems with U.S. corporate management generally, with an alleged chronic preoccupation with short-run results, quick profits, and inadequate long-run commercial vision. In the case of AT&T, corporate adaptation problems may also have been compounded by circumstances relatively unique to telecommunications.

Government long sheltered major parts of the U.S. telecommunications industry from direct competition. On the supply side, competitive suppliers of goods and services were handicapped or barred by Federal and state regulation from competing. On the demand side, customers were not free to exercise choice in most instances. A result may have been to reduce both the appetite and ability of some U.S. telecommunications firms to engage in vigorous and successful competition.

There are obvious exceptions. Leading U.S.-based companies including IBM's Rolm subsidiary, for example, and Motorola were relatively adroit in meeting and typically beating foreign-based competition in their respective telecommunications submarkets both at home and abroad. Other firms such as AT&T, however, did not quickly develop the ability to function in competitive markets because for years the company did not need to, and devoted its resources to satisfying "captive" Bell System requirements.

Indications are AT&T has improved its competitive and marketing talents in the past two years. Although the firm has incurred special charges against earnings and eliminated many U.S. jobs, the investment community has generally viewed these as positive developments, likely to produce a more efficient company that will be better able to compete. It is nevertheless true that there have also been some corporate mistakes and commercial failures. During the past three years, moreover, foreign-based firms better able to meet customer demand have prospered and, in some cases, become further entrenched. At the time of divestiture, for example, AT&T had difficulty in supplying its No. 5ESS switches to Bell companies due to internal corporate problems, as previously noted. Demand, therefore, was channeled to its principal U.S. market competitor, Northern Telecom, which was able to produce and deliver a comparable digital switch. AT&T's much-heralded diversification into the computer equipment market, moreover, has been less successful than expected. The trade reversals the United States has experienced in the "information" sector, in short, may reflect the predictable difficulties which large, pervasively regulated companies encounter when abruptly faced with the necessity to compete.

Regulatory Restrictions Crucial. In addition to these "structural" problems, the abundant restrictions placed on established telephone companies both by regulators and the courts under the AT&T consent decree also are crucial to the trade deficits the United States has incurred in telecommunications. Federal regulation has adversely affected AT&T's ability to meet growing foreign challenges in telecommunications both at home and abroad. The AT&T consent decree has also limited the ability of Bell companies to engage in several lines of business, as well as in international trade generally, while stimulating U.S. demand for certain communications products supplied by foreign-based firms. At precisely the same time foreign-based challenges to our technological leadership were intensifying, half our domestic telecommunications industry was tied-down by judicial regulation and our leading firm, AT&T, was ensnared in a webwork of state and Federal regulatory constraints. Predictably, our foreign trade predicament quickly worsened.

Pertinent to AT&T particularly are FCC rules instituted in 1980 as part of that agency's "Second Computer Inquiry." Those rules, in brief, required AT&T and the other companies then comprising the unified Bell System to segregate their competitive and regulated operations in separate, "arm's length" subsidiaries. Commercial and other relationships among and between subsidiaries were meticulously prescribed. FCC rules also deregulated the provision of customer premises terminal devices, and placed extraordinary information disclosure obligations on AT&T and the Bell companies.

Although commendably procompetitive in purpose, and designed to minimize the possibility telephone companies might gain unfair commercial advantages in competitive markets by leveraging economic power associated with monopoly services, these FCC rules had significant international trade consequences. Deregulating the terminal equipment market, for example, while placing special burdens on the telephone companies' efforts to compete in that field, not only had the effect of opening demand for such equipment to many non-U.S. equipment suppliers, but also handicapping their principal U.S.-based competitors. Requiring disclosure of so-called "network information," moreover, often had the practical effect of requiring the former Bell System systematically to provide commercially valuable information to foreign-based companies.

It was not merely the requirement that there be separate subsidiaries which created problems. Corporations obviously establish subsidiaries routinely for a diversity of legitimate business reasons. The FCC's Second Computer Inquiry Rules, moreover, did not necessarily eliminate all potential competitive risks. As critics have noted, their practical effect in many

regards was simply to convert difficult cost allocation problems into equally difficult transfer pricing problems. Compliance with FCC rules, however, indisputably placed large cost burdens on AT&T and the Bell companies, burdens not also placed on foreign-based competitors. In 1984 AT&T estimated, for example, that compliance with these FCC rules cost the firm as much as \$1.4 billion yearly, estimates which stood largely unchallenged. Even if inflated by a factor of two, these costs constituted more than the combined net income of the competitors the rules ostensibly protected.

In 1985 the FCC proposed and implemented significant changes in the rules applicable to AT&T. The agency also recently adopted new rules that may reduce some of the burdens on the now-divested Bell companies. Full "structural separation" will no longer be required in the case of Bell company equipment operations. These changes in FCC rules, however, occurred only after foreign-based firms established firmer U.S. market positions. Government actions thus had the practical effect of according foreign-based telecommunications companies a significant "head start" in their effort to secure U.S. market shares.

While there has been relaxation of many of these regulatory constraints, Bell companies remain uniquely subject to the parallel, judicially administered regulatory regime embodied in the AT&T consent decree. Under that decree, for example, the Bell companies are flatly barred from engaging in domestic equipment manufacturing for domestic markets. They may manufacture abroad for offshore markets, but only after securing ad hoc waivers from the judgment court. The Bell companies also are required to use open, nondiscriminatory equipment procurement. Indeed, they are the only part of the domestic U.S. communications sector explicitly subject to such a competitive procurement obligation. While Bell companies are prohibited from competing with AT&T in toll services and equipment manufacturing, moreover, AT&T is permitted to compete in business service-related local exchange markets. Indeed, along with MCI and other long-distance companies, it is endeavoring to do so.

The consent decree's requirement of nondiscriminatory procurement is not new. An analogous requirement was placed on the then-unified Bell System in 1976-77 by the FCC. It was part of its "Phase II" proceeding that studied relationships between AT&T and Western Electric. Subsequent to that proceeding, AT&T established the "Bell System Purchased Product Division" which

actively sought to develop new suppliers. Bell Canada Enterprise's Northern Telecom subsidiary was one of the first switch suppliers approved as a Bell System supplier. This step significantly contributed to that foreign-based firm's substantial current U.S. market share.

Prior to divestiture, however, a majority of "big ticket" network equipment purchases was still internalized to the Bell System. Western Electric (now AT&T Technologies) was often the lowest cost, most responsive supplier. Today, though AT&T Technologies continues to be AT&T's primary equipment supplier, the divested Bell companies purchase increasing amounts of equipment and other goods and services from foreign-based suppliers.

Vertical integration into design or manufacture of telecommunications equipment is an option foreclosed Bell companies by the consent decree. They thus necessarily channel their demand -- which represents about 80 percent of total U.S. and, indeed, more than 30 percent of world demand for most "big ticket" telecommunications products -- to outside companies. See Table T-7. Explicitly enjoined from discriminating in favor of AT&T, moreover, and closely monitored both by Government and AT&T's competitors, Bell companies appear actively to be searching out new suppliers. Not surprisingly, given the preeminent position of the Bell companies as purchasers of telecommunications products in the United States, one apparent effect of the AT&T consent decree thus has been the increasing U.S. sales enjoyed by most foreign-based equipment suppliers, especially Japan-based firms. See Table T-4, above.

Table T-7

Bell Company Equipment Procurement
(Percent Purchased from AT&T 23 Technologies)

<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986E</u>
92.0	80.0	71.8	64.2	57.6

Source: NTIA.

These procurement figures are subject to some qualifications. Prior to divestiture, for example, Western Electric was both a manufacturer and distributor. Pre-divestiture sales figures, therefore, may include products made by other companies, then resold to Bell operating companies and AT&T's Long Lines department through Western. Some of the post-divestiture increase in Bell company purchases from "foreign-based" firms reflects large purchases from Northern Telecom Inc. and Siecor, a 50:50 joint venture between Siemens AG and Corning. Both vendors currently manufacture most of the products sold to Bell companies in the United States. These figures, moreover, also may reflect purchases by Bell companies' retail equipment subsidiaries in some cases. Those subsidiaries resell terminal equipment produced by foreign-based firms.

Imperfections in available statistics notwithstanding, it is nevertheless indisputable that divestiture has had adverse trade effects by channeling telephone company procurement dollars to foreign-based firms. Other provisions of the consent decree, moreover, have had more subtle trade consequences. Bell companies are barred, for example, from providing a broadly defined category of "information services." Such services include many of the latest communications service options, such as "voice storage and forwarding," electronic mail, and least-cost routing of long-distance calls (a service the judgment court has ruled also has attributes of prohibited interLATA inter-exchange service).

Virtually all these new services can be provided technologically at least two ways. The capability can be built into central office equipment; or it can be incorporated into customer premises terminal devices. In the case of "voice storage," for example, service can be provided using telephone company central office switches, as is now done in several countries abroad. Alternatively, it can be provided using a "feature-rich" private branch exchange switch (PBX). Or, in the simplest application, voice storage capability is available using telephone answering machines. Demand for such machines, incidentally, has approximately doubled over the past three years and will amount to some 5.8 million -- more than 15,000 a day -- this year, virtually all of which are manufactured overseas.

By prohibiting the Bell companies from offering these new communications services using central office switching apparatus, customer demand for such new services must be satisfied, if at all, using terminal equipment. In some instances, it may be more efficient to use terminal equipment; in others, central office facilities may be more desirable. The

consent decree restrictions, however, override efficiency considerations and indiscriminately channel demand for such "information services" to terminal suppliers. As U.S.-based companies generally have a significantly larger share of the telephone central office switch market than the PBX and other customer premises equipment markets, the net effect is to channel customer demand to products manufactured abroad.

Consent decree restrictions thus affect the efficient functioning and development of the communications services market. Under freely competitive conditions, the locus of certain capabilities within the overall network would be determined by price, efficiency, and performance considerations. This normal evolutionary process is thwarted, however, when Government dictates that a certain class of new communications service options may only be provided in a given fashion, or only by a particular group of firms. Such Government determination, moreover, has the practical effect of sheltering firms which supply advanced terminal equipment from their most likely competition, namely, those which would compete by offering comparable services using central office gear. Consequently, the "information services" restriction not only skews the market in favor of terminal equipment suppliers, many of which are foreign-based. It also tends to afford them the functional equivalent of a protected U.S. market.

Flatly prohibiting potential new Bell company enterprises also may have had significant effects on research and development (R&D) activities. The consent decree does not explicitly forbid research undertakings. The Bell companies could, in theory, undertake research into virtually any area, assuming regulatory permission, without necessarily violating the decree. The Bell companies either individually or through their central services organization, Bell Communications Research Corp. ("Bellcore"), could theoretically engage in research and then market the results to unaffiliated firms. The 1956 Western Electric consent decree precluded the unified Bell System from retailing other than "communications services subject to regulation." Yet AT&T participated in a number of other lines of commerce by virtue of its patent licensing and related activities. Presumably the Bell companies could do the same, although the issue evidently has not yet arisen under the present consent decree.

The practicalities are, however, that the market for such independent research is quite small. Absent the ability fully to exploit research results through manufacturing few companies evidently spend significant sums on in-house research, and the available information indicates that the Bell companies spend very little on research at this time.

The Bell companies in 1985 spent only about \$1,445 per employee on R&D, compared to an average \$3,758 for all U.S. industry, according to Business Week tabulations. In 1985, Bell companies had total revenues about three-quarters as great as AT&T and IBM combined. While those two firms in aggregate spent about \$5.7 billion on R&D, Bell companies spent only about \$800 million directly. See Table T-8, below. Bell companies obviously spend considerably more on R&D indirectly, as their purchases help fund R&D activities of other firms. To the extent those purchases are made from foreign-based companies, however, the effect is to fuel R&D activities aimed at commercially besting U.S. firms both here and abroad.

Table T-8

R&D Expenditures in Telecommunications
and Information Service Industries: 1985
(\$ Millions)

Industry Group	Annual Sales	After Tax Profit	Annual R&D Expenditures	R&D as % Sales	R&D as % Pre-Tax Profit	R&D Expenditures per Employee
Electronics	\$52,100	\$1,785	\$2,294	4.4%	82.6%	\$3,168
Info. Processing						
- Computers	98,155	8,069	7,554	7.7	53.4	7,562
IBM	50,056	6,555	3,457	6.9	29.8	8,525
- Office Equip.	6,793	158	412	6.1	207.1	4,468
- Peripherals	19,617	499	414	7.0	145.6	6,025
- Software Svcs.	4,962	418	413	8.3	57.8	6,307
Semiconductors	10,861	146	1,165	10.7	476.6	6,491
Telecommunications						
- AT&T	34,910	1,557	2,210	6.3	86.8	6,545
- Other Non-RHCs	22,391	-249	595	2.7	neg.	N/A
- RHCs incl. Bellcore (estimates)	62,786	7,465	800	1.3	6.1	1,445
All Industry Composite (\$ Billions)	\$1,553.4	\$60.9	\$48.8	3.1%	42.1%	\$3,758

Source: Business Week; Shearson Lehman Brothers;
Bell Communications Research.

Again, these statistics are subject to qualification. There is no general consensus, for example, regarding what corporate activities should be categorized as "research and development." Spending considered a marketing expense by one firm may be labeled an "R&D" expenditure at another. In the case of firms such as AT&T that are engaged in diverse manufacturing and service activities, the programs and expenditures lumped under "R&D" may be quite broad.

Qualifications aside, it is nevertheless clear that the Bell companies by nearly any measure are only marginal factors in telecommunications research and development today. This is directly attributable to the AT&T consent decree. Yet many trade experts consider R&D critical to the long-range commercial competitiveness of American industry in most world markets.

Foreign government barriers to U.S. market access abroad may persist. If U.S. products are technologically superior, however, foreign consumers will press for the ability to purchase U.S. goods and services. Despite the importance of U.S. R&D in communications, there is some indication that it is flat or, perhaps declining.

A measure of innovation, albeit imperfect, is U.S. patent activity, which has been analyzed for telecommunications by the U.S. Patent and Trademark Office (PTO). See Patent Profiles: Telecommunications (PTO, 1984). PTO found, for example, that the proportion of foreign-origin patents in telecommunications increased sharply between 1970 and 1983. In 1970, 25.6 percent of U.S. telecommunications patents were of foreign origin, as compared to 43.8 percent in 1983. This increase in foreign-origin patents is slightly larger than that for all technologies combined, which increased from 26.9 percent in 1970 to 42.2 percent in 1983. Overall patenting in telecommunications increased steadily over this period, due to the increase in foreign-origin patenting U.S.-origin patenting in telecommunications, however, decreased slightly. There were 27.8 percent more patent applications filed in 1980 than in 1970. But the number of foreign-origin patent applications filed in 1980 was more than double the number in 1970, while U.S.-origin patent applications decreased by 4 percent. Patent activity in telecommunications also increased relative to all technologies, from 3.4 percent of all applications in 1970 to 4.6 percent in 1980.

These PTO findings lend some support to the view that U.S. innovation in this key high-tech sector is being overtaken by firms abroad. The preliminary figures on patent activity post-1983, moreover, do not indicate any substantial change in the earlier trend. Some in industry do not agree that U.S. innovation is stagnant, and they also dispute the relevance of patent statistics. Not all developments, they argue, are patentable -- certain computer software advances, for example. The increasing competitiveness of communications markets generally, moreover, may induce firms to forego patenting, to avoid disclosing any possible competitively sensitive information. If there is a correlation between innovation and

international trade success, however, as many suggest, the precipitous declines in the U.S. telecommunications trade balance in recent years do not imply adequate U.S. industry innovativeness.

Current consent decree restrictions on Bell company activities direct substantial sums toward fueling R&D programs of foreign-based firms. This problem may not admit to prompt solutions; as discussed later in this report, there are limitations on how quickly increased R&D spending necessarily yields commercially valuable results. By the same token, Government clearly should seek to foster, not undermine, what constitutes a major public policy priority, namely, fostering U.S. technological leadership and excellence in a key "high-tech" sector.

Specific Lines of Commerce at Issue

Three interrelated lines of commerce are affected by the AT&T consent decree and reviewed in this report. These are the markets for: (1) network equipment; (2) customer premises equipment; and (3) long-distance communications and "information" services.

Network Equipment

The term "network equipment" generally is considered to encompass the transmission and distribution facilities, including central office switching apparatus, comprising the nationwide regulated telephone network. This network today consists of some 22,500 telephone central office installations (of which about 9,000 are owned by the Bell companies), more than three billion circuit miles of engineered and in-service transmission capacity, and about 118 million access lines connecting telephone service customers to traffic concentrators and switching offices. Typically, switching equipment represents approximately 50 percent of total telephone industry investment. Overall, the national network operated by the regulated telephone companies constitutes a capital investment of substantially exceeding \$150 billion, more, incidentally, than the direct Federal investment in the interstate highway system. In addition, large communications users and particularly the Federal Government, have substantial investments in transmission and switching equipment, for the most part interconnected with the public switched telephone network.

In 1986, the telephone companies which were not previously part of the unified Bell System -- i.e., the "Independents" -- invested some \$4.7 billion in plant modernization and expansion. The divested Bell companies had capital budgets aggregating about \$14.6 billion and AT&T invested \$2.2 billion on its long-distance telephone network in 1986, 57 percent of its total capital spending budget of \$3.5 billion. The competitive long-distance carriers collectively invested about \$2.5 billion on their networks, about 63 percent of their estimated total capital budgets of about \$3.8 billion. A significant percentage of competitive carrier network spending went for switching and related products made by foreign-based firms.

Areas of Limited Competition. The network equipment market encompasses a range of products and not all market segments fall within what might be denominated the "zone of international competitive engagement." At present, for example, AT&T has installed about 105 very large No. 4ESS switches (capable of handling 107,000 terminations and 600,000 call attempts). These are used chiefly in its class 1 to class 3 toll switching centers; the firm plans to have a total of about 200 such machines in place by the end of the decade. There is little significant foreign-based competition for these large toll switching machines and AT&T's domestic manufacturing operations will continue to meet AT&T requirements. Other toll carriers purchase large switches from other U.S. and foreign suppliers. Neither their traffic requirements nor the apparatus used, however, approach the dimension of much of the network switching gear used by AT&T. Both supply and demand for the very largest telephone switches is thus limited mostly to AT&T, remains almost entirely American, and this seems likely to remain so for at least the balance of the century.

Other large toll switches widely used in the United States include AT&T's No. 2ESS and No. 3ESS machines, equipment that is generally used in class 3 and class 4 offices. While some foreign-produced switches have capacity comparable to these large, AT&T-supplied devices, again, this is a relatively distinct network equipment market segment. Some competitive common carriers have requirements for this size toll switch. With the exception of Digital Switching Corporation, however, most of their switches are now provided by Northern Telecom, Fujitsu, and Ericsson, all foreign-based firms. Again, though, this is a market sector in which AT&T Communications today represents most of the U.S. demand and its switching requirements are likely to continue to be met solely by AT&T Technologies. Very large and large toll switches, in short, are not now market sectors deemed particularly vulnerable to foreign-based competition.

Wideband (high-capacity) transmission systems is another network equipment market sector in which U.S. firms currently have some considerable lead. There are significant Japanese challenges in fiber optic equipment and microwave gear. AT&T, however, is generally considered to have outdistanced Japan-based firms in optoelectronics and is also considered to be the premier supplier of long-haul digital microwave equipment.

Europe-based fiber optic firms including Pirelli and Ericsson have achieved some U.S. commercial success. The latter firm is providing equipment to US Sprint as well as to the large private fiber optic network now under construction in the upper midwest and northeast under the sponsorship of several major electric utilities ("NorLight"). Siecor, half-owned by Siemens AG, has a large share of the U.S. fiber optic market. Most experts believe, however, that AT&T will remain the dominant factor in the long-haul transmission systems market at least through this report's 1990 time horizon, if not longer.

Area of Competitive Engagement. Both here and abroad, the perceived primary "zone of contestability" is the market for smaller, local service switches -- namely, central office machines with a capacity from 10,000 to 100,000 lines (and averaging about 60,000 to 70,000 lines). Here, the range of competitive alternatives is broad, and broadening. It includes AT&T's modular No. 5ESS, GTE's GTD-5EAX, Ericsson's AXE machines, Alcatel's E10-Five, Siemen's EWSD, GEC and Plessey's "System X," and Northern Telecom's popular but nonmodular switching equipment series (DMS-10 and DMS-100).

The term "small switches," which is colloquially used in conjunction with this market segment, ordinarily triggers objections from telephone system engineers and other specialists in the field. They point out that most switches today are "modular," after a fashion, and that network architecture and "switching hierarchies" make it technically feasible to use machines of varying traffic load capacities for a diversity of switching chores.

While most electronic switches today are modular, most also come with a central processing unit (CPU) of fixed capacity. Add-ons to the basic machine can call more and more of that capacity into service. But to a greater degree than generally appreciated, the maximum capacity of switches marketed today is predetermined, and persons in the industry (other than traffic engineers) often refer to the "small" or "local" switch market, a term which will be used in this and other sections of this report.

Competition among world-class equipment manufacturers has focused on this equipment submarket and switch prices have steadily declined, partly due to this competition (from about \$1,000 to about \$300 per line or less over the past four years). Switching equipment sales are especially attractive, since initial sales also tend to lead to further sales downstream as equipment is repaired, modernized, or its capacity expanded. This, plus the fact certain switch types and brands are technically incompatible, tends to affect competition in the field.

Local switches constitute 80 percent of the world switching market, measured by number though not necessarily the value of switches now installed. U.S.-based manufacturers today have a negligible share of the market for such switches abroad. ITT Corporation's offshore manufacturing subsidiaries did have a significant share of the European market. ITT recently sold majority control of its telecommunications manufacturing operations, however, to the leading French manufacturer, CGE, which has incorporated those operations with those of its Europe-based subsidiary Alcatel. GTE Corporation also recently sold majority control of its overseas switching and transmission systems operation to Siemens AG. Foreign-based telecommunications equipment firms which manufacture here (chiefly Northern Telecom) have a significant share of the U.S. market, as shown in Table T-9, below. The only U.S.-based manufacturer now aggressively seeking sales abroad, however, is AT&T.

Table T-9

1985 Digital Lines Placed
in Service Worldwide

<u>Firm</u>	<u>Percent Lines</u>
Northern Telecom (Can.)	25 %
AT&T (US)	21
Alcatel (France)	14
GTE (US)	8
Ericsson (Sweden)	8
NEC (Japan)	8
Siemens (West Germany)	6
ITT (US)	4
Other	6

Source: NTIA.

Northern Telecom Inc., a subsidiary of Bell Canada Enterprises, and AT&T are the principal suppliers of all categories of switching equipment to the Bell companies today. GTE sells chiefly to its local telephone companies, which represent about 8 percent of the nation's 118 million access lines and 250 million telephones.

Foreign-based switch suppliers have been successful in selling products to Independent phone companies and the competitive common carriers. They are aggressively seeking Bell company sales but have achieved limited success to date. The largest competitive carrier, IBM's affiliate, MCI, has bought its switches from Ericsson, Fujitsu, Digital Switch, and Northern Telecom. Foreign-based suppliers are also principal suppliers to U.S. rural telephone companies, in part as a result of Plessey's acquisition of General Dynamic's Stromberg-Carlson subsidiary, a longtime supplier to this small part of the overall switch market.

Major Demand Factors. The Bell companies, in aggregate, represent about 80 percent of U.S. demand for all switching apparatus. Non-Bell telephone companies and a few large corporate communications users constitute the balance of the demand side of the market. Data regarding their 1985 procurement which the Bell companies supplied NTIA indicates about 52 percent of their total procurement budget went for switching. Foreign-based firms captured about 29 percent of the total spent on switching. Of this amount, approximately 90 percent of the equipment involved was manufactured or assembled in the United States. Switch sales by foreign-based firms to the Bell companies have steadily increased from 6 percent in 1983, to 18 percent in 1984, and reached 29 percent last year.

AT&T and Northern Telecom Inc. today supply virtually all Bell companies' switching equipment needs. The present heavy reliance by Bell companies on these firms probably results from the court-ordered "equal access" process. Directed to accomplish significant changes in switching installations over a brief period, Bell companies evidently chose to rely primarily on their traditional suppliers.

The court-ordered interLATA "equal-access" process, however, was largely completed in 1986. All Bell companies, moreover, have indicated publicly that they are seeking additional equipment suppliers. Information supplied to NTIA, furthermore, indicates an increasing amount of Bell company spending for transmission products, and especially fiber optic products, is going to foreign-based and foreign-affiliated firms, as shown

below. See Table T-10. Foreign investment in communications and associated manufacturing facilities in the United States, moreover, has been growing rapidly, which suggests further changes in Bell company procurement. See Table T-11.

Table T-10

Bell Company Network Products Procurement
Percentage Purchased from Foreign-based and Affiliated Firms

Switching Equipment Procurement

<u>1983</u>	<u>1984</u>	<u>1985</u>
6	18	29

Fiber Optic Procurement

<u>1983</u>	<u>1984</u>	<u>1985</u>
35	23	40

Transmission Equipment Procurement

<u>1983</u>	<u>1984</u>	<u>1985</u>
5	3	23

Source: NTIA.

Table T-11

Foreign Company Involvement in U.S.
High Technology Markets 1977-1984

<u>Communications Equipment Manufacturing (SIC 366)</u>	<u>1977</u>	<u>1981</u>	<u>1984</u>
Number of Foreign Affiliates Operating in U.S.*	14	22	23
Assets in U.S. (\$ Millions)	\$1,620	\$2,753	\$3,178
Employment in U.S.	NA	36,703	37,901
<u>Computers and Office Products (SIC 357)</u>			
Number of Foreign Affiliates Operating in U.S.*	8	31	37
Assets in U.S. (\$ Millions)	\$421	\$1,612	\$3,063
Employment in U.S.	6,273	23,473	32,646

* Assets, sales, or net income greater than \$10 million in U.S. annually.

Source: U.S. Department of Commerce, Bureau of Economic Analysis.

Again, a significant amount of the equipment bought from foreign-based firms by the Bell companies is manufactured or assembled in the United States. Indeed, most expect this to continue, given trends in this field to collocate manufacturing with ultimate markets, at least insofar as high-value products such as switches are concerned. In spite of this local production, however, statistics show aggregate imports of telephone equipment continuing to increase, resulting in the trade changes discussed at the outset of this report.

Future Expansion. The overall U.S. domestic network equipment market expanded rapidly in 1986. Industry shipments rose almost 24 percent to about \$13.1 billion, according to Commerce Department estimates. Shipments of central office switching equipment were valued at about \$5.3 billion in 1986, up 25 percent over 1985. Sales of multiplexing equipment grew over 25 percent to \$1.5 billion. Transmission systems and carrier line equipment sales rose 12 percent in 1985, according to NTIA estimates, to about \$2.1 billion. Comparable increases occurred abroad, reflecting not only the rapid growth of telecommunications services generally, but also the ongoing industry shift from traditional analog switches to new digital apparatus.

The total 1986 U.S. domestic market for local loop fiber, interoffice trunk fiber, digital switching, and other digital telecommunications equipment has been credibly estimated by Frost & Sullivan, a leading market research firm, at about \$6.9 billion. That figure is forecast by them to increase about 53 percent over the next decade, reaching \$10.6 billion in 1996 in constant 1986-dollar terms. U.S. domestic market projected growth rates, however, vary by sector, as shown in the commercially developed figures in Table T-12 below. Interestingly, non-carrier demand is forecast to increase more rapidly than common carrier demand. Corporate expenditures for in-house communications network products, which amounted to about \$384 million in 1986, are forecast to more than triple to \$1.4 billion in 1996. Purchases by long-distance carriers are likely to fluctuate narrowly in the \$750-\$850 million annual range. Regulated local telephone companies, however, should continue to constitute the bulk of the market, with their purchases rising from \$5.7 billion to \$8.4 billion between 1986 and 1996.

By year end 1989, AT&T says it will have 24,000 fiber route miles in place, compared to 11,000 currently, according to the Wall Street Journal. US Sprint estimates it will have 23,000 route miles of fiber in place by the end of 1989. MCI, the other large U.S. facilities-based toll carrier, indicates it will have more than 10,000 route miles of fiber in place by the end of this year, up from 5,500 at the end of 1986.

Table T-12

U.S. Telecommunications Equipment
Market, 1985 and 1990E
(\$ millions)

	<u>1985</u>	<u>1990E</u>	<u>1985-1990E</u> <u>CAGR</u>
Public Network Equipment			
Switching	\$ 6,005	\$ 5,100	-3.2%
Transmission	5,761	9,993	11.6
Other	1,784	1,628	-1.8
Private Network Equipment			
Terminals	1,243	2,018	10.2
Switching	5,662	3,957	-6.9
Attached Processors	55	629	62.8
Data Communications	2,137	6,698	25.7
Bypass Networks	<u>228</u>	<u>556</u>	<u>19.5</u>
TOTAL	\$22,875	\$30,579	6.0%

Source: Northern Business Information; Frost & Sullivan.

Overall, the increasing volume of high-capacity fiber optic transmission links should exert a dampening effect on demand for switching and associated traffic management equipment and products. Telecommunications network design always involves trade-offs between the cost of switching and the cost of transmission facilities. Most agree the traditional economics of this trade-off have been radically altered by the advent of fiber optic technology and should further change as the efficiency of fiber continues to improve exponentially over the next few years.

Some experts also predict that advances in fiber optic will reduce demand for smaller, local switches, by making "backhauling" more attractive. Backhauling is the switching of circuits over seemingly irrational routes -- going from Washington, D.C., to New York, for example, via Chicago. The rate at which carriers move toward networks based on fewer, larger switches, and more backhauling, could be affected by the artificial service boundaries imposed on the telephone industry

by state and Federal regulation, as well as judicial regulation under the AT&T consent decree. With the cost of transmission falling more rapidly than switching, however, backhauling (and use of fewer, larger switches) may make more economic sense than deploying a large array of costly local switches. To the extent demand for larger switches thus may be boosted, AT&T, as the premier supplier of such large capacity switches, would be advantaged.

Customer Premises Equipment

Customer premises equipment is a generic term that includes telephone handsets, key telephone systems, and private branch exchanges (PBXs), on-site switches designed and used to handle the telecommunications requirements of a single major user (or, in the case of so-called "shared tenant services," a group of users). Also generally included are electronics-based communications products including modems, multiplexing equipment of certain kinds, facsimile, and videoconferencing apparatus.

About 2,000 "interconnect" companies retail customer premises equipment in the United States. Sales totaled about \$14 billion in 1985, up from \$12 billion in 1984, according to our estimates. The International Trade Administration recently estimated total shipments in this submarket of about \$5.1 billion. The difference may reflect our use of sales figures (value installed) versus manufacturer-supplied shipment statistics (value shipped), plus some difference in the products included in this category. Value installed is typically twice value shipped, especially in the case of commercial communications installations, and there are few, if any, consistent equipment categories employed in this or, for that matter, many other communications service and equipment markets.

Handset and Key System Markets. The competitive and trade characteristics of the various categories of customer premises equipment vary widely. In general, however, the more costly and sophisticated a given product, the more likely it is that it will be produced (or at least assembled) in the United States -- except in the case of residential handsets, most of which are now manufactured abroad.

The telephone handset market, deregulated by the FCC in 1980, accounted for about \$1.4 billion in sales in 1985, compared with \$920 million in 1984, but evidently declined to about \$900 million in 1986, perhaps reflecting some market saturation. There are an estimated 250 million commercial and residential telephone handsets in use in the United States today. A leading trade association, the Electronics Industry Association (EIA),

recently forecast that 28.2 million telephones will be sold in the United States this year, including 4.8 million cordless phones, 240,000 cellular phones, and 5.8 million answering machines.

Far East manufacturers dominate this part of the overall customer premises equipment market, accounting for three-quarters of the products sold. Since the early 1980s, residential handset manufacturing has increasingly moved overseas, chiefly due to labor cost considerations. AT&T, GTE, ITT, Comdial, and Northern Telecom, however, still produce handsets in the United States.

Comdial and ITT evidently are the only companies now producing handsets domestically for the residential market. All of AT&T's residential handset manufacturing operations have been moved overseas since 1984. GTE recently announced an agreement, under which Fujitsu will acquire majority interest in GTE's customer premises equipment operations but it still will make some business handsets here. ITT, of course, recently merged all of its offshore and some of its domestic communications manufacturing operations with those of the French government-owned CGE organization (with the communications operations assuming the name Alcatel N.V.). Whether this will affect ITT's domestic business and residential handset manufacturing operations is unknown.

Key telephone systems are more sophisticated, multi-line business communications installations. They bridge the market between single-line, chiefly residential customers, and larger communications users with sufficient traffic to warrant installing a PBX. Key system sales in 1985 were about \$2.5 billion, up from \$2.1 billion in 1984. The International Trade Administration recently estimated 1986 key system sales were down from 1985, to about \$1.85 billion. This decline may be a function both of market saturation and the increasing competitiveness of phone company offerings such as Centrex.

AT&T currently is estimated to have about one-fourth of the total key system market, though it generally has a larger market share with respect to larger key telephone installations. A 1985 commercial survey found, for example, that while AT&T had only about 17 percent of the 4 to 16 station key system market, it had a 32 percent share of the 17 to 40 station market, and a 55 percent share of the over-40 station part of the market. Competition, however, is intense and this is reflected in steadily declining prices. Prices are projected to fall, for instance, from about \$225 per station in 1985 to about \$160 per station by 1989. The telephone equipment retailing subsidiaries of the Bell companies are substantial and growing competitive

forces in the key system market. Bell company subsidiaries, however, currently market no AT&T key systems or related products.

Table T-13

U.S. Key System Market Shares (1985)

<u>Firm</u>	<u>Estimated Share</u>
AT&T	24.7 %
TIE	16.4
ITT	8.3
Toshiba	7.6
Matsushita*	7.1
Iwatsu	5.9
Vodavi	4.9
NEC	3.9
Others	21.3

*92 percent shipped to Executone

Source: Northern Business Information.

Private Branch Exchanges (PBXs). The most commercially important and technically sophisticated part of the customer premises equipment market is the PBX market. PBXs are switches located on customer premises and used increasingly, in addition to handling telephone traffic, for other kinds of business communications. There are about 240,000 PBXs installed in the United States today, and the market has been growing until recently at a rate of about 15 percent compounded each year. U.S. PBX sales in 1985, according to our estimates, were about \$3.4 billion, up from \$3.1 billion in 1984. ITA recently reported total 1986 manufacturer shipments valued at about \$1.8 billion. Five companies -- AT&T, Northern Telecom, IBM's Rolm subsidiary, British Telecom's Mitel subsidiary, and NEC -- currently account for about 75 percent of the U.S. PBX market, measured in terms of lines of switching capacity shipped in 1985, up from 71 percent in 1984.

Because they are regarded as the potential "hubs" of tomorrow's "electronic office," competition in the PBX market has intensified in recent years. A number of firms that are also major suppliers of electronics-based office equipment, Japan-based firms especially, are seeking to capture market share. Germany's Siemens AG also has made major efforts to penetrate the U.S. PBX market. Reportedly it will spend \$300 million in 1987 marketing its PBX and small central office switch product lines here. The telephone equipment retailing subsidiaries of Bell companies today are among the largest PBX distributors, and among the largest distributors of PBXs produced by foreign-based firms. Bell subsidiaries, again, currently market no AT&T PBXs.

Table T-14

U.S. PBX Market Shares (1985)

<u>Firm</u>	<u>Estimated Share</u>
AT&T	25.1 %
Northern Telecom	19.1
Rolm	15.0
Mitel	8.2
NEC	7.6
GTE	4.0
Siemens	3.8
Others	17.2

Source: Northern Business Information.

Virtually all of the multinational corporations now active in our PBX market have some manufacturing facilities in the United States. It has not been possible, however, precisely to determine the extent of U.S. labor content or value added. Certain U.S. "manufacturing" facilities produce PBXs here primarily using components, subassemblies, and assemblies imported from abroad. Others, however, are more integrated and produce many of the items required for final assembly in this country. Complicating the task of determining domestic labor content or value added is the fact that the software incorporated in increasingly sophisticated PBXs is not generally unbundled.

Software may constitute as much as 70 percent of the value of certain PBXs. At least in the case of U.S. brandname PBXs, most software appears to be produced in the United States.

Primary PBX market customers are larger business communications users which employ such switches as part of their overall communications (and, increasingly, data processing) systems. These customers can be divided into two groups. The first are the very largest firms, chiefly major multinational corporations. They typically have substantial in-house communications expertise and thus the ability to piece together systems using equipment supplied by a number of firms. The second group, however, consists of large to medium-sized corporate, educational, or government communications users. They may not now have the in-house resources to facilitate "piece-part" procurement of communications equipment, circuits, and services. This second group thus often prefers to deal with vendors able to offer "one-stop shopping" or a "system solution." For this group, price may be less a factor than convenience, reliability, and the ready availability of maintenance, repair, and upgrading services.

The 1982 AT&T consent decree segmented the U.S. communications market and made "one-stop shopping" difficult. Few firms can fulfill all of a user's communications requirements -- for local, long-distance, and "information" services, as well as for communications equipment of all kinds. Companies such as GTE, AT&T, and IBM's Rolm subsidiary, however, are able to offer a full range of equipment, together with long-distance and sophisticated data services. Using letters of agency, they can usually contract for local services. There are, in addition, an increasing number of independent firms which perform essentially a brokerage function, selling complete packages of services and equipment to users which satisfy all their communications and, in some cases, data processing requirements. Bell companies, however, are precluded by court order from engaging in any facet of the "interLATA" long-distance communications market and may not provide any "information services." Under FCC regulations, moreover, they were until very recently barred from jointly marketing equipment and regulated local telephone services. The ability of Bell companies to select long-distance service providers on behalf of their customers also is constrained (though not entirely precluded) by the consent decree.

Bell and other local telephone companies offer services using central office switching equipment that compete with certain services available to PBX customers. "Centrex" service is the principal example of such a competitive offering. Because of AT&T consent decree restrictions, however, Centrex customers may not have access to several "enhanced" or information services, such as voice storage and forwarding ("voice mail"), or "least-cost routing" of long-distance calls that are common

features of newer PBXs. Additional features common to newer PBXs, such as "Station Message Detailed Recording" (SMDR) and similar aids to communications traffic management, also are unavailable to Centrex customers as they are regarded as "information services" the Bell companies may not offer. Such restrictions tend to make purchase of a PBX installation artificially attractive to communications users interested in obtaining the latest features.

Other Terminal Equipment. In addition to terminal equipment used for voice communications, there is a significant class of non-voice communications equipment, much of which is manufactured abroad. The U.S. facsimile equipment market, for example, should generate about \$560 million in 1986 sales. Virtually all facsimile machines sold in the United States today are produced abroad. Modems, or devices which facilitate data communications, accounted for about \$750 million in sales in 1985. While a majority of modems appear to be assembled in the United States, a substantial percentage of the components evidently are produced overseas. There is, in addition, a significant and growing market for answering machines, as previously indicated. Some 5.8 million such units, with a retail value of about \$500 million, should be sold in the United States this year.

Priority of U.S. Market Access. Traditionally, much of the U.S. communications equipment market was sheltered from direct foreign competition. North American and other countries' technical standards differed significantly. Participating in the U.S. market, therefore, entailed equipment alterations. The vertical integration of most U.S. telephone companies -- and the fact there was little demand apart from these companies -- also was generally regarded as a barrier to competitive entry.

While some technical barriers to entry persist, and there remains some vertical integration, the sheer size of the American market makes it worthwhile for foreign-based manufacturers to adapt to North American standards. The computerization of communications equipment makes adaptation simpler today. And, the emergence of corporate users as an increasingly significant demand factor also has had the effect of encouraging entry.

The United States represents at least 40 percent of world demand for almost all categories of communications equipment. Together, the United States and Canada also represent the largest single market where uniform technical standards prevail. (Mexico conforms to the international CCITT standards, but operates as part of the uniform North American numbering plan. Its switching machines have similar translation and signaling requirements.) The European Economic Community, in aggregate, constitutes an economic entity comparable in size to the United States. Efforts by EEC member countries to develop a European standard, however, have not yet succeeded. In most European countries, moreover,

telephone companies alone constitute most of the demand, and those companies traditionally have relied on a small group of indigenous equipment suppliers.

Virtually all world-class telecommunications equipment manufacturers today consider securing significant U.S. market share a necessary concomitant to achieving and sustaining global commercial success. Some claim, for example, that a company must have at least 7 percent of the world switching equipment market to constitute an effective competitor. This, of course, makes the individual Bell companies especially attractive sales targets as they each individually represent nearly 5 percent of world demand for certain network products.

All major telecommunications equipment producers worldwide appear to assume that, without a significant U.S. market position, they will be unable to achieve economies of scale, scope, or production comparable or superior to companies now enjoying a significant U.S. base, such as Northern Telecom and AT&T. See Table T-15, below. Another reason for U.S. market participation is the benefits from involvement in the most technologically sophisticated market, where digital communications improvements usually are implemented in advance of the rest of the world.

Table T-15

Foreign-based U.S. Market Competitors

<u>Japanese</u>	<u>European</u>
Nippon Elec. (NEC)	Alcatel (CGE)
Fujitsu	Siemens
Hitachi	Ericsson
O.K.I.	Plessey/Stromberg-Carlson
Toshiba	Philips
Iwatsu	Mitel (BT subsidiary)
Matsushita	
Sumitomo	<u>Canadian</u>
Uniden	Northern Telecom

Source: NTIA.

Not only have all major, world-class communications equipment manufacturers targeted the U.S. market, but several have indicated interest in eventually establishing U.S. manufacturing facilities, except in the "low-tech," labor-intensive telephone handset sector. The threshold U.S. annual sales level for such

U.S. production, however, appears to be about 200,000 lines of switching equipment. No foreign-based companies except Northern Telecom have yet attained this level of sales.

This expressed interest in establishing U.S. manufacturing operations could have positive U.S. employment consequences. But it could have potentially adverse effects as well. Establishing domestic manufacturing capabilities might be the first step toward further expansion of the U.S. operations of foreign-based firms. At present, U.S.-based firms capture a significant part of the overall profit associated with the sale, installation, and maintenance of foreign-manufactured telecommunications products. In addition to ordinary distributor and retail markups, "value installed" is often twice or more "value shipped." U.S.-based companies that distribute, retail, install, and maintain telecommunications systems produced abroad thus likely earn profits from the overall transaction equal to, if not significantly greater than, those of the equipment's foreign manufacturer.

Several foreign-based communications companies actively seeking to penetrate the U.S. market, in addition to establishing manufacturing and assembly facilities here, are further diversifying and creating U.S. distribution, retailing, installation, and maintenance subsidiaries as well. L.M. Ericsson, for example, has created a U.S. subsidiary headquartered in Richardson, Texas, with separate divisions in Kansas, Connecticut, and New Hampshire. It also has partnerships with Honeywell and an Atlantic Richfield subsidiary that markets cellular mobile radio products. Ericsson had 1985 U.S. sales of almost \$450 million. NEC, with "full service" subsidiaries in Europe, has established a U.S. sales subsidiary that has enjoyed 100 percent compounded annual growth for the past three years. Sales of NEC communications products in North America expanded from \$450 million in 1983 to nearly \$800 million in 1984, and reached almost \$2 billion in 1985.

West Germany's Siemens organization is another world-class competitor identified as planning to expand U.S. operations into the manufacturing stage of production. Siemens today reportedly has some 21,000 U.S. employees and its 1985 U.S. sales in amounted to \$1.9 billion, of which an estimated \$925 million represented communications products.

Alcatel, now the world's second largest communications equipment maker, has a joint venture with Fairchild Industries to offer and manage "turn-key" corporate communications systems. Reportedly it may broaden this enterprise soon to include AT&T. At present, AT&T and Alcatel's parent firm, CGE, reportedly are also negotiating AT&T's purchase of substantial quantities of

French-made digital microwave equipment. Alcatel had U.S. sales of \$300 million in 1985 and its chairman has stated his intention substantially to increase that sales volume.

While U.S. firms remain preeminent in many relevant markets, telecommunications trends nevertheless appear reminiscent of U.S. experience in other fields. In the auto industry, for example, Japan-based manufacturers initially relied on U.S. distributors and retailers. They shared the commercial risks of new entry and achieving customer acceptance. Once well-established in the U.S. market, however, foreign-based auto manufacturers often bought their U.S. distributors. In some instances, they sought to purchase the most profitable retail outlets as well. Recently, they have sought to establish U.S. manufacturing and assembly plants, supported by foreign-based suppliers that have also set up U.S. production facilities. The result has been to increase overall foreign profits earned on American market sales.

Foreign-based manufacturers were aided in their U.S. expansion by substantial leverage vis-a-vis American distributors (and retailers as well), many of which were relatively small, single product line operations. Just as such diversification on the part of foreign-based manufacturers into additional stages of production has magnified their profits earned on U.S. sales, the same could occur in communications. Telecommunications partnerships or joint ventures with U.S. companies with economic strength or leverage roughly comparable to foreign firms, however, might lessen any chance of a "squeezing-out" of U.S. distributors and retailers in this sector.

Long-distance and Information Services

The U.S. long-distance services market produced revenues of about \$59.1 billion in 1985, up about 8 percent from the previous year. AT&T's revenues were about \$36.8 billion (including access payments), those of competitive carriers \$6.3 billion, and the long-distance revenues of the local exchange companies (chiefly "intraLATA toll" provided by the Bell companies) amounted to \$13.8 billion, or 23 percent of the total U.S. long-distance market. The remaining \$2.2 billion represents the "revenue equivalent" of private microwave networks, together with the record and data communications services offered by Western Union and other firms. Not included are revenue equivalents attributable to Federal Government domestic communications systems.

Increasing Foreign-based Entry. Interstate "interLATA" long-distance usage currently is growing by about 12 percent yearly, according to the FCC, and may increase somewhat more given recent FCC-directed reductions in toll rates. There is little foreign-based involvement in the U.S. long-distance field,

though one foreign-owned company, TDX, a wholly-owned subsidiary of Britain's Cable & Wireless PLC, has aggressively entered the conventional toll services market on a resale basis.

In the data-related, "enhanced services" sector, at least two major foreign communications entities reportedly have acquired small U.S. subsidiaries, and a consortium of European electronics manufacturers reportedly is planning to establish a third. Again, however, there is relatively little foreign-based company presence in this particular field of endeavor.

At present, a joint venture of the French Atomic Energy Agency and the government-owned posts and telecommunications administration reportedly offers sophisticated data communications services through an affiliate doing business chiefly in California. British Telecom has acquired the ITT Dialcom network; it provides remote access data processing and information access worldwide. Pirelli, a major producer of fiber optic systems abroad, and Telettra, the communications arm of Italy's Fiat organization recently announced plans to establish a U.S. communications services operation. A partnership of Telecom Plus and Siemens has been organized to resell interexchange network services. British Telecom, AT&T, and Kokusa Denshin Denwa (KDD), the monopoly Japanese international carrier, moreover, are combining forces to develop international digital networks which will be marketed in the United States.

Section 310(b) of the Communications Act prohibits granting radio frequency licenses to firms more than 20 percent foreign-owned. This provision, however, does not apply to firms such as TDX, which enter the U.S. services market, participate on a resale basis, and thus are not legally licensees of the underlying radio-based communications facilities. Nor does the statutory restriction on foreign ownership apply to new communications modes such as fiber optic systems that, unlike traditional microwave networks, do not require a Federal radio frequency license.

While foreign-based firms are thus permitted to establish nationwide long-distance and related communications service operations in the United States, Bell companies are restricted to providing only intraLATA services, namely communications within the 164 geographic areas prescribed by the judgment court under the AT&T consent decree. They may not offer toll services in geographic areas not contiguous with their local exchange operations. They also may not engage in international communications nor provide services between foreign countries.

The consent decree does not prohibit all long-distance operations by the Bell companies. The current prohibitions, rather, are a matter of degree. In approving the decree, the district court found that the public interest would be furthered

by combining local and some long-distance operations under common ownership. The court in 1985 indicated reluctance, however, to go beyond the present combination of about 80 percent of U.S. local telephone revenues and 23 percent of toll operations in the Bell companies.

Equipment Connections. Some of the equipment used to provide enhanced communications services in the United States is supplied by foreign-based companies. At present, Bell companies primarily use the Northern Telecom SL-10 system and the Siemens EDX-P switches to provide certain local, value added communications services. The Siemens data switch reportedly has been ordered by Indiana Bell, New York and New England Telephone Companies, BellSouth, and US West and will be used in conjunction with planned "integrated services digital networks" (ISDNs). Among other major suppliers of this very specialized category of equipment, is Boston-based Bolt, Beranek & Neuman (BBN), one of the companies responsible for developing the packet switching technology upon which value added systems are based today.

GTE Telenet, now part of US Sprint, is the largest U.S. value added carrier and sells both services and equipment. It has estimated that its Systems Division today enjoys 20 percent of the world market for value added network equipment. Other major suppliers are Siemens (20 percent), Tymnet (15 percent), Northern Telecom (7.5 percent), and BBN (7.5 percent). Less successful equipment suppliers in this sector include Ericsson, AT&T, Amdahl, and NEC. While the range of commercial enterprises supported by value added networks is large and growing, actual network equipment outlays here are small. They probably did not exceed \$100 million in 1985. Most assume, moreover, that U.S. value added network operations are at best nominally profitable, thus limiting present demand for additional equipment.

Another value added service is local area networks (LANs). These systems, used to connect offices, data processing centers, and similar business-related operations, range from a simple copper cable loop, to coaxial cable, to broadband fiber optic packet switching arrangements.

Demand for such commercial networks is increasing rapidly and the worldwide LAN market is expected to grow from some \$760 million (90,000 networks) in 1985 to \$1.5 billion (180,000 networks) in 1990. The United States represents a majority of this new communications market, with 1985 LAN sales of about \$540 million. U.S. LAN sales are expected to reach about \$1 billion by 1990.

The growth of value added or "enhanced" services communications systems generates user demand for terminal equipment. Much of this specialized terminal equipment derives from the East Asian "merchant market." The expansion of U.S. value added communications networks, as well as provision of information services by U.S. telephone companies, thus implies some increasing demand for terminal devices produced chiefly overseas.

Specialized Transmission Systems. In addition to the customer premises and network switching equipment markets, there is also a growing market for microwave and other transmission equipment and systems. Indeed, some market research firms now forecast that transmission equipment and systems will be the only part of the overall telecommunications equipment market to grow rapidly over the next five years.

In the long-distance equipment market, the past five years have seen: (a) moderate growth by AT&T and faster expansion by its toll service competitors; (b) rapid expansion of private networks, Federal Government systems, and networks owned by groups of major users, such as the electric power industry's NorLight system and the seven-state communications network recently proposed by New York State; and (c) rapid expansion of fiber optic systems.

AT&T in 1984 had an estimated in-service transmission capacity of about 987 million circuit miles. It increased to about 1.03 billion circuit miles in 1985. Competing common carriers, however, in 1984 had an estimated 1.19 billion circuit miles of engineered capacity -- about 20 percent more than AT&T. It increased to about 1.7 billion circuit miles by year-end 1985, about 64 percent more than AT&T. Much of this rapid increase in capacity was due to installation of substantial fiber optic transmission capacity, as shown below.

Table T-16

U.S. Long-Distance Fiber Optic Networks

<u>Network</u>	<u>Planned Miles</u>	<u>Miles in Service (11/86)</u>
US Sprint	23,000	6,500
AT&T	10,280	5,200
MCI	7,000	5,000
Nat'l Telecom. Network	11,951	6,983
Regional Networks	<u>9,126</u>	<u>2,480</u>
TOTAL	61,357	26,163

Source: Fiber Optic & Communications Newsletter,
May 1986.

Private forecasting firms such as Northern Business Information maintain the market for transmission equipment will more than double, from \$5.1 billion in 1985 to \$10.1 billion in 1990, largely due to fiber optics. Demand, however, has softened and many analysts expect the current decline to continue through 1987 as long-distance networks near completion and transmission speeds and capabilities increase in quantum jumps (e.g., from 45 and 90 megabits/second to 1.6 gigabits/second by 1987).

The present drop-off in the industry, however, may be the very factor that will eventually bring fiber optic technology into the local loop by increasing its cost-competitiveness with copper wire, satellites, and other telecommunications technologies. Currently, even though fiber cost has dropped to 30 cents a meter, it remains a relatively costly means of serving the individual local loop subscriber. Fiber is more cost-effective than other forms of transmission only in places where there is enough traffic to take advantage of its comparatively unlimited capacity. "The expected transition from the long-haul loop to the subscriber simply has not happened because there is no demand related stimulation forcing telephone companies to race out and buy the equipment," according to researcher John Kessler

of Kessler Marketing Intelligence. Broadband facilities to the home will not be required until the slowly-evolving home information services prove cost-effective to the subscriber. The pace with which the home information services market develops, moreover, depends in part upon whether the Bell companies and AT&T are permitted to enter the business.

Estimates are that AT&T today has slightly less than half the U.S. market for fiber optic cable and associated optoelectronics (which usually constitute 50 percent or more of total system cost). Its principal U.S. competitor is Siecor, a 50:50 joint venture between Siemens AG and Corning. Foreign-based firms such as Ericsson, Pirelli, and Alcoa-Fujikura have had some U.S. sales success in fiber optic cable, while NEC, Fujitsu, and Hitachi have sold optoelectronic components (lasers, LEDs, and photo-detectors). Foreign-based firms have been most successful marketing products to AT&T's long-distance competitors. They are also major suppliers to several private networks. The proposed NorLight system, for example, will be built using chiefly Ericsson and Alcoa-Fujikura products.

Demand for long-distance microwave transmission systems appears relatively firm today. Such systems are installed to provide service on routes where fiber optic are not cost-justified. Major suppliers include, in addition to AT&T, Rockwell International's Collins Radio division and NEC. The long-distance microwave transmission sector is expected to grow from \$550 million in 1985 to \$850 million in 1990. Foreign-based firms captured 20 percent of this market in 1985. This may increase in view of AT&T's pending agreement with the French CGE organization to purchase a significant amount of such equipment and to assist its U.S. sales.

In the local distribution market, microwave systems operating in the 18-23 GHz range offer users increasingly attractive alternatives to traditional land-line systems operated by local telephone companies. This technology is new; the leading U.S.-based supplier, Digital Radio Inc., for example, reportedly was incorporated only in 1983.

Local microwave distribution systems are evolving slowly, although several are operated by Federal and other government agencies. Such systems are closely related to the "uneconomic bypass" concerns at issue in the FCC's Access Charges proceedings. They offer business a means of avoiding local telephone company prices now inflated above actual cost to generate subsidies for other users. Customer savings may be dramatic. AT&T claims, for instance, in sales materials distributed in conjunction with the Digital Radio systems it retails, that "the NDS-DR-23 [system] can pay for itself in less than a year in most cases."

While U.S.-based firms are leaders in the 18-23 GHz microwave business today, NEC America Inc. and Ericsson also are aggressively marketing such microwave systems. Local telephone companies are currently at a competitive disadvantage. Their service prices are inflated for government-directed cross-subsidy purposes. AT&T consent decree restrictions on information services also make it difficult for them to offer service options as advanced and sophisticated as customers can obtain by linking together "feature-rich" PBXs using local microwave or LAN systems.

Relatively small today, local microwave system growth is dependent on whether Government policies are altered to afford local telephone companies more flexibility to compete on a price and service basis. If policies remain unaltered, demand could produce a fast-growing equipment and systems market and Japan-based companies such as NEC are likely to capture a significant share.

Other specialized segments of the communications equipment and services field include cellular mobile radio and the "Very Small Aperture Terminal" (VSAT) satellite network markets. The cellular radio equipment market had a total sales value of about \$629.1 million in 1985, according to Frost & Sullivan, a private market research firm. It is forecast to be \$3.1 billion in 1990 when 468 cellular systems will be operational nationwide. Subscriber equipment (both mobile and portable transceivers) represents 40 percent of the total market, accounting for about \$251.4 million in sales last year.

Bell companies, in aggregate, currently are the largest providers of cellular mobile radio. In addition to systems collocated with their local exchange networks, several (such as Pacific Telesis, Bell Atlantic, and Southwestern Bell) have majority and other interests in cellular systems in other parts of the country. A majority of the subscriber equipment sold is foreign-made, particularly by OKI and NEC. OKI reportedly now assembles some of this equipment in the United States. Much of the "big ticket" base station and other equipment, however, is supplied by U.S.-based companies, particularly Motorola and General Electric which manufacture these products here.

At present, 400,000 Americans reportedly subscribe to cellular radio services. An estimated 1.7 million will subscribe by 1990, when cellular equipment sales are forecast to be about \$4 billion (\$2 billion for customer equipment and \$2 billion for transmission and associated network equipment). These estimates, however, may be overly optimistic. Some of the commercial excitement initially surrounding the FCC's licensing of cellular systems has dimmed, as expansion costs have proven higher than forecast and projected short-term profits have not been forthcoming. Several major newspaper chains that initially were

investors in cellular radio, for instance, recently divested these properties (in some instances, to Bell companies), for lack of short-run profits.

The VSAT or "micro earth station" market is a recent phenomenon. The first installations appeared only in the early 1980s. Equatorial Communications Co., a California-based firm, pioneered this particular application of space communications technology. It uses a patented "spread-spectrum" technology. Several major U.S. and foreign-based corporations including Loew's, Wal-Mart, Southland Corporation (7-11 Stores), Federal Express, Safeway, Farmers Insurance Group, and Schlumberger currently are establishing nationwide or regional VSAT networks. They handle intracorporate communications relating to inventory control, credit checks, facsimile, oil exploration, and videoconferencing. Equatorial has also been relatively successful exporting this technology, recently selling a VSAT network to the Indian Government, for example.

Both receive-only and transmit-receive VSAT terminals are typically used, depending on the particular application. In late 1985, the U.S. installed base of interactive VSAT terminals was about 1,000 units. This is generally regarded as a fast-growing market, despite the financial problems recently affecting industry leaders. Sales estimated to total \$60 million in 1986 are generously forecast to approach \$1 billion by the end of next decade. NASA has estimated U.S. domestic sales of about 260,000 units yearly by 1994, perhaps optimistically, and worldwide sales of as many as 800,000 units.

The proliferation of private satellite networks used for both long-distance and local communications has significant revenue implications for established common carriers. In November 1985, AT&T reportedly solicited requests for quotations from three vendors to supply it as many as 10,000 VSATs. At present, U.S. firms lead in this sophisticated communications technology. In addition to Equatorial, important suppliers of some or all of the components necessary to establish and operate VSAT networks include M/A-Com, Comsat, and Avantek.

Significant Restrictions Abroad. The ability of the Bell companies or, indeed, any U.S.-based firms, to provide long-distance telephone, "enhanced," "value added," or other communications services in markets overseas is, at best, unsettled at present. As part of legislation sanctioning limited competition in its domestic communications market, Japan made provision for some foreign ownership of certain value added carriers by non-Japan-based companies. Both AT&T and IBM have since entered consortiums with Japan-based firms to provide such services. Britain, however, is the only other nation to enact telecommunications reform legislation and it currently maintains a "duopoly" policy with respect to much of its domestic market. At present, only British Telecom and Cable & Wireless's Mercury

subsidiary evidently are permitted to provide most domestic communications services on a facilities basis. Britain has proposed more liberal rules regarding value added networks using leased transmission capacity. But those reforms have not yet been finally implemented.

Several European telecommunications administrations have considered liberalizing restrictions on both conventional and computer-related communications services. Little actual change has yet been accomplished, however. Many U.S. observers see only a marginal chance that open entry and procompetitive policies will be forthcoming soon in major markets such as West Germany which, today, are essentially closed to significant value added services competition.

Because the FCC in recent years has deregulated almost all companies engaged in interstate communications except AT&T, little current data is publicly available regarding foreign-based firms' activities in the U.S. long-distance communications and related services businesses. Foreign-based firms have concentrated on penetrating U.S. equipment markets, though this focus may change. What is clear, however, is that prevailing U.S. policies, especially those embodied in the AT&T consent decree, restrict the activities of several of our leading communications companies both at home and abroad while, at the same time, affording competitive opportunities to an increasing array of foreign-based services firms.

The lopsided trade situation confronting the United States in electronics-based products, and persistent Government restrictions on our leading telecommunications firms, are especially important given the increasingly international character of the markets concerned. In 1975, for example, combined U.S. exports and imports represented only about 5 percent of total U.S. telephone equipment sales, compared to nearly 16 percent in 1985. The importance of telecommunications equipment trade, in other words, tripled in just ten years. This highlights the importance of expanding foreign market access for American firms while, at the same time, reexamining self-imposed U.S. restrictions.

Advanced communications systems and services can make a significant contribution toward improving the productivity, and thus the global competitiveness, of U.S. business and industry generally. Communications and associated computer-related services potentially offer a means of reducing the advantages low labor cost countries may enjoy in certain fields. Advanced communications technology is not necessarily a universal panacea for all that ails parts of the American economy. Among other things, that same cost-saving technology usually is available -- and increasingly employed -- by our trade rivals abroad. What is clear, however, is that these technologies can make a difference. If telephone companies are impeded in their commercial

exploitation of these technologies, that implies potential revenues foregone (or, to the extent capability to offer services already exists, imposing continued inefficiencies and opportunity costs on telecommunications users). Those losses are likely to be considerably smaller, however, than the opportunity costs incurred the U.S. business community and economy overall.

Demand for Export Services. Internationally, there is some demand, chiefly on the part of developing countries, for engineering, systems management, and consulting services aimed at improving indigenous telecommunications networks abroad. Until recently, however, few U.S. firms placed much emphasis on such ventures. GTE and AT&T in partnership did secure a major contract in the 1970s to rebuild part of the Egyptian telephone network. AT&T was a significant supplier of microwave and other communications equipment to Iran under the Pahlavi regime. AT&T also has sought to develop business in India, Bangladesh, and other Asian nations including China and Thailand. Since divestiture, Pacific Telesis has contracted with the South Korean government to provide consulting and engineering services in conjunction with the upcoming Seoul Olympics. Another Bell company, BellSouth, has indicated an interest in the China communications market. GTE, in partnership with French communications firms, recently secured a multibillion dollar NATO radio communications system contract. GTE's Canadian telephone subsidiary also has had limited success marketing equipment in China.

Several factors, however, limit the ability of U.S. firms to penetrate foreign telecommunications markets. In many instances, longstanding commercial relations dating from the colonial era, dictate national telecommunications supplier relations. Virtually all member countries of the French Union, for example, rely on French telecommunications equipment and service suppliers today. In other instances, foreign-based firms have long been entrenched in markets abroad. Ericsson subsidiaries, for example, dominate Mexico and Brazil's telecommunications equipment markets. A Siemens subsidiary has a large share of Argentina's market. Though ITT had a favorable commercial position in some overseas markets, its telecommunications equipment operations are now majority-owned by France's CGE.

A substantial number of contracts with developing nations, moreover, traditionally have been dependent on preferential or concessionary financing, usually supplied by the source government, working in concert with its national telecommunications firms. This has been true particularly in the case of Japan and Scandinavian-based firms, which have penetrated "Third World" communications markets, Africa in particular. Because the U.S. Government in recent years has not encouraged "soft" loans by the Export-Import Bank in this sector, not many major U.S. telecommunications sales have been made in developing countries.

Foreign telecommunications administrations also not infrequently cite increasingly strict U.S. export controls as reasons for avoiding U.S. contracts. As non-U.S. telecommunications companies "lock-up" increasing numbers of developing country markets, short-run or long-term opportunities available to U.S. firms diminish.

Until quite recently, moreover, the United States has rarely mustered the political forces which often determine major telecommunications procurements overseas. U.S. political pressures have not been uncommon with respect to major agricultural, weapons systems, even civilian aircraft purchases. The top-level involvement of the U.S. political leadership in international communications trade again, however, has been rare. While the Reagan Administration commendably has shown considerable awareness of the importance of this particular part of our export -- and import -- economy, it has had to contend with the results of too many years of previous "benign neglect."

The success of U.S. telecommunications firms abroad has also been adversely affected by the timing of the AT&T consent decree. At the same time the world market for communications products was expanding rapidly, the leading U.S. firm, AT&T, was thrust into a Government-dictated reorganization. In addition to the turmoil that effort occasioned, the Bell System breakup also resulted in "icing down" industry capital and human resources comparable to two-thirds those of IBM and AT&T combined, namely, the Bell companies. Barred initially from foreign ventures, Bell companies eventually were able to pursue some international enterprises but only after time-consuming judicial waiver proceedings. A result may have been to compound problems the U.S. telecommunications industry already confronted in endeavoring to compete more effectively overseas.

Trade and Competitiveness as a Preeminent Factor. Vertical integration on the part of some or all Bell companies might appropriately be prevented or limited if it were determined that liberalization would have a clear and immediate adverse impact on well-defined U.S. international trade interests. Most agree the United States today is engaged in the functional equivalent of economic warfare with certain of its traditional trading partners, particularly in the critical telecommunications and computer, or information industry sector. By virtue of self-inflicted wounds, Government actions proven imprudent in hindsight, and persistent foreign restrictions on U.S.-based competition, there is significant chance America's future in this "sunrise," "high-tech" sector will be eclipsed if current policies are not changed.

Unquestionably, there is some potential that removing certain restrictions placed on Bell companies under the AT&T consent decree might exacerbate the communications trade and employment predicaments confronting the United States. Given the present severity of these difficulties, it is especially incumbent on Government to exercise special care.

The current market statistics do not uniformly show the presence of severe problems today. In reviewing the specific sectoral forecasts which follow in Part III, however, readers should bear two factors in mind.

First, the historical track record of Government as a long-run prognosticator in the telecommunications field is at least only fair. While this report endeavors to be accurate, estimates of future markets and revenues in any Government report should be discounted accordingly.

Second, in telecommunications and computers particularly, Government often has either failed to anticipate potential adverse developments, or underestimated the velocity with which those developments might occur.

A case at point is the current predicament confronting the U.S. semiconductor industry. Heralded as among the most promising of our "sunrise," "high-tech" industries only a few years ago, this sector which is critical to much of our economy and our national defense today faces quite serious problems. Similarly, while there were forecasts envisioning a possible reduction in the U.S. trade surplus prior to the Bell System's dissolution, no Government entity anticipated how quickly that surplus would evaporate, much less the substantial and growing deficits which materialized in a matter of but 36 months.

Telecommunications is not simply another trade commodity comparable to citrus, tobacco, or pasta. Rather this is a field where further adverse developments would be of commercially and strategically critical consequence. The need for caution and, if needed, appropriate safeguards, is a function from a public policy standpoint of the likelihood of harms materializing, and the impact of such harms, should they occur. Here, even in those instances where current statistics may suggest a relatively low probability of adverse trade developments, the implications of these harms, should they arise, are so severe that, again, considerable prudence may be called for.

PART II. BELL COMPANY DIVERSIFICATION AND FORECASTS

Theory and Practice of Vertical Integration

Typically firms vertically integrate for two reasons: first, to overcome real or perceived imperfections in supplier (or other related) markets; and, second, to achieve greater production efficiencies and thus, ultimately, secure improved profits. Rate base regulated companies, moreover, may vertically integrate and expand the scope of their operations under certain conditions to increase the profitability of their regulated enterprises -- or, as some have contended, to shift profits beyond reach of regulators. They may also diversify to lessen their dependence on just a few lines of commerce, to insulate themselves from the adverse business cycle effects, or to enhance their attractiveness to investors.

The history of the U.S. telephone industry is essentially one of extensive to very extensive vertical integration on the part of the principal industry players (e.g., AT&T, GTE, United Telecom, and, to a lesser degree, other holding companies such as Centel and Mid-Continent (now ALLTEL)). While the extent of such vertical integration lessened during the 1970s, it remained a prime characteristic of the former Bell System.

Prior to the 1984 Bell System breakup, AT&T justified its extensive vertical integration into equipment manufacturing on a number of related grounds. Manufacturing equipment ensured a more predictable supply of consistently high-quality products, the firm maintained. Close collaboration between commonly owned manufacturing and service operations fostered production of products responsive to user needs, and which reliably worked. Such organization also tended to minimize overall equipment costs, thus, in the final analysis, contributing to lower rates and superior telephone service, the company maintained.

Critics of AT&T's extensive vertical integration contended, on the other hand, that the firm's diversification was part of an overall monopolistic scheme to foreclose competitive opportunities otherwise available to unaffiliated equipment suppliers; or was designed to circumvent regulation and capture monopoly rents in regulated sectors by selling excessive volumes of overpriced telephone equipment to Bell companies. Some have suggested in this regard, incidentally, that the significant post-divestiture profitability of the Bell companies is a function not only of competition driving equipment costs lower, but also because they are no longer obliged to buy allegedly excessive volumes of overpriced products to boost Western Electric's overall profits. It should be noted that while most

of these allegations were raised, they were not conclusively proven in the course of the Government's AT&T antitrust litigation.

Prior to the Bell System breakup, AT&T justified common ownership and control of its local and long-distance communications services operation on the ground that this too gave rise to significant production efficiencies, and thus contributed to lower subscriber costs. Critics maintained, however, that subscribers generally were denied ability to choose their long-distance carrier by the Bell companies. They also suggested the regulatory equivalent of the proverbial "shell game" was thus facilitated, with AT&T moving profits across jurisdictional boundaries to avoid regulatory detection. This, in turn, allegedly produced noncompetitive conditions and costs exceeding any economies of joint production. It should be noted in this regard, that it was not alleged, much less proven, in the course of the AT&T litigation that the firm (or any of its subsidiaries) earned "excessive" profits on its regulated operations and, indeed, U.S. telephone prices then were, by a considerable margin, the lowest in the world.

These previous controversies aside, few would dispute the fact that today's overall telecommunications market environment differs markedly from the closed economic system within which the unified Bell System functioned. With regard to manufacturing and on the negative side of the equation, the likelihood of adverse effects due to vertical integration by Bell companies should be considerably diminished. By virtue of regulatory and consent decree provisions, as well as marketplace developments, competitive supply and demand conditions now prevail in many, if not all, U.S. domestic telecommunications equipment markets. Any one of the Bell companies, moreover, is less than one-seventh the size of the former AT&T and only about the same size as GTE. The ability of these firms to distort competitive marketplace developments thus is much reduced. On the positive side, the presence of efficient and competitive equipment markets producing high-quality products also undercuts some of the traditional rationales for diversification (e.g., the need to ensure a reliable supply of such products).

With regard to most long-distance services, and notwithstanding current imperfections, most agree there is now or soon will be effective competition among suppliers of long-distance telecommunications in a majority of markets. "Equal access" requirements of the AT&T consent decree removed Bell companies as exclusive "agents" previously controlling customer demand for toll services. Equal access means a majority of telephone subscribers now have freedom to choose among competing toll service suppliers; it has resulted in effective competition in demand for such services. Equal access, furthermore, has curtailed the ability of local exchange carriers technically to

advantage toll operations with which they may be affiliated. Given the very substantial price reductions which have occurred especially in interLATA, interstate toll markets, moreover, any concerns regarding profit manipulation (or aggrandizement) by diversified Bell companies likely have diminished.

In telecommunications equipment, only one category of telecommunications products has yet to be moved beyond the scope of regulation or "detariffed" -- central office switching and associated network transmission equipment. Other equipment categories either have been or soon will be removed from carriers' rate bases by virtue of commendable state and Federal regulatory initiatives. The 1977 equipment registration program and other reforms instituted by the FCC guarantee customers broad choice. There is independent demand in the market for most telecommunications products. Few contend, moreover, that there is other than effective competition among the suppliers of most such products. Both competitive supply and demand conditions, in short, generally prevail.

A firm diversifying into a competitive market, general economic theory maintains, ordinarily stands to earn no more than a competitive return from such a venture. The decision to diversify into equipment manufacturing by a Bell company's management, therefore, is unlikely to differ in most instances from other investment decisions. Such diversification might be justified on the ground it would ensure more reliable supply of products, facilitate better quality control, foster the introduction of new products the market at large is unwilling to risk, or otherwise contribute overall efficiency to communications equipment retailing operations. Government policy, obviously, should hardly forestall corporate pursuit of such desirable goals absent strong, countervailing public policy considerations.

By the same token, there is a potential problem here that by diversifying to fulfill perfectly legitimate, individual corporate interests, a Bell company could adversely affect the overall national interest. In the case of central office products, for instance, Bell companies understandably are reluctant to remain dependent as they are today on two firms (AT&T and Northern Telecom). Bell companies' individual interests might be advanced by the presence of viable supplier alternatives which might include their own manufacturing operations. Even were Bell companies to continue to rely only on these two firms, the option of doing otherwise obviously has considerable value in terms of spurring greater responsiveness and price competitiveness on the part of those suppliers. An analogy drawn from another field might be the airline business. Although a given company might rely almost exclusively on Boeing, McDonnell-Douglas, or Canadair, for example, nevertheless, that carrier unquestionably benefits by the presence of real or

perceived aircraft supplier alternatives. This, of course, is little more than evidence of the general rule that buyers ordinarily benefit from the existence of a supplier market that is actually or potentially competitive.

At the same time, however, actions by a Bell company aimed at fostering its own competitive alternatives could have an adverse effect by undermining the long-run viability of U.S.-based suppliers. Under perfectly competitive market conditions, maximum competition ordinarily furthers U.S. economic interests. "Competition," as one familiar corporate message proclaims, "makes American industry excel." There are not now, however, perfectly competitive conditions in much of the world market for central office equipment.

A majority of national markets abroad, even those which are legally open to U.S. competitors, are as a practical matter foreclosed to U.S. entry. This is true in countries such as West Germany, for example, the world's third largest communications market, where U.S. firms that do not manufacture in that country are essentially barred from large parts of the market as a function of deliberate government policy.

The obvious risk, and a risk discussed further in detail in this report, is that by sanctioning certain actions by Bell companies prior to the opening of foreign markets, Government might stimulate significant competition in the short run, but inadvertently or unintentionally lay basis for significantly less competition (and a degree of highly undesirable national technical dependency) in the future. And thus the central public policy question arises, namely, what reasonable means are available which would facilitate an appropriate accommodation of individual corporate goals and objectives with the country's best near-term and long-run interests?

Corporate Strategy Considerations

There is an understandable tendency to regard the Bell companies a single monolithic corporate group. In reality, their individual corporate circumstances vary, as do their publicly stated goals and strategies. Four Bell companies, for example, currently are active in retailing telephone handsets nationwide (Southwestern Bell, BellSouth, Ameritech, and Pacific Telesis). Others have not aggressively pursued sales in this highly competitive sector. One Bell company (NYNEX) has disavowed interest in large-scale manufacturing. BellSouth, on the other hand, has taken a different tack, indicating interest in producing central office switching gear, and a third, Ameritech, has indicated an interest in potentially producing such products in partnership with foreign-based firms. All have expressed interest in providing "information services," but differ

regarding which services they might offer. One Bell company has indicated interest in entering the "interLATA" toll market now on a facilities basis; others have suggested they might enter following the forecast "shake out" and curtailment of the "glut" of transmission capacity. And, one Bell company recently stated that it has little interest in entering this field generally, but may wish to do so in order to meet the needs of some customer groups, major corporate users, for instance.

Whether Bell companies would pursue the same commercial goals, much less do so contemporaneously, is a matter of controversy and debate. In general, however, three schools of thought prevail.

The first school maintains that it is simply unrealistic or naive to assume seven large corporations simultaneously would pursue the same commercial opportunities, particularly in light of these firms' efforts over the months since divestiture to differentiate themselves in investors' eyes. More likely, some would target certain discrete markets to the exclusion of others, and those target markets most likely would be those that are currently underserved and not very competitive. The ability of certain Bell firms to diversify, moreover, may be limited by virtue of efforts already undertaken. Having recently acquired a nationwide network of mobile radio operations at a premium price of about \$1 billion, the ability of Southwestern Bell, for example, further to expand in the short run may be limited. Pacific Telesis and NYNEX also have concluded major acquisitions in the past two years, and may similarly be reluctant to diversify further in the short term.

The second school of thought, however, suggests that all Bell companies will indeed follow parallel courses in order more effectively to pursue that small number of very large corporations which constitutes a major chunk of total communications service demand. They will all, in short, choose to chase after the same large tails.

Major users allegedly demand vendors which are prepared to supply a full repertoire of service and equipment choices. The revenues in that large corporate user marketplace, some suggest, are so large that even if a company can realistically expect to secure only a fraction of the action, that likely will exceed any other niche or group of niche markets in dollar volume. So critical is this particular part of the market, moreover, some maintain, that no Bell company can afford to neglect it, lest users themselves diversify ("bypass") or, more likely, shift their business to other major firms (including other Bell companies).

The third school of thought suggests that the only certainty here is that, given the opportunity, the Bell companies will diversify and thus it is fruitless (or inappropriate) for Government to speculate on their future commercial actions. This view is premised on the fact that virtually all other major telecommunications firms are already diversified, and there is little ground to assume Bell company managements will act differently. It also reflects the view that diversification as often as not is a function of "situational decisionmaking," and not always the consequence of long-run, deliberate company planning.

In 1985, GTE Corporation's unregulated activities generated, for example, revenues equal to about 57 percent of its telephone companies' revenues. In addition to its local telephone holdings, GTE manufactures telecommunications equipment, has a major "information services" subsidiary, is engaged in the long-distance toll business, produces a broad range of lighting products, and is an important defense contractor. The unregulated activities of United Telecom generate revenues equivalent to about 24 percent of its telephone operations. In the case of Continental Telecom and Centel, comparable percentages were 50 and 31 percent, respectively. AT&T's unregulated activities in 1985, moreover, produced revenues which slightly exceeded those of its regulated telephone operations (net of local access payments). Nor is diversification strictly a U.S. phenomenon. Bell Canada Enterprises, for instance, in addition to local and long-distance service operations, has majority ownership of Northern Telecom and an array of other businesses including Canada's largest energy pipeline company. Many rate base regulated telephone companies, in short, are part of broadly diversified corporate enterprises.

In the competitive carrier field, National Telecommunications Network is owned by a consortium of regulated pipeline, railroad, electric, and local telephone companies. MCI Corp. is affiliated with IBM Corp. which, in turn, owns Rolm Corp., a major PBX supplier. Few of the competitive carriers or equipment companies active in the U.S. communications market could accurately be labelled as non-diversified companies.

Because of the prevailing consent decree restrictions, the Bell companies are less diversified into unregulated activities than other major U.S. telecommunications firms. Over time, it is reasonable to assume that Bell companies will broaden their revenue bases, although they may adopt different approaches.

Bell companies' corporate strategies almost certainly will be affected by those of their most likely actual and potential competitors, including AT&T, GTE, and IBM. Whether Bell companies would choose to compete head-to-head against AT&T in long-distance and manufacturing is not clear. Bell companies by

themselves today are relatively ill-equipped to challenge AT&T successfully in certain equipment manufacturing endeavors; that was a line of commerce in which these companies never engaged while part of the unified Bell System and in which they thus lack sophistication and expertise. Even were they able to acquire such capability through partnership with a foreign-based firm, Bell companies confront the reality that AT&T's capabilities are not static. As they might organize to challenge that premier U.S. telecommunications equipment manufacturer, AT&T unquestionably would itself be moving ahead. AT&T, moreover, is today clearly in the process of establishing commercial and other relationships with many of the world's leading foreign-based telecommunications firms, as are GTE, IBM, and most other major U.S.-based players. The set of world-class, foreign-based companies available to the Bell companies for joint venture purposes may be limited.

These matters are discussed in subsequent chapters by this report. In the sections which follow here, however, forecasts regarding specific lines of business and possible trade effects are provided.

Telephone Handsets Forecasts

A common enough assertion is that, permitted to do so, Bell companies promptly would enter telecommunications equipment manufacturing, foreclose sales opportunities otherwise available to existing firms, inexorably "bleed away" sales from leading U.S. suppliers such as AT&T and GTE, and thus exacerbate current U.S. telecommunications trade deficit problems. However credible this familiar scenario might be in other lines of commerce, virtually all agree that in the telephone handset business, Bell company diversification into manufacturing would have few discernible short-run or long-term adverse effects.

Our analysis indicates total U.S. handset sales in 1985 of about \$2.05 billion and we forecast the market for this equipment to grow to about \$3.02 billion in sales by 1990. AT&T now is the market leader, commanding about 20 percent of the handset market. It is followed by Tandy Corporation with 13 percent, Dynascan/Cobra at 11 percent, ITT with 8 percent, and GTE at 6 percent. All are U.S.-based firms, but they manufacture or assemble most of their handset output offshore. Two Japan-based companies -- Uniden and Matsushita (Panasonic) -- have captured a combined 18 percent of the U.S. telephone handset market. More than 70 other firms (both U.S. and foreign-based) share the remaining 24 percent of the market. One firm, Northern Telecom, is expanding its Nashville, Tennessee, handset manufacturing

operation. As previously mentioned, the Charlottesville, Virginia-based Comdial Corporation (partly owned by Pacific Telecom and ALLTEL) also manufactures handsets in the United States. The obvious trend however, is to shift such manufacturing overseas.

The telephone handset market is growing at an 8 percent compound annual rate and this is expected to continue through the end of this decade. For this segment of the market, either in the short run or long term, our estimate is AT&T will remain the U.S. market leader, regardless of whether Bell companies expand their telephone handset retailing operations to encompass manufacturing. From an international trade perspective, whether a factory in Singapore or the Maldives producing handsets for the U.S. market is owned by AT&T, ITT, or a Bell company does not make a great deal of difference.

The handset market truly constitutes a consumer goods business today. Distribution is achieved through department stores, variety and discount chains, some electronics outlets, and specialized communications and office equipment stores. AT&T, however, enjoys significant commercial advantages, chiefly due to a well-deserved reputation for marketing consistently high-quality instruments through a nationwide network of "phone stores" backed up by a sound customer service operation. AT&T thus commands a degree of customer acceptance today which few companies in the field can easily match, much less, readily displace.

This solid market position represents a change from just a few years ago. Prior to adoption of the FCC's 1977 "registration program," virtually all U.S. telephone handsets were produced by U.S.-based firms (chiefly AT&T, ITT, and GTE). AT&T alone accounted for nearly 80 percent of total annual production. In the aftermath of the FCC's 1977 decision, there followed increasing penetration of the market by foreign-based firms. For a brief period customer demand switched toward lower priced, lower quality products, and foreign brandname imports surged. AT&T's determination to sell its installed base of equipment at the time of divestiture, however, reduced aggregate demand for all terminal equipment significantly. At present, customer disenchantment with so-called "throw-away phones," cheap handsets made mostly in Singapore and Taiwan, appears to have peaked. The clear market trend today is toward higher priced, better quality equipment, a segment of the market in which AT&T has few perceived peers.

Because labor costs in the case of telephone handsets continue to represent a high proportion of overall production costs, a majority of private sector forecasters see continuation of trends whereby manufacturing is shifted abroad to lower labor cost areas, chiefly East Asia (excluding Japan). "Feature-rich"

handsets are also an increasingly significant part of the market, and this is a market subsegment that Japan-based firms in particular have targeted. In some instances, foreign-based firms manufacture them to specification using components and sub-assemblies produced in other countries including the United States and this may have positive domestic employment effects. Most products, however, are technically fungible and the technology involved is unsophisticated relative to other telecommunications products.

There is, in short, a worldwide "merchant market" in handsets and it is characterized by strong price competition, periodic oversupply, and advertising-induced product differentiation -- all indicating effective competition. A Bell company permitted to manufacture handsets would, in all probability, simply follow the course pursued by other U.S.-based firms. It would establish foreign manufacturing facilities, or contract with a foreign-based firm to produce the requisite equipment. Profit margins in this line of commerce are not large, however. Commercial success lies in achieving high volume production and retail sales, again not easily accomplished in light of AT&T's preeminent market position.

Given that the handset market is now competitive, subscribers generally are well-informed about available equipment options, and FCC rules require separate accounting, the hypothetical ability of Bell companies to manipulate this particular market, to foreclose sales opportunities, or in any realistic fashion "re-monopolize" the field is small. Nor is the conventional handset market an area where there is significant potential for manipulating interconnection criteria or other technical standards to achieve anticompetitive effects. The technical nature of the public-switched message telephone network today is not such as to facilitate such illicit company behavior. Confronted with a broad mix of network transmission facilities and switching equipment of varying origins and vintages, any telephone company's ability to foreclose or disadvantage competing manufacturers of telephone handsets is not reasonably a problem. Any one of the Bell companies, moreover, represents only a fraction of the overall handset market. Absent illegal collusion, therefore, the ability of these firms adversely to affect marketplace competition through manufacturing is small.

Having been permitted by the judgment court to engage in retailing of telephone handsets, moreover, there are few grounds in economic theory to sustain forecasts of hypothetical competitive or other harms. Functionally, the handset business can be considered a cluster of interrelated processes, extending from initial product development through design and manufacturing, to distribution, retailing, installation, and maintenance. It is perhaps least inaccurately described as the "business of providing handsets."

The consent decree explicitly permits the Bell Companies to distribute, retail, install, and maintain customer premises terminal equipment. They are now allowed, in other words, to engage in most of the commercial activities which, combined, comprise the business of providing handsets.

If Bell companies are assumed to have market power which can be brought to bear on the handset business, that market power presumably could be exercised regardless of the number of stages of production in which the firms are permitted to engage. Any hypothetical ability to exercise market power would not be appreciably enhanced whether the Bell companies are allowed to engage in some, all, or most of the pertinent production stages. We have, in short, already incurred most of the risks hypothetically associated with allowing Bell companies to engage in handset provision. The fact that no adverse effects have been shown to have resulted from permitting the Bell companies to engage in many pertinent production stages to date, moreover, suggests risks of expansion to permit actual manufacturing are, again, small.

What may be true with respect to most of this sector, of course, may not prove universally true. In respect of certain newer, more computer-related, specialized networks, for example, there is a slightly higher -- but still small -- chance of carrier conduct aimed at handicapping unaffiliated terminal equipment suppliers. Such specialized network standards are more rigorous and demanding and admit to a greater manipulation potential. It is thus at least conceivable that problems might arise.

Hedging such prospects, however, are several significant factors. If telephone companies have the incentive and ability to engage in such monopolistic conduct, they presumably can do so independent of diversifying further into manufacturing from their current equipment retailing base. Allowing manufacturing of such specialty terminal equipment, therefore, would again do little to aggrandize latent risks.

Those who typically make use of specialized communications or information services networks, moreover, generally constitute among the most sophisticated communications users. They are precisely the customers most likely to resist, counteract, or circumvent efforts to compel use of carrier-determined equipment. Since the carrier's profits derived from marketing services are likely to exceed those which participation in manufacturing could provide, furthermore, any such strategy is unlikely to prove commercially successful.

From a trade perspective, permitting Bell companies to provide information services could stimulate demand for more sophisticated terminal equipment associated with such offerings, as discussed. Much of that equipment, as is true of other

terminal devices, is also manufactured or assembled abroad. The immediate effects on U.S. trade balances or employment, however, are relatively indeterminant.

Among other considerations, some of the electronic components incorporated in specialty terminal apparatus assembled offshore are now produced in the United States. The electronic components sector is a fast-growing, high-tech, "building block" industry in which the United States today leads, and in which domestic employment opportunities are growing.

An estimated 569,000 U.S. workers in 1986 were directly involved in the U.S. electronic components and accessories industry. Industry surveys indicate that over half the electronic components produced supply the U.S. telephone and computer industries. Of 77 segments used by the Commerce Department to analyze trade trends, more U.S. workers in this segment are manufacturing here for export than in all but four other fields. One hundred and forty-nine thousand U.S. jobs in the electronic components and accessories industry were involved in manufacturing for export in 1984. These statistics suggest that any increases in the offshore assembly of terminal equipment and similar devices may stimulate further U.S. production of the components, subassemblies, and assemblies exported to facilitate those offshore operations.

Not only are U.S. jobs in the components and accessories field dependent on exports, but the level of export dependency has been steadily growing throughout the U.S. electrical and electronic equipment industry as well. This is expected to continue through 1990, as shown below.

Table T-17

Electronics Industry Export Dependency

<u>Year</u>	<u>% of Output Related to Exports</u>	<u>% of Employment Related to Exports</u>
1972	11.2%	11.6%
1977	16.7	12.4
1984	16.8	17.0
1990E	17.9	18.7

Source: NTIA.

In several electronic components submarkets, increasing U.S. employment is expected over the next few years. Employment in the electronic resistors submarket, for example, is expected to grow because of declining imports as well as increasing exports. U.S. employment in the electronic capacitors submarket is also expected to increase because increasing automation is allowing manufacturers to move offshore facilities back to the United States.

In the semiconductors submarket, imports declined from \$7.6 billion in 1984 to \$6.8 billion in 1985. They may decline further in the next few years because of partial resolution of unfair trade complaints filed by U.S. manufacturers against Japanese firms. This submarket employed 194,000 U.S. workers in 1986.

Semiconductors are a major component of many U.S. telecommunications products, reportedly comprising roughly 6 percent of value shipped on average (although considerably more in the case of some products). If Bell companies were permitted to manufacture specialized terminal devices but conducted most assembly operations offshore, demand for components thus generated could have positive U.S. employment consequences.

In conclusion, the current judicial restrictions on Bell company domestic manufacturing of handsets would seem to accomplish little affirmative purpose. The competitive, trade, and employment effects of removing this particular prohibition are at best positive and at worst, inconclusive. Certainly it is difficult to show any compelling public policy purposes which are furthered by continuing to prohibit domestic Bell company manufacturing of handsets and related terminal equipment for sale in U.S. markets.

We have not endeavored, of course, to assess the commercial or other benefits Bell companies might secure by diversifying into handset and terminal equipment manufacturing or, indeed to speculate on whether they might all enter this field. Absent some good reason for Government to foreclose such options, whether to engage in handset manufacturing is a decision best left to Bell company managements. We conclude, in sum, based on our review and appraisal of likely short-run and longer-term circumstances in this particular market segment, that there simply are no good reasons to continue the present flat prohibition on domestic Bell company manufacturing of handsets and related terminal equipment products from a trade or other standpoint.

Key Telephone Systems Forecasts

Bridging the market between individual handsets and larger "private branch exchange" (PBX) installations, the key telephone system part of the overall customer premises equipment business generated sales revenues of about \$2.2 billion in 1985. We forecast revenues to decline slightly for 1986 to about \$2.14 billion, and to remain essentially flat over the remaining years of this decade, amounting to about \$2.13 billion in 1990.

Key telephone sales are likely to prove flat or to decline slightly for two main reasons. First, an increasing number and variety of "low-end PBX" systems are now available. Second, telephone company-supplied Centrex (and equivalent) service offers customers, typically smaller businesses, reasonable alternatives. Changes in the Federal tax laws, which curtail availability of investment tax credits and quick write-offs of telephone and other commercial equipment, may also dampen business demand for key telephone installations over coming years.

AT&T has the largest market share in this equipment submarket today. Indeed, the firm's share is significantly above its reported 26 percent share of the total market if only larger key telephone systems are considered. At present, AT&T manufactures most of its key systems in the United States. Other U.S. manufacturing operations include those of ITT Corporation (which recently sold an interest in its telephone equipment business to the French Government-owned CGE organization) and Vodavi, which currently markets products made or assembled offshore. Vodavi is 20 percent owned by South Korea's Goldstar Ltd., which, incidentally, has several joint ventures with AT&T.

Foreign-based firms today enjoy about half the U.S. key system market and virtually all of the products they market here are manufactured abroad, increasingly in South Korea. Bell companies today retail key telephone systems manufactured by others, but none of these companies has yet secured a large national market share.

Price competition in key telephones is intensifying, as shown by the fact that the per-line price of key systems has steadily declined by some 5 to 10 percent yearly since the Bell System breakup in January 1984. Prices fell some 15 percent per line in 1985 alone. In 1985, the average price per key system station, according to usually reliable commercial sources, was about \$225, down from \$280 per station in 1984. It is forecast to fall to about \$160 per station by the end of the decade. This is an area, however, where consumer demand and vendor-manufacturer experience seems to track the handset market. That

is, after initial fascination with lower priced, generally foreign-manufactured and supplied installations, much of the demand now appears to be shifting toward higher quality, often premium priced systems -- an area where, again, AT&T is preeminent.

Because key telephone systems tend to be relatively sophisticated products, proportionately more such systems are assembled or manufactured in the United States than in the case of "lower tech" products such as residential handsets. This is consistent with the apparent rule of thumb in this field generally, namely, that the more sophisticated a given communications product, the more likely it will be produced at least in significant part in the United States.

Intense price competition may eventually oblige U.S. manufacturing facilities to relocate to low labor cost areas abroad. This assessment, however, is subject to qualifications. There are distinct advantages to locating telecommunications and electronics manufacturing operations in the United States, as Northern Telecom's expansion of its Nashville and other plants suggests. As operations become increasingly automated and "roboticized," for example, the putative advantages of cheap foreign labor diminish. Indeed, given the sophisticated manufacturing equipment used, there are obvious risks associated with entrusting costly automated machines to low-paid, relatively unskilled, foreign workers.

Locating manufacturing operations closer to the ultimate customer, moreover, simplifies production logistics. It tends to reduce inventory, warehousing, shipping, distribution, and other related costs. Because inventories tend to be smaller, manufacturers may be in a better position to respond more quickly to rapid shifts in customer demand, and to capitalize on changes in component and subassembly costs. Collocation, in addition to minimizing foreign currency exchange, profit repatriation, and similar problems, from a production standpoint tends to lessen overproduction possibilities, and thus profit-destroying "peaks and valleys."

A company retailing key telephone systems assembled in Sri Lanka or the Maldives, in Columbus, Ohio, for example, must necessarily maintain a substantial inventory "in the tube," even in this era of inexpensive air transportation. That inventory alone tends to inject commercial inflexibility, and thus limit adaptability to changing marketplace circumstances. Ironically, at precisely the same time many U.S.-based firms appear to be increasingly "outsourcing" their telephone equipment manufacturing operations, Japan-based firms and Canadian-owned Northern Telecom appear to be expanding at least their assembly operations in the United States -- perhaps partially as a

hedge against potential tariffs and other trade barriers, but also, according to some experts, because "on-site" manufacturing simply makes increasing commercial sense.

If Bell companies were permitted to manufacture key telephone systems domestically for the U.S. market, the effects would likely prove quite similar to those estimated with regard to possible handset manufacturing operations. Since Bell companies are able to retail key telephone systems, again, they already enjoy much of whatever ability and incentive to leverage their market power they might enjoy if they were also manufacturers. Permitting them to diversify further into a market which by all measures is effectively competitive should thus yield few if any significant adverse effects.

Bell company diversification into manufacturing of key telephone systems could pose significant competitive challenges for foreign-based companies which currently have at least half the U.S. key system market, and possibly an even larger share of the market for smaller key systems. Whether this would succeed in slowing or reversing foreign capture of this market, however, is unclear. All of these foreign-based companies are substantial, broadly diversified operations and their U.S. distributors in several instances are also affiliated with large U.S. enterprises. Executone, which distributes Matsushita products, for instance, is owned in part by both Continental Telecom and Southern New England Telephone Company. Japan-based manufacturers and their U.S. distributors, moreover, actually enjoyed their most rapid growth and expansion at a time when the unified Bell System was engaged in numerous "hard market" competitive activities later held unlawful in private antitrust litigation. It is not reasonable to assume that these substantial, demonstrably adroit, and commercially resilient enterprises stand at risk of failure due to any marginal increases in existing strong competition caused by further expansion of Bell companies into equipment manufacturing.

At the same time, key systems obviously compete in some ways with telephone company-provided Centrex (and similar) offerings. Whether Bell companies, if engaged in both retailing and manufacturing key systems, would aggressively market such products in direct competition with their Centrex services is unclear. Some maintain they would not; others point to possible advantages to overall firm profits stemming from aggressive intra-firm competition, a practice not uncommon in other lines of commerce.

The presence of Centrex alternatives would complicate any hypothetical monopolization program undertaken by a Bell company in this particular area. This is because equipment competition sufficiently severe genuinely to threaten competing vendors of key systems certainly would also be sufficient to threaten the

profitability of Centrex offerings. A Bell company by manipulating Centrex prices could seek to "administer" demand for customer premises equipment, including products sold by that company's own equipment subsidiary and that, of course, is undesirable. Importantly, however, the addition of the actual manufacturing element would not appear appreciably to affect whatever market power a Bell company might presumably enjoy already.

Most private sector industry analysts contend that telecommunications equipment manufacturing today is not very profitable. In this regard, they point to significant losses recently incurred by established companies such as Ericsson, AT&T, and Northern Telecom, as well as the recent decisions by ITT and GTE largely to exit the field. Since the value shipped of key systems tends to be about half the value installed, it is unclear what additional profits Bell companies might secure were they to diversify into the manufacturing stages as well. There are other reasons, moreover, which might mitigate against Bell company diversification into manufacturing of key telephone systems.

All Bell companies today have equipment retailing affiliates which market a diversity of products supplied by several competing suppliers (other than AT&T). At present, no Bell company retailing affiliate apparently markets AT&T Technologies' products. This diversity of offerings presumably reflects the fact that, in a field where customer desires and requirements vary considerably, those retailers able to offer a full line of equipment choices probably will enjoy a competitive edge.

Were Bell companies (or some of them) to diversify into manufacturing key telephone systems or related products, their retailing subsidiaries might confront pressures to offer only products the corporation or affiliated firms manufacture, as is true with AT&T today. Second, however, and in order to offer customers the widest range of choices, the company might also feel obliged to manufacture a broad range of products. This, of course, would not only significantly increase entry and operating costs; it would also magnify commercial risks, given the competitiveness of this particular market.

To the extent that a given Bell company engaged in key system manufacturing chose to retail only its own products, those U.S. and foreign-based firms whose products are now distributed by that Bell company obviously would be denied some actual or potential U.S. distribution avenues. While Bell company retail operations are only one of many distribution outlets, this could conceivably reduce U.S. equipment sales by some foreign-based firms in the short run, at least until alternative distribution arrangements were developed.

By the same token, such an "exclusive dealing" strategy on the part of any one Bell company would also constitute a relatively high risk proposition. Among other things, the equipment retailing, installation, and maintenance affiliates of the various Bell companies today compete increasingly in each other's telephone service franchise areas. US West's equipment affiliate, for example, has aggressively sought and obtained contracts from the General Services Administration to provide telephone systems in Federal installations nationwide. NYNEX, through its recent purchase of IBM's retail computer stores, competes directly with Bell Atlantic Business Systems. If a given Bell company retailing affiliate were to offer simply products of its own manufacture, therefore, there is little reason to assume it alone could "force" such limited choice on any given market or customer group, given that there are a number of other "full-line" Bell as well as other company operations actively competing in this field. Any such effort by a Bell retail operation most likely would risk rapid loss of profits and market share.

Permitting the Bell companies to engage in domestic key telephone system manufacturing for the U.S. market, in conclusion, poses few new or significant public policy or trade risks. Economically and commercially, the Bell companies already are able hypothetically to visit on the competitive marketplace the near-endless "parade of horrors" which wily lawyers for their actual and potential competitors have been able to suggest. Any anticompetitive consequences of removing restrictions on domestic manufacturing of handsets and key systems for the U.S. market likely would prove relatively insignificant. Such manufacturing, moreover, probably would have virtually no significant adverse impact on trade in this particular market segment.

PBX Equipment Forecasts

Our figures indicate in 1985 U.S. PBX sales aggregated about \$3.15 billion and in 1986 totalled about \$3.25 billion. By 1990, annual U.S. PBX sales should total some \$4.39 billion, or about 80 percent of the handset and key telephone system markets combined. Measured by lines of equipment capacity shipped, we estimate compound annual growth of about 6 percent yearly through the end of this decade.

Three Competitive Tiers. While there are a significant number of U.S. and foreign-based firms now active in the U.S. PBX market, private sector business analysts generally arrange these companies into three relatively distinct tiers. The first-tier companies generally are considered to include the acknowledged market leaders -- AT&T, IBM's Rolm subsidiary, and Bell Canada Enterprise's Northern Telecom Inc. affiliate. Combined, they

currently have at least 75 percent of the installed base and enjoy about 55 percent of annual U.S. PBX sales. These first-tier PBX competitors are generally considered to have strong and durable market positions. They command substantial customer acceptance and have extensive nationwide sales, installation, and maintenance operations in place.

The second tier of PBX suppliers is said to include other major multinational companies such as Siemens, GTE-Fujitsu, NEC, and British Telecom's recently acquired, Canada-based Mitel subsidiary. Of these firms, GTE-Fujitsu currently has the largest installed base, although the NEC base is growing rapidly. Not all these firms, however, today have significant presence in all geographic markets. Some, such as Siemens, also reportedly bear the burden of past technological difficulties. U.S. customer acceptance of Siemens' PBX, for example, evidently has been affected by software problems which arose with some of that company's initial U.S. offerings.

Finally, and in addition to these two tiers, there is said to be a third tier of PBX vendors, chiefly smaller, "high-tech" companies which typically have sought to capitalize on their abilities in the computer and data processing fields by also producing and marketing PBXs (e.g., Jistel, Melco Labs, Harris Corp.). Several of these firms rely chiefly on venture capital and few market their products nationwide. None of these firms, moreover, has apparently been able in recent years to secure significant U.S. PBX market share. Lacking a large installed base to "farm," as it is put by the industry, few private analysts regard them as assured long-term players in the PBX arena.

Three Competitive Factors. Three factors, in turn, are generally considered to affect competition in the U.S. PBX market. First, the average size of PBXs sold is increasing, and the "add-on" market (which hinges on an installed base) is growing in commercial importance. While the total number of lines shipped grew 10 percent between 1984 and 1985, shipments of new PBX systems actually declined by some 3 percent. Sales figures for 1986 show continued decline in unit sales. The total U.S. installed base, moreover, grew only about 8 percent during that period, significantly less than previous years. These sales statistics indicate some market saturation. They also suggest partially competitive telephone company offerings such as Centrex are dampening demand, particularly at the low end of the PBX market.

Second, there is increasing customer preference for digital rather than analog PBX equipment, in part because many users believe it more efficient to handle both voice and data traffic with the same equipment. This trend potentially

jeopardizes AT&T; for while its 12 million line installed base is substantially larger than any of its competitors, it is also estimated to be about 85 percent analog.

Third, however, there is prospect of deployment by companies including AT&T of "integrated services digital networks" (ISDNs) and PBX equipment unable to interact efficiently with ISDN could be rendered obsolete. A carrier, for example, could "pump" so much network and traffic management information down ISDN control channels that users without the line-side facilities capable of handling it would have to replace or drastically upgrade their PBX equipment, or forego use of ISDN. The present data rate of most PBXs, for example, is only .56 Kb/s, below the speed at which ISDN systems may function. While ISDN thus represents a potential threat to AT&T's PBX competitors, who would find their installed bases threatened, it also is perhaps an even more serious threat to AT&T itself, whose own largely analog base might be even more quickly eroded.

International Trade Prospects. Industry analysts disagree regarding the possibility AT&T might undertake what is sometimes extravagantly referred to as a "scorched earth campaign" -- viz., through rapid deployment of ISDN, deliberately depreciate the value of the current installed PBX bases (including its own) and endeavor to capitalize on resulting less competitive market conditions. Among other things, ISDN may prove only a gradually evolving service, and not prove commercially significant until well into the 1990s. Data traffic is increasing, but the present mix of 90 percent voice and 10 percent data should change to only about 80 percent voice and 20 percent data by 1995. Further complicating the situation is the tremendous diversity of signaling arrangements that exists with regard to equipment hypothetically connected to ISDN systems. Dozens of different communications protocols are in use among the millions of computers, word processors, and data terminals currently installed.

One factor which might stimulate rapid deployment of ISDN systems by local telephone companies including the Bell companies is the fact the rate base investment prospects for these firms, absent such costly new systems, may be clouded. Increasing equipment capabilities, steadily declining prices of communications products, and demographic factors including lower household formation rates and relatively stable population levels, are reflected in the declining new capital investment a number of local phone companies have reported in recent years. Rate base investment opportunities, in short, may become scarcer through the next decade, absent advent of large, capital intensive, new services such as ISDN. This, of course, might provide an "artificial" stimulus to the establishing of ISDN. Most experts

agree, however, that the PBX market will remain a major telecommunications market sector and the United States is likely to remain the primary competitive market for such equipment worldwide for at least the balance of the decade.

In addition to these factors, developments in the transmission field bear on competition and trade in PBX equipment. PBX and telephone circuitry expenditures generally are cross-elastic. That is, users can significantly reduce line costs by installing a more costly and sophisticated PBX, and vice versa. What this means domestically, and from an imports standpoint, is that the price and cost of circuits will tend over time to affect the size of the PBX market. And what implies from an international and trade perspective is that the policies foreign communications administrations pursue with respect to communications services and their prices will tend to determine foreign demand for PBXs (and hence U.S. exports, potentially).

Since PBXs offer subscribers means of circumventing or ameliorating common carrier line charges and related restrictive practices, only in the United States are users today generally able to purchase, install, and use PBX equipment of their own choosing subject to just technical regulations. To the extent foreign communications administrations continue to rely heavily on price discrimination to generate the surplus ostensibly necessary to subsidize social programs, they seem unlikely to liberalize technical and other barriers to U.S.-based PBX competition quickly.

Because PBX systems constitute an alternative to securing more carrier-supplied lines, or permit use of "private lines" for "public-switched message" traffic, European telecommunications administrations in particular closely police PBX installations, limit their use, and follow other restrictive practices. In most European countries, technical standards governing installation and use of PBX equipment are rigid and demanding. Equipment typically must be obtained from approved sources, undergo rigorous testing procedures, and be installed by the national communications administration or a cluster of companies it has licensed for such work. Excepting British Telecom, which recently purchased the Canada-based Mitel Corporation, none of the European telecommunications administrations are formally integrated into manufacturing, and the same is true in Japan. Post and telecommunications administrations, however, have close relations with indigenous equipment suppliers in most instances. The preferred status of such suppliers, and the persistence of rigid carrier technical requirements and restricted regulatory pricing schemes, has the practical effect of curtailing the PBX export market potentially available to American firms.

Three large firms active in the U.S. market today have achieved measurable shares of foreign PBX markets. Northern Telecom, Mitel, and Rolm Corporation, for example, have a significant share of the Canadian market. After years of seeking to market their products in Europe and Japan, they have secured small overseas bases. AT&T also has made a major effort to market PBXs in Canada, but has confronted a stiff import tariff (17 percent); it has not yet achieved much commercial success. This all, in short, implies that any trade consequences of relaxing current AT&T consent decree restrictions to permit the Bell companies to diversify into PBX manufacturing are likely to affect only U.S. imports, not the exports side of the national trade ledger.

Competition policy concerns can be raised regarding involvement of rate regulated telecommunications carriers in the PBX business. These concerns have international trade ramifications since the competitiveness of U.S. markets tends to determine the sales opportunities available to foreign-based firms. The argument is also advanced on occasion that "too much" or "unfair" competition -- in part attributable to the Bell companies hypothetically -- will erode the U.S. domestic sales base of American firms and thus adversely affect their ability to compete overseas.

These competition concerns and arguments come in a diversity of forms. Because such equipment is competitive with telephone carrier service offerings, there is some theoretical possibility of anticompetitive "market/demand administration" activities, i.e., monopolistic promoting of one alternative over another and curtailing customer choice. There is also some possibility of anticompetitive, discriminatory conduct. A user purchasing a telephone company-supplied PBX, for instance, might experience fewer difficulties and delays in obtaining necessary line hookups or other needed communications services. PBX equipment, moreover, is considerably more complex technologically than handsets or key telephone systems. The possibility that a more vertically integrated carrier might manipulate telecommunications system standards to advantage its affiliated PBX supplier is thus theoretically greater in this sector than in others.

There is the additional potential for sustained sales below marginal cost on the part of telephone company-affiliated PBX suppliers -- so-called "predatory pricing." Leaving aside the question whether such pricing could ever prove successful in a declining cost industry with virtually no legal barriers to entry, "predatory pricing" is not an easy argument to sustain, considering the likely targets of such illicit conduct. At least three of the major PBX suppliers in the United States today -- AT&T and IBM's Rolm subsidiary, as well as Bell Canada's Northern Telecom -- obviously have deep pockets. Mitel, moreover, is a

subsidiary of British Telecom, a firm which is larger than any of the Bell companies. Many other PBX vendors are likewise affiliated with major multinational firms.

Telephone company-affiliated firms might nevertheless for some reason engage in "predatory pricing" which conceivably could affect the very smallest firms in this market and hasten the industry consolidation private analysts predict. Virtually all of the competition policy concerns which might be legitimately advanced including these, however, would mitigate against sanctioning any Bell company (or other common carrier) involvement in any part of the PBX business. That, clearly, is not the present situation.

The AT&T consent decree permits the Bell companies to engage in all but actual domestic manufacturing of PBXs for domestic use. It also permits AT&T (a rate base regulated firm), which potentially has at least equal if not greater "market power," to participate in all stages of production. GTE, which is in partnership with Fujitsu in the manufacturing and marketing of PBX products, has extensive local telephone operations and is comparable in size to any of the individual Bell companies.

As discussed earlier in the section above on handsets, if Bell companies (or AT&T, GTE, or other carriers for that matter) enjoy "market power" which might be brought to bear and used to gain unfair, anticompetitive advantages in the PBX field, that power can be exercised without necessitating corporate involvement in all stages of production. Permitted today to engage in distributing, retailing, installing, and maintaining PBXs, the Bell companies need not vertically integrate further into yet more stages of production to affect the market. To capture "monopoly rents," it is unnecessary, figuratively speaking, for a potential robber baron to own all the Rhine River castles; one or two ordinarily will suffice.

Bell companies, by virtue of the judgment court's decision in 1982 to alter the settlement agreement as initially proposed by the Government, and to permit their participation in some stages of the overall PBX business, have -- and have had -- means available theoretically to leverage any market strength to distort the competitive process. The fact that this has not demonstrably occurred to date provides some indication that the potential for abuses is small, or existing regulatory and antitrust safeguards are sufficient, or both.

Allowing Bell companies to diversify further into PBX manufacturing, should one or more of the seven firms choose to do so, in sum, should have no appreciable adverse effects on any latent competitive problems which might exist. Similarly, such diversification should have little or no adverse effect on trade dynamics in this particular sector.

If Bell companies were allowed to diversify into manufacturing, they might, in theory, establish "preferred supplier" relationships. Such arrangements, however, could be entered into today. The AT&T consent decree does establish a general obligation on the part of Bell companies (but not AT&T) to employ open, nondiscriminatory procurement. This has been interpreted by some as applying to unregulated telecommunications equipment affiliates as well. Any such general obligation, however, obviously admits to deviations, should companies so choose.

There are, again, obvious commercial risks, however, associated with any "exclusive dealing" policy when a general trade product such as PBXs is involved. To the extent retailing affiliates do not offer customers the breadth of choice they demand, an affiliate risks relinquishing business to other firms, including the equipment affiliates of other Bell companies. To the extent such exclusive dealing limits or reduces retail sales, and thus total revenues of any underlying manufacturing operation, the firm may be less able to fund the research and development activities necessary to continue to offer state-of-the-art products in an increasingly competitive field.

Even if a Bell company were to establish a joint venture with one or more foreign-based firms to manufacture PBX equipment to be retailed by the carrier's equipment affiliate, that would not necessarily result in increased U.S. imports. As indicated above, most PBX equipment now sold in the United States has some significant U.S. content. The products marketed by the leading manufacturers are produced almost exclusively here. At least one Japan-based manufacturer assembles products in the United States. Software, moreover, is increasingly a predominant system cost component, and its origination varies. In some cases, the software is developed at the manufacturer's "home base" and forwarded to overseas assembly locations. In other instances, the PBX software used in the United States is produced here. The problems of determining the "nationality" of PBX equipment are not different in character, though they are greater in degree, than those in other equipment markets due to the increasing value of the pertinent software.

Modifying or eliminating the current AT&T consent decree prohibition on manufacturing as it applies to PBX equipment, again, is unlikely to have significant adverse trade or other consequences during the 1987-90 timeframe at issue here. The leading U.S. suppliers of PBX equipment today appear to be well-positioned to retain strong market positions. Even in league with foreign-based manufacturers, moreover, PBX manufacturing would afford those Bell companies which chose to enter this particular field few special advantages -- and little additional ability to distort competitive markets that they do not, in theory, already enjoy. All suppliers today have the opportunity,

moreover, to sell directly to telephone company service customers, and that, of course, should continue to prove true for the indefinite future.

Digital Central Office Switching Equipment

Our information indicates that U.S. digital central office switching equipment sales amounted to about \$3.69 billion in 1985. They totalled about \$3.7 billion in 1986, and are expected to decline to about \$3.2 billion in 1990. After the early 1990s, however, sales should begin to increase gradually, due to the scheduled conversion and replacement of now-installed No. 1ESS analog switches to digital operation (and the possible installation of yet to be produced optical switches capable of handling fiber optic communications traffic more efficiently). Notwithstanding declining U.S. demand through the balance of this decade and the current dominance of the U.S. central office switching market by AT&T and Northern Telecom, this particular part of the overall communications market is, as indicated earlier, clearly perceived as the primary "zone of competitive engagement" for the dwindling number of world-class switching equipment firms.

Overall, the digital switch market has been aptly analogized to the jet engine market and the dynamics of these businesses are similar in several respects. The number of customers, for example, is relatively limited and each enjoys significant economic power in some regards. There also are a small number of producers each of which, in turn, has its own kind of market power.

R&D costs are very large; at least \$1 billion in R&D expenditures reportedly would be required to develop either a new digital switch or a new jet engine. These similar lines of commerce are also sometimes characterized as both capital-intensive and labor-intensive. Production costs are so high, moreover, that significant unit sales are required to break even. One estimate, for example, is that the sale of 400 switches (or jet engines) is needed to break even, and 700 units to achieve profitability.

At present, about one dozen firms worldwide are engaged in producing digital and electronic switching apparatus, some on a substantially subsidized basis. Production costs are so high, however, and competition has become so intense in recent years, that many experts see the number of world-class switch market competitors declining to no more than four or five independent producers by the turn of the century. (By comparison, three companies today produce virtually all the free world's jet engines -- General Electric, Rolls-Royce, and United Technology's Pratt & Whitney subsidiary.)

Canada and the United States, Europe, plus Japan constitute about 90 percent or more of the world switch market, with the United States alone representing at least 40 percent. Two of the largest switch producers today are well entrenched in the U.S. market. Market share estimates vary but in 1985 Northern Telecom and AT&T probably shared at least 70 percent of the U.S. central office switching market, shipping about 6 million lines apiece (or a total of 12 million of the 17 million lines installed that year). By most estimates, both firms shipped well over three times as many lines of equipment capacity as the next largest U.S. company in the field, GTE Corporation, which sold some 1.7 million lines, primarily to its owned and operated local telephone companies plus a few of the U.S. Independents.

Not only do Northern Telecom and AT&T by nearly any measure currently dominate the U.S. central office switching market, but both have an installed base which dwarfs their competitors. This is an important competitive advantage given that telephone companies often are reluctant to incur the spare parts, inventory, and personnel training costs associated with adding new makes of central office equipment, or replacing existing plant piecemeal. Both of these manufacturers have a steady source of revenues from producing software upgrades to the installed base. Each firm, moreover, has a substantial research and development capability and thus is well-positioned to maintain a leading position in the world switch market.

Despite obvious competitive obstacles AT&T and Northern Telecom's switching rivals confront, the aggregate requirements of the Bell companies are so large that securing even a small share of their demand apparently is deemed highly important by several foreign-based firms. It is considered important to facilitate economies of scale and scope sufficient to maintain dominance of "home" markets. It is also believed an important means of ensuring success over the long term in the global market.

Table T-18

Regional Bell Operating Companies' Central
Office Switch Installations and Access Lines
1985 and 1986 (projected)

Company Access Lines <u>Installed</u>	<u>Electro-</u> <u>Mechanical</u>		<u>Analog</u>		<u>Digital</u>		<u>Total</u>	
	85	86	85	86	85	86	85	86
<u>Ameritech</u>								
Illinois Bell 4.8 million	125	108	142	137	36	76	303	321
Indiana Bell 1.45 million	96	89	59	59	9	16	164	164
Michigan Bell 3.8 million	207	186	144	143	23	46	374	375
Ohio Bell 2.96 million	133	99	94	91	32	65	259	255
Wisconsin Bell 1.53 million	46	26	65	64	21	41	132	131
<u>Bell Atlantic</u>								
C&P Telcos 5.92 million	381	219	243	241	96	202	720	662
Bell of Pa. 4.62 million	184	111	139	133	80	159	403	403
Diamond State 337,487 lines	3	0	14	14	16	20	33	34
New Jersey Bell 4.2 million	72	55	118	117	24	37	214	209
<u>BellSouth</u>								
Southern Bell 8.08 million	255	215	273	256	119	181	647	652
So. Cent. Bell 6.42 million	601	568	291	283	69	109	961	960

Company Access Lines Installed	<u>Electro-</u> <u>Mechanical</u>		<u>Analog</u>		<u>Digital</u>		<u>Total</u>	
	85	86	85	86	85	86	85	86
<u>NYNEX</u>								
New York Tel. 8.69 million	379	331	236	232	86	140	701	703
New England Tel. 4.8 million	519	456	92	92	71	104	682	652
<u>Pacific Telesis</u>								
Pacific Bell 11.52 million	351	322	302	301	81	108	734	731
Nevada Bell 185,000 lines	16	13	14	13	12	16	42	42
<u>Southwestern Bell</u>								
SW Bell 10.9 million	810	716	438	431	63	170	1311	1317
<u>U.S. West</u>								
Mountain Bell 5.17 million	582	549	193	189	34	76	809	814
NW Bell 3.41 million	503	487	135	133	20	39	658	659
Pacific NW Bell 2.59 million	175	120	80	78	14	69	269	267

Source: Communications Week.

At the same time that foreign-based switch producers have targeted Bell companies as potential customers, the companies themselves have initiated their own programs aimed at obtaining additional suppliers of some categories of central office products. These programs are regarded by some as simply efforts to spur AT&T and Northern Telecom to lower their prices and

improve their responsiveness. They are also regarded, however, as possibly the prelude to individual or collective "vertical re-integration" by some of the firms which once constituted much of the fully vertically integrated Bell System.

As the central office equipment used by U.S. telephone companies becomes increasingly computerized, software becomes more and more critical. It also becomes, as in the PBX business, a larger part of overall equipment or systems cost. Bell Communications Research Corp., the research consortium of the Bell companies, has software design and production capabilities today comparable to those of other firms. Individual Bell companies also increasingly have the ability to design and produce many of the computer programs which could, in theory, direct operation of their central office switching gear. Increasingly, however, proprietary software (source codes) is integrated with equipment. While Bell companies thus conceptually might diversify only into producing simply software, it is also possible that they would produce both software and hardware, if permitted to "manufacture."

There are a number of ways Bell companies hypothetically might enter all or part of the switch business. First, they could do so on an independent, de novo basis. While costly and time-consuming, that is not necessarily an undertaking beyond the financial capabilities of these very large and profitable firms.

Second, Bell companies could enter through acquisition of an existing switch manufacturer. A French-based organization (CGE), for example, recently concluded an agreement effectively to acquire ITT's telecommunications manufacturing operations. Siemens has recently purchased most of GTE's offshore manufacturing. Any of the individual Bell companies is approximately as large as Siemens or CGE. There are also U.S. switch makers such as Digital Switch Corp., not now part of much larger corporate entities, that might be acquired.

Third, one or more of the Bell companies could diversify into switching in partnership with an established manufacturer. Joint production agreements are increasingly the dominant form of commercial organization throughout the telecommunications manufacturing field. Indeed, one Bell company has indicated this is the means it would choose.

Given substantial barriers to speedy, "full-blown" entry into central office switch manufacturing, most assume any Bell company choosing to diversify into this field would do so in partnership with an established manufacturer. At present, there are only two large U.S.-based central office switch manufacturers, AT&T and GTE. Stromberg-Carlson, traditionally a major

supplier to the U.S. independent telephone industry, was acquired in the early Eighties by Britain's Plessey organization, which bought the firm from General Dynamics.

ITT Corporation, as noted, has sold majority control of most of its telecommunications equipment operations to a French Government-owned company. Alcatel, owned by the French Government, reportedly has been discussing joint ventures with Digital Switch Corporation, a small U.S.-based digital switch supplier that, to date, has sold chiefly to the U.S. competitive carriers. Alcatel's parent firm, CGE, and AT&T are negotiating an agreement whereby AT&T will assist in U.S. distribution of French-made telecommunications products in return for liberalized AT&T access to French markets.

In view of existing global telecommunications commercial alliances, it seems most likely any Bell company choosing to diversify into switch manufacturing would enter into a joint venture agreement with a Japan-based firm already established in this field, or perhaps with West Germany's Siemens organization. Some speculate NEC and Fujitsu are the most likely candidates, despite these firms' existing relations with AT&T. Fujitsu and Siemens, incidentally, have a history of commercial collaboration spanning most of this century. Both thus might be involved in any Bell company joint venture. Others believe Ericsson, which has had financial problems in recent years, is a likely candidate. For these foreign-based companies, an attraction of an alliance with a Bell company would be the likelihood it would gain preferred access to that phone company's future switch requirements, internal demand equivalent in some cases to 5 percent or more of the world switch market.

Forecasts in general, and in telecommunications in particular, are difficult, and those by Government historically subject to risk of wide error. With respect to the electronic and digital switch field, however, perhaps the most common assumption is that, absent present consent decree restrictions on manufacturing, one or more of the Bell companies rapidly would enter into foreign joint ventures which would focus on producing equipment directly competitive with AT&T's No. 5ESS switch. AT&T's domestic switch sales the company argues, would decline, more rapidly than foreign switch markets could be opened to competition. This, in turn, it contends, would damage AT&T, the U.S. "flagship" in this critical field, to the long-run detriment of U.S. telecommunications leadership. Accordingly, some maintain that the current restrictions on Bell company switch manufacturing should be retained, at least until foreign switch markets are more open. Alternatively, any Bell entry into switch manufacturing with a foreign partner should be conditioned on the partner's home government granting U.S. firms expanded foreign market access.

A key question here is whether there is a high risk of such harms materializing. A related question is whether conventional regulatory and other Government control mechanisms apart from the decree are so inadequate to manage or control risks -- or to obtain expanded foreign market access -- that absolute prohibitions are appropriate. If the answer to these questions is "yes," flatly prohibiting Bell company manufacture of electronic and digital switches might be defensible as a public policy proposition.

Most of the debate which has surrounded this particular aspect of the overall issue of possible Bell company manufacturing has involved relatively speculative -- or at least, not fact-based -- assertions and counter-assertions. As a first step toward bringing more clarity to this debate, therefore, certain assumptions that admit to at least some objective assessment were developed.

It was assumed, to begin with, that any given Bell company's diversification into digital and electronic switch manufacturing would be most likely under three conditions. First, the company would probably have to have a significant internal requirement for electronic switches generally, and for the category of switches said to be most "at risk," namely the "smaller" switches comparable to the No. 5ESS that AT&T produces for installation in local class 5 central offices. Such switches constitute about 80 percent of switches measured by number, though not necessarily as measured by value installed.

Second, the hypothesized, diversifying Bell company would have to have some reasonable assurance that its state regulators would approve replacement of existing electromechanical switches by new electronic switches. This should not necessarily be assumed, given arguments regularly advanced in some states that switch upgrading expenses should not be chargeable against "ordinary telephone subscribers" because they facilitate new offerings those subscribers neither use nor desire. In this regard too, the hypothesized firm would have to have some reasonable assurance that it could afford such upgrading. While all the Bell companies today are profitable, virtually none have earned the maximum allowable rate of return consistently over all of the past five years. Recent years have also seen quite rapid changes in profit levels even by firms which assumedly have significant market power. The profitability of AT&T, Comsat, and ITT, of course, are cases on point. There is no guarantee that Bell companies will continue to be as profitable as today when the hypothesized switches they manufacture or co-manufacture are being brought on-line.

Third, the hypothesized Bell company, with the internal demand plus the wherewithal to satisfy it, would also have to have some reasonable assurance that it could: (a) circumvent the decree's "open procurement" decree with impunity; or (b) reliably produce switching equipment at costs sufficiently below competitors' prices to minimize regulatory problems; or (c) look forward optimistically to selling the output of its manufacturing operations in an increasingly competitive switch market that already has claimed a number of major corporate casualties. The likelihood that a rate regulated telephone company today could pass along inflated central office equipment costs has diminished in recent years as the telecommunications equipment field has steadily become more price-competitive, market price benchmarks have materialized, and regulatory scrutiny has grown due to local rate increases and associated political pressures. At the same time, a foreign-based firm in partnership with a Bell company might well be prepared to sell switches here at a less profitable price, and recoup any losses by overpricing the equipment it sells in its protected home market abroad. The real risk, therefore, may be sales by the joint venture of switches at "subsidized" prices that firms including U.S. firms without protected home markets cannot match.

The optimal candidate for a partnership with a foreign-based firm to produce digital and electronic switches, in short, would be a Bell company: (1) whose existing network now relies significantly on smaller, primarily analog switches; (2) which is assured of future profits; and (3) can either reasonably expect to dupe its regulators or to succeed in marketing where others have failed.

The available information indicates that few of the Bell companies today fully satisfy this hypothetical profile. Relying on published industry information, for example, we counted the total number of switches which the Bell companies individually were forecast to have in service by the end of 1986, and also determined the total percentage of existing electronic and digital installations. Such information provides at least a very rough idea of the potential demand for digital and electronic switches which each of the Bell companies generally represents.

In addition, we then sought to determine the relative mix of switches used by each of the Bell companies in their current network, again using generally available trade and industry information. Average number of lines served per switch provides a very rough indicator of typical switch size, although a number of caveats and qualifications apply to such numerology. As discussed above, equipment marketers may recognize "local digital switches" as a distinctive commodity, but telephone engineers, citing the partial modularity of switching equipment today and the vagaries of network architecture, generally do not.

Nevertheless, the smaller the "average" switch used, the more likely would seem diversification into the local, digital switch market in, potentially, partnership with a foreign-based firm.

This information is displayed in Table T-19, below. What these numbers indicate, for example, is that by year-end 1986, Ameritech Corporation, which serves principally the densely populated, heavily commercialized areas of the Midwest, will have almost twice as many lines served per switch on average than US West, which serves many of the less densely populated, less commercialized areas in Western and Rocky Mountain states. One could not unreasonably conclude that Ameritech's telephone exchange business today is thus considerably more dependent on large switches than US West's. These figures also indicate Ameritech's current switch investment overall is only about three-quarters as electronic and digital as US West's. If one followed such information through to a logical conclusion, one might assume that neither Ameritech nor U.S. West is an optimal candidate for a partnership with a foreign-based firm for the purpose of manufacturing smaller capacity, local electronic switches.

Table T-19

Relative BOC Switching System Characteristics

<u>Company</u>	<u>A.</u> <u>Total</u> <u>Switches</u> 1986	<u>B.</u> <u>Total</u> <u>Lines</u> <u>Installed</u> 1986 (\$ Millions)	<u>B+A</u>	<u>C.</u> <u>Percent</u> <u>Electronic</u>	<u>D.</u> <u>Percent</u> <u>Digital</u>	<u>C+D</u>
Ameritech	1,246	14.5	11,637.24	40.8	19.6	60.4
Bell Atlantic	1,308	15.1	11,544.34	29.4	31.9	61.3
Bell South	1,612	14.5	8,995.04	48.6	17.9	66.5
NYNEX	1,355	13.5	9,963.10	58.1	18.0	76.1
Pacific Telesis	773	11.7	15,135.80	43.3	16.0	59.3
SW Bell	1,317	10.9	8,276.39	54.4	12.9	67.3
US West	<u>1,740</u> 9,351	<u>11.2</u> 91.4	<u>6,436.78</u> 9,774.36	66.4	10.6	77

The chance to secure preferred access to simply part of the annual switching equipment requirements of any one of the Bell companies, however, might be sufficiently attractive to some foreign-based equipment manufacturers now seeking to penetrate the U.S. market to induce them to enter into a manufacturing joint venture. West Germany's Siemens organization, for example, has publicly stated its intention to expand U.S. telecommunications sales. France's Alcatel has funded an extensive U.S. telecommunications products advertising effort. The argument has been advanced that affiliation with a Bell company would provide foreign-based firms enhanced standing in the U.S. and world telecommunications equipment markets while also providing those firms telephone network management expertise they do not now have. With such information and experience, these firms presumably would be even more formidable competitors of U.S.-based switch manufacturers both here, and, assuming eventual opening of more offshore markets, overseas.:

Firms such as Siemens and Alcatel, as well as Japan-based companies, clearly have an incentive to improve their U.S. sales. To date, Siemens, for example, has evidently seen only one of its conventional central office switches actually placed in service by a Bell company. Siemens has sold specialized digital service switches, and other switches for testing purposes to Ameritech, BellSouth, Bell Atlantic, and NYNEX. But only one "standard" Siemens switch apparently is currently in service in Bell company territory. Similarly, Alcatel, which internationally now ranks as the second largest producer of switching gear, to date has reportedly booked only about 100,000 lines of switching equipment orders in the United States -- less than 1 percent of the lines which the Bell companies put in service annually. This France-based company, moreover, has sold no switching apparatus to Bell companies; its most promising sales to date have been to the second-ranked non-Bell holding company, United Telecom. NEC America has sold one digital switch to a Bell company, US West's Northwestern Bell subsidiary. NEC has also sold switches for testing purposes to US West's Mountain Bell and Pacific Telesis' Pacific Bell subsidiaries. There are also reportedly some 165 NEC analog switches now in use by the Bell companies, having been purchased by AT&T at some time in the 1970s. By way of comparison, AT&T and Northern Telecom in 1985 each shipped about 6 million lines of switching equipment to U.S. telephone companies.

At present, FCC regulations adopted in connection with that agency's Second Computer Inquiry and Third Computer Inquiry require Bell companies and AT&T to disclose a significant amount of network information to equipment vendors including foreign-based firms. Bellcore, moreover, routinely makes available to virtually all present and prospective equipment suppliers a substantial amount of information regarding current and projected telephone network needs. This regular and extensive publication of network information will continue under existing rules and

regulations independent of whether the present consent decree prohibitions on Bell company manufacturing of central office equipment either domestically or for domestic sale are changed.

Assessing the magnitude and speed with which adverse trade effects might materialize obviously depends on many variables. If joint venturers chose to use existing overseas production capacity, however, and to adapt an existing switch design to U.S. use, the first jointly produced switches probably could be available for installation in roughly one year, though possibly longer.

According to Bell company statements filed with the judgment court, it takes between 18 and 24 months on average between the time a given switch is ordered from a domestic manufacturer and the time that switch is installed and working. Part of this time lag, however, reflects a backlog of orders placed with AT&T and Northern Telecom. Presumably less time would be entailed in the case of equipment produced by a Bell company in partnership with a foreign-based manufacturer that did not have such a backlog.

If a Bell company and its foreign partner were to undertake to design and manufacture a completely new digital switch, considerably more time would be entailed. Among other things, any machinery the joint venture would produce would have to satisfy the current Bellcore equipment testing and approval procedures.

Bellcore now has a two-stage process that companies must comply with in order fully to qualify as equipment suppliers to Bell companies. The process, which is paid for by the manufacturers, is not mandatory and at least one Bell company (US West) reportedly is now field testing a "non-conforming" NEC switch. Most assume, however, that switch manufacturers interested in attaining serious U.S. market status would complete both phases of this process. Indeed, it seems counterintuitive to assume a foreign-based manufacturer would, on the one hand, link up with a Bell company to secure a greater U.S. market presence and, on the other, fail to comply with existing industry equipment approval procedures.

Phase A of the Bellcore program entails switching system documentation analysis, to determine if products will work according to Bellcore's "LATA Switching Systems Generic Requirements" guidelines (LSSGR). At present, this phase takes about 12 months. Phase B is an actual field trial of equipment and it takes nine months on average. To date, not all equipment suppliers have met Bellcore's requirements. AT&T, Northern Telecom, GTE, Ericsson, and Stromberg-Carlson have fulfilled both Phase A and Phase B requirements. Still in process evidently are switches to be offered Bell companies by NEC, Siemens, and Alcatel.

The hypothetical, jointly manufacturing Bell company might begin installing co-manufactured switches (and thus, in theory, displacing AT&T and Northern Telecom switch sales) without complying with the Bellcore testing process, although some Bell companies have indicated they would not do so. As owners of Bellcore, moreover, Bell companies presumably could take steps to expedite this testing process. Assuming compliance with the full panoply of procedures, however, it would be at least two years after the prohibition on manufacturing might be lifted, and after agreement with a foreign-based manufacturer might be reached, before the first actual displacement of an AT&T or Northern Telecom switch or potential switch sale might occur, if a new product is involved.

Realistically, the time from proposing a change in the decree through actual installation of a newly designed, Bell and foreign company, jointly manufactured switch would be at least three years. During such time the cost and character of switches produced by the two dominant U.S. market firms are likely to change considerably, making their offerings even more competitive relative to other vendors, including any manufacturing BOCs. During such time, moreover, the overseas marketing opportunities available to AT&T, Northern Telecom, and others presumably would grow, unless it is also assumed the substantial efforts now being devoted to market opening by Federal trade and other agencies prove ineffectual.

Permitting Bell companies to manufacture switches for the U.S. domestic market in partnership with a foreign-based firm could complicate these overseas "market access" efforts. A U.S. Government decision to sanction such vertical integration might be regarded overseas as tantamount to reinstating the kind of nontariff trade barrier which the former Bell System's pervasive vertical integration represented, albeit on a smaller scale. This is because overseas administrations might regard Bell company vertical integration as giving selected foreign-based firms preferential U.S. market access -- and complicating the task of attaining significant U.S. sales for those foreign-based firms not chosen for joint ventures.

At the same time, a foreign-based switch maker in partnership with a Bell company would have little apparent incentive to condone steps opening its home market to U.S. (or other) entry. Indeed, precisely the opposite would seem true, namely, that it would wish to maintain barriers to home market competition while exploiting its special relationship with a partner Bell company.

Over time, such developments could have the effect of reducing U.S. competitiveness in this high-tech field. A German-based company with a secure home market and a special relationship with a Bell company, for example, would have access to a

larger world market share than the leading U.S.-based switch maker, AT&T. To the extent economies of scope or scale are important in switch manufacturing, that German-based firm would have an inherent, perhaps decisive, advantage in the long run.

While there thus are risks associated with permitting Bell companies to joint venture with foreign-based firms to produce switching and associated central office equipment, it must be borne in mind that these are not necessarily new trade risks. Bell companies already are permitted to engage in switch manufacturing abroad for offshore markets. Under waivers granted by the court, they are thus allowed to emulate AT&T, for instance, which is currently manufacturing its No. 5ESS switch in South Korea (and is planning to do so in Taiwan as well) for Korean and other Asian markets. Presumably any foreign-based manufacturer in partnership with a Bell company offshore, moreover, would already have some access to network and other information, and enjoy at least some of the enhanced market acceptance and sales potential which affiliation with a Bell company allegedly yields. Bell companies, furthermore, are highly likely to buy switches from foreign-based firms over time. These possible benefits would obviously inure to foreign-based firms independent of whether the decree's prohibition on manufacturing is changed.

As many of the risks hypothesized have already been incurred, the question with regard to domestic switch manufacturing in partnership with a foreign-base firm may be whether any incremental increases in existing risks presents unacceptably high public policy costs. In this respect, the issue of possible Japan-based (or other) firms "leapfrogging" U.S.-based switch makers to make the next generation of switches should be noted.

Japan-based firms have not yet proven strong, indomitable competitors in the digital and electronic switch market. Some contend, however, that Japan-based companies may now be developing the next generation of switches, presumably light switches capable of handling fiber optic traffic more efficiently. While some today discount this potential problem, these contentions are reminiscent of those presciently advanced in the 1970s regarding Japanese programs in semiconductors. Few then took seriously the challenge to U.S. semiconductor leadership that has since materialized on the part of Japan-based companies. Maintaining a strong, indigenous switch manufacturing base in many regards is as important to the United States as ensuring a viable semiconductor industry. Legitimate concern thus has been voiced that permitting Bell company participation in possible Japanese switch development activities presents significant new threats to continued U.S. technological leadership in this field.

While there are legitimate concerns, again it should be noted that any risks here are not necessarily new, but rather of heightened degree. Several U.S.-based firms other than the Bell companies, of course, already are engaged in extensive telecommunications joint research and development activities with Japan-based firms, as discussed later in this report. Such activities would also be permissible on the part of the Bell companies, moreover, if focused on foreign manufacturing for foreign markets. The question thus again involves assessing the magnitude of incremental adverse effects of altering the current consent decree prohibitions.

In summary, the available facts do not suggest a high probability that all or even a significant number of the Bell companies would diversify into electronic or digital switch manufacturing. If one or more of these companies did so, however, they would almost certainly undertake a joint venture with a foreign-based firm.

Because such manufacturing joint ventures are already permissible overseas for foreign markets, perhaps at worst there would be only a small adverse change in the U.S. trade picture in this area. It is not necessary for the Bell companies actually to engage in manufacturing, moreover, for many of the information flows and other potential harms some forecast to materialize. Existing and required information disclosures, together with the information ordinarily made available to any switch provider, might have a similar, possibly harmful, longer term effect on U.S. competitiveness in this area.

By the same token, the circumspection and care with which Government should address these issues properly is a function both of the probability a risk might materialize and the injury to the national interest if that harm in fact occurred. Even if the probability were low, if the potential harm were great, that might be grounds for establishing special review procedures.

The proposal has been advanced to permit Bell companies to diversify into central office equipment manufacturing, but to require review of proposed joint ventures with foreign-based firms. In those instances where the home market of such a foreign-based firm is closed to U.S. competition, the joint venture at issue might be barred, unless and until foreign market access is ensured.

Such an approach has the advantage of according U.S. trade negotiators a potentially significant tool to open closed communications markets overseas. It would also reduce, though not eliminate altogether, the risks associated with Bell company diversification into switch making in partnership with foreign-based firms. At the same time, this approach might be

sufficiently flexible to provide Bell companies the greater ability to deal on an equal basis with their existing switch suppliers which they maintain they need.

Information Services

Estimating the results of removing the consent decree's restrictions on "information services" is a difficult endeavor. The present or future revenues attributable to such services are difficult to calculate, inasmuch as there is little general agreement regarding what activities comprise this line of commerce. The situation is further complicated because the nomenclature employed by the FCC (e.g., "basic" versus "enhanced" services) and that associated with the AT&T consent decree ("information services" and its subset, "electronic publishing," for example) differs. This is, moreover, a field abounding in commercial hyperbole, with sometimes extravagant estimates of both present and future service revenues.

At least three very broad categories of "information services" activity, can be identified and employed as an aid to analysis. The first category of activities could be called adjunct or auxiliary communications offerings -- voice storage and forwarding, "electronic mail," various kinds of telephone traffic management, and interactive computer communications services including "computer bulletin boards" such as currently offered by the Defense Department's ARPANET and others.

A second general category of information services would be comprised of offerings such as remote access to databanks and computer information services and include so-called "transactional services" (e.g., credit card verification, reservation services, etc.). This is a cluster of services which relies heavily on both computer and communications technologies. Business Week recently estimated that database access services alone accounted for some \$1.6 billion in U.S. and world market revenues last year. See Tables T-20, T-21.

Table T-20

Selected U.S. Electronic Information Service Sales (1986)

<u>Service</u>	<u>Revenues</u> (\$ Millions)
Securities and Commodities Quotes	\$560
Professional (Legal, Medical, etc.)	213
Scientific and Technical	91
Abstracts, Bibliographies, and Other Text	76
Nonbusiness Consumer	48
Other Numeric Data Bases*	623

* Includes credit and other financial information

Source: SRI International.

Table T-21

Leading Information Service Suppliers (1986)

<u>Company</u>	<u>1985 Information Revenues</u>	<u>Percent of Total Co. Revenues</u>	<u>Type of Information Sold</u>
Reuters	\$505	80%	Commodities and securities, quotes, news
Dun & Bradstreet	325	12	Credit and miscellaneous business information
Quotron*	187	91	Securities quotes
TRW	160	3	Credit checks
Mead	154	6	Legal and general business information
Telerate**	149	100	Commodities and securities quotes
McGraw-Hill	120	8	Financial information
Dow Jones	100	10	Securities and general business information

* Acquired by Citicorp in 1986.

** 52% owned by Dow Jones & Co. and Oklahoma Publishing.

Source: SRI International; Business Week.

A third category of "information services" consists of services that entail mass media-like distribution of news, information, and entertainment. Included would be videotext services similar to the Prestel and Minitel services available to British and French telephone subscribers through those countries' respective telecommunications administrations, or the West German Bundespost's Bildschirmtext, an interactive teletext offering.

It is perhaps easiest to estimate the positive economic and trade effects of permitting Bell companies to offer what might be denominated "category I" information services, namely "adjunct" offerings that closely resemble traditional communications services. Voice storage, electronic mail, and "station message detail recording," which permits communications managers to monitor actual use of business telephones more efficiently, represent services with a revenue potential of not less than \$2 billion annually. To the extent such services are provided using central office equipment, they imply some reduction in demand for foreign company-supplied customer premises terminal equipment. The broader availability of such adjunct services -- now available chiefly to major corporate users who can afford their own "feature-rich" equipment -- has potential productivity promoting implications. How the United States chooses to sanction telephone company provision of such services also has ramifications abroad, where foreign telecommunications administrations often advance sweeping definitions of what constitutes "communications," definitions that might curtail U.S. companies' ability to participate in foreign "information services" markets.

It is harder to estimate the effects of permitting Bell companies to offer many of what might be labelled category II or III services, namely, database access or mass media-like offerings. Whether Bell companies are permitted, for instance, to compete with Mead Corporation in offering legal research and information retrieval services, or to compete with established newspaper publishing firms in offering advertising services, neither necessarily nor directly implicates U.S. international trade, provided the Government does not simultaneously determine that all such offerings constitute a logical part of regulated telecommunications, which is unlikely.

Unlike the situation prevailing overseas, U.S. debate regarding the involvement of telephone utilities in these category II or III information services has not involved excluding potential non-telephone company players. Rather, most of the debate has concerned how telephone companies may participate, with appropriate safeguards, in lines of commerce that all agree are amenable to competitive provision.

The exclusion of the Bell companies from providing adjunct category I communications services does have direct and immediate trade implications. The practical effect of this particular set of restrictions is to stimulate demand for certain categories of "feature-rich" terminal equipment. Much of that equipment is provided by companies that are based overseas.

There are services which can be offered technologically using either central office equipment or equipment located on the customers' premises, as discussed at the outset of this report. An example frequently advanced is voice storage and forwarding, sometimes also called "voice mail." Marketed in the United States today, are answering machines which will both receive a message and, at a predesignated time, relay that call to another location; or which can be remotely accessed from any telephone and will then play back any messages received. This same feature is increasingly available using certain makes and models of PBXs. Such a feature could be provided ubiquitously to all telephone subscribers employing computerized central office switches. Under the AT&T consent decree, however, Bell companies are not permitted to do so, with the result that customers seeking these services are obliged to use terminal equipment which is typically manufactured abroad.

Current consent decree restrictions on such information services not only have the practical effect of channeling demand toward "feature-rich" customer premises equipment produced by companies based overseas. The restrictions also have the effect of protecting those firms in their exploitation of U.S. demand from their most likely actual and potential competition, namely, central office switch-provided offerings by the Bell companies.

By curtailing further commercial exploitation of central office switch capabilities, demand for central office apparatus is affected. Because the principal suppliers of such equipment to the Bell companies today are AT&T and Northern Telecom, both of which manufacture most of the pertinent products in the United States, the ineluctable consequence is to dampen demand for those suppliers' central office offerings. As both firms are also important suppliers of certain categories of customer premises equipment, "smart" PBXs, for example, any revenues foregone may not be great. That is, sales lost due to lower central office equipment demand may be compensated for, at least in part, by increased customer premises equipment sales. The U.S. labor content of AT&T and Northern central office equipment, however, is around 80 percent. It is lower in the case of much of their now-marketed customer premises gear.

Removing current restrictions relative to this class of information service offerings would thus reduce present biases favoring non-U.S. products. It would be difficult, however, accurately to forecast possible net gains as a consequence. We believe annual revenues from such adjunct services would be not less than \$2 billion yearly by 1990, if permitted today. Among other things, however, Bell companies today also are significant distributors of customer premises equipment. They are thus likely to profit-maximize when determining whether to offer new, sought-after services using their switching facilities or by selling, for example, more PBXs. There are regulatory considerations, moreover, which may bear on these companies' decisions.

If the existing consent decree restrictions on manufacturing as they apply to all categories of equipment other than central office switches were removed, this might have certain unpredictable effects on the information services market. Permitted to manufacture customer premises equipment, and assuming the profitability of such ventures, the Bell companies might focus on selling such equipment even if the decree were also modified to permit greater use of central office equipment to provide information services. An effect might thus be to exacerbate actual and perceived "out-sourcing" of U.S. telecommunications manufacturing jobs to facilities overseas.

Ensuring that the evolution of the network is determined by competitive marketplace forces and efficiency considerations, and not dictated by judicial regulation, is an important objective. Current restrictions with respect to the first category of information services clearly have potential to distort the future efficient development of the telephone network. Absent changes in these restrictions, moreover, there is potential that certain subscriber groups, particularly average residential subscribers, will not as rapidly have access to the full range of new service options which modern technology makes possible. From a public policy standpoint, there is a significant difference between such services being unavailable because of competitive market determinations, or because Government has imposed restrictions. To the maximum extent, customer acceptance or rejection of services should be a function of market, not Government, determinations.

It should be noted that the information services roughly grouped in the second category discussed above are an increasingly significant contributor to the U.S. export portfolio. The opinion has been expressed that permitting diversification by the Bell companies into this field would adversely affect the domestic base of U.S. information service providers which, in turn, would be less able to compete effectively overseas. If there were a significant likelihood unfair or anticompetitive

actions by Bell companies would yield such undesirable results, this might mitigate against removing pertinent consent decree restrictions.

The FCC in its Third Computer Inquiry, however, has adopted regulations which provide safeguards against such hypothetical harms. These safeguards, coupled with the oversight of the Bell companies by both state and Federal regulatory agencies, go far toward alleviating any legitimate concerns. Any severe adverse effects on information service providers, moreover, will arise only over time, if at all, thus affording Government the opportunity to take any needed corrective action.

In conclusion, eliminating the current information services restrictions regarding category I auxiliary communications offerings should have positive trade effects. It would potentially remove some of the bias favoring foreign customer premises equipment suppliers implicit in the current situation.

Category II and III offerings, however, implicate chiefly social, diversity, and other non-trade questions, although some of the services involved are a significant source of export earnings today. If there were any significant adverse competitive effect of permitting Bell company participation in these latter service categories, that might conceivably have adverse international trade effects. Such participation, however, could also have general productivity enhancement effects throughout the economy. Participation might correct the present anomalous situation where a significant class of "electronic publishing" services are readily available to consumers abroad, but unavailable to people here. Given present FCC and other regulatory safeguards, permitting Bell company diversification into these latter two categories of information services seems unlikely to have any appreciable adverse effects on U.S. information services exports through 1990, if not beyond.

Long-distance Services

Our figures indicate that total long-distance (both inter- and intraLATA) revenues amounted to about \$59.1 billion in 1985 (including transfer payments to local exchange carriers). We estimate toll revenues will be about \$119 billion in 1990, assuming nominal growth of about 15 percent (not adjusted for inflation). This estimate may be low, however, for several reasons.

Demand stimulation due to reductions in certain toll prices caused by regulatory policy changes, for example, may be understated. Changes in traditional cost recovery practices associated with instituting end-user access charges in 1984 have reduced interstate toll prices some 22 percent in the past two

years, and caused a surge in traffic growth. The FCC, moreover, recently ordered a further 11 percent reduction as a consequence of its earlier ruling lowering maximum allowable rates of return for AT&T and the Bell companies. Because of these (and possibly other) price reductions, toll traffic growth may rise exponentially and exceed the 8-10 percent real revenue growth which we estimated previously.

While our current toll revenue estimates take private communications systems into account, we also assume they will expand no faster than public-switched systems and this, again, may underestimate likely growth. As the cost of private systems continues to decline, such alternatives to the public switched network may become increasingly attractive to the major users which account for a majority of toll calling. This is particularly likely if regulation, increased payments to local exchange companies, and other factors limit the ability of the toll carriers -- especially AT&T -- to reflect cost savings due to technological advances in their prices.

At present, the AT&T consent decree essentially divides the long-distance market between AT&T and its competitors on the one hand, and the Bell companies on the other. IntraLATA toll revenues (almost \$14 billion at last estimate) accounted for nearly one-quarter of the total long-distance services market. The intraLATA toll market, however, is not now generally open to effective competition. Although the judgment court required Bell companies to offer all interLATA carriers "equal access" by fall 1986, it declined to order intraLATA equal access. Several state public utility commissions, moreover, legally prohibit local and intraLATA toll competition, although the number is declining. Under recent court decisions, furthermore, the ability of the FCC legally to order intraLATA equal access probably is limited.

If the current 75:25 percent boundary line segregating toll markets were altered or removed, some changes could occur that have international trade effects. Most would expect, for example, that a prerequisite to permitting Bell companies freely to compete in the 75 percent of the toll market now allocated chiefly to AT&T would be to institute intraLATA equal access. That, in turn, could stimulate demand for certain central office equipment and related products.

There are no good estimates, but achieving interLATA equal access, according to one published estimate, entailed Bell Company expenditures averaging approximately \$3.5 million per end office (class 5 office). There are approximately 9,000 class 5 offices operated by the Bell companies. Not all such offices would necessarily be converted if intraLATA equal access were required. Some may still employ electromechanical switches that lack the stored program capability to provide "equal access." If one assumes, however, that 60 percent of Bell class 5 offices

would be converted, and that intraLATA equal access conversion costs would be half those of the interLATA equal access process, procurement by the Bell companies of approximately \$9.5 billion of central office switching apparatus potentially would be required.

By any measure, intraLATA equal access would require substantial central office equipment outlays in addition to those now planned by the Bell companies. This could provide opportunities to foreign-based firms which, to date, have not made appreciable equipment sales to the Bell companies. It could also provide substantial sales opportunities to any Bell company-owned or affiliated switch manufacturer, if current restrictions on manufacturing were altered. More likely, however, a majority of any such procurement would be placed with the two primary Bell company central office equipment providers, AT&T Technologies and Northern Telecom. This would be particularly true if the Bell companies were eager promptly to complete the intraLATA equal access process as a prerequisite to their competitive entry into the interLATA market.

Entry by the Bell companies into the interLATA toll business could also implicate potentially larger expenditures by them on the switching and transmission systems needed to handle such traffic. Even if the Bell companies in some instances were to enter on a resale basis, reselling bulk transmission capacity purchased from one or more of the 193 domestic interLATA carriers, switching systems in addition to those now needed to handle intraLATA toll and local calling presumably would be required.

There is no way accurately to predict what additional volume of switching and transmission systems Bell companies might buy to facilitate entry into the interLATA toll field. In the past, however, AT&T's toll service competitors constituted a prime source of sales for foreign-based firms, purchasing a majority of their switches and transmission systems from such firms. In the case of the Bell companies, it seems most likely they would continue to rely primarily on their existing switch suppliers (AT&T and Northern Telecom) and on their existing transmission system suppliers as well.

In the case of transmission systems, procurement figures which were supplied by the Bell companies indicate increasing reliance on foreign-based firms, and on companies such as Siecor which have substantial non-U.S. ownership. Pertinent statistics are shown in Table T-22, below.

Table T-22

Bell Transmission System Procurement
From Foreign-Affiliated Suppliers

<u>Year</u>	<u>% Equipment (Excluding Lightwave)</u>	<u>% Lightwave Equipment</u>
1983	5%	35%
1984	8	23
1985	22.6	40

Increased Bell company purchase of transmission systems and related products from foreign-based and foreign-affiliated firms has significant trade, though not necessarily U.S. employment, implications. Some private sector analysts see the U.S. transmission equipment market as the major growth market in the telecommunications equipment field through the end of this decade, with 1990 sales of about \$10.5 billion, compared to \$5.1 billion in 1985. The rapid growth in the transmission equipment market is largely a function of increasing demand for lightwave systems (and associated optoelectronics). In addition to AT&T, major suppliers of lightwave systems in the U.S. market include Ericsson, Alcoa-Fujikura, Pirelli, and Siecor (50 percent owned by Siemens AG). An increasing amount of the lightwave equipment installed in the United States, however, is manufactured or assembled in this country, though much of the critical research and development activity fueled by U.S. purchases may take place overseas. To the extent that permitting the Bell companies to expand their toll operations may drive growth of foreign-based fiber optic suppliers, that may have long-term adverse trade implications.

Permitting Bell companies to compete in the interLATA toll services market also has obvious implications for AT&T, IBM's affiliate, MCI, US Sprint (co-owned by United Telecom and GTE Corp.), and other interLATA carriers. In 1985, for example, AT&T's interLATA operations reportedly accounted for about 88 percent of AT&T's net earnings -- some \$1.3 billion out of a total \$1.45 billion. Other sources of AT&T net earnings were sale of equipment to telephone companies, chiefly the Bell companies, which yielded \$317 million in profits, and equipment rentals, which accounted for \$760 million. Telephone company

equipment sales are forecast to be flat for the balance of the decade, however, and may decline. Equipment rental revenues, moreover, will continue to decline.

Increased competition with its long-distance operations could reduce the profit flow which AT&T is now using to sustain perhaps a majority of its other commercial operations, including its research and development activities. In theory, such competition in its chief domestic, profit-generating market might induce AT&T to market more aggressively overseas. More likely, however, it would adversely affect this major U.S. company which already has encountered significant commercial problems in the post-divestiture environment due to restricted overseas access.

Increased toll services competition for MCI, US Sprint, and other competitive carriers could have the effect of reducing their revenues and thus their capital budgets. At present, the competitive carriers are investing about \$2 billion annually; MCI alone invested some \$3.5 billion during the period 1982-85. The competitive carriers do not now have significant research budgets; hence, there is little potential adverse impact in that respect. A substantial percentage of the competitive carriers' capital budgets, however, goes to procure telecommunications products produced by foreign-based firms. In the case of some of these carriers, 100 percent of their equipment reportedly is supplied by Japan-based companies. Reducing those capital expenditures, therefore, could have the effect of reducing U.S. sales by some foreign-based telecommunications equipment suppliers. To the extent the Bell companies choose to rely to a greater degree on suppliers which manufacture chiefly, or are based, in the United States, and competitive carriers purchases from foreign-based firms are reduced, toll competition could have some positive trade effects on the imports side of the U.S. trade ledger.

Permitting the Bell companies to expand their long-distance operations, in sum, would probably --

- o Increase demand for central office products necessary to accomplish intraLATA equal access conversion, a majority of which products probably would be supplied by AT&T and Northern Telecom.
- o Increase demand for switching equipment that probably, but not necessarily, would be supplied by AT&T and Northern Telecom.
- o Increase current demand for transmission equipment supplied by foreign-based and affiliated firms.

- o Adversely affect on AT&T's competitiveness by reducing the profits now used in support of a diversity of AT&T operations including research and development, and by increasing the rivalry between AT&T and the Bell companies (thus inducing their more rapid shift to alternative suppliers).

PART III. POINTS AND COUNTERPOINTS

In this part, some of the claims and counterclaims regarding the allegedly positive and negative aspects of possible AT&T consent decree changes are examined. Issues discussed include potential research and development effects, the likelihood of undesirable foreign joint ventures, "national dependency," and related matters.

Research and Development

Some believe that the United States today is lagging certain of its international trading partners, particularly Japan, in telecommunications and related sector research and development (R&D). They maintain that an unintended effect of the AT&T breakup was to damage what was popularly regarded as the premier U.S. research and development operation in this field, namely Bell Labs. Proponents of changing or removing the AT&T consent decree's restrictions on the Bell companies further suggest that a positive consequence would be to increase indigenous U.S. research and development activities and, presumably, the commercial gains from such undertakings. Opponents, on the other hand, claim that such changes would jeopardize the AT&T revenues which are needed to sustain those parts of Bell Labs that AT&T kept following divestiture, and thus, in the end, exacerbate present or perceived R&D problems.

Research and development activities are important from a U.S. trade standpoint in several ways. First, R&D-intensive manufactured products most recently have been a prime source of significant U.S. export gains, while deficits in non-R&D-intensive manufactured products have steadily grown. Having the most technologically sophisticated products, second, may be a more reliable means of penetrating otherwise closed foreign markets than relying on Government-applied pressures and negotiations. If U.S. business communications offerings are the most advanced available, for example, businessmen in West Germany who are competing with U.S. firms in other lines of commerce (such as banking and international finance) might be competitively disadvantaged if they do not have ready access to the same sophisticated communications products as their U.S. competitors. At least in theory, therefore, West German and other foreign businesses would exert internal pressures to liberalize local market controls and reduce trade barriers and, in so doing, expand the communications trade options available to U.S. firms.

In 1968, the United States had a \$10 billion trade surplus in R&D-intensive products, and a \$9 billion trade deficit in non-R&D-intensive products. By 1980, our surplus in the former category had risen to about \$52 billion, and our deficit in the latter had deteriorated to over \$33 billion. Notwithstanding escalating trade deficits affecting too many basic U.S. industries since 1980, the United States today still enjoys a significant trade surplus position in certain "high-tech" lines of commerce, in the computer sector particularly, where U.S. technology currently leads the world.

In 1986, for example, the United States should experience a trade surplus of about \$2.2 billion in the electronic computing equipment sector (SIC 3573) -- compared to the projected NTIA \$1.6 billion deficit in the telephone and telegraph equipment sector (SICs 3661, 3662). In general, moreover, the "higher-tech" a given line of commerce, the more important export markets are in that field. Exports should account for about 29 percent of total computer equipment industry shipments in 1986, considerably more than the 6 percent exports-to-shipments ratio which prevailed in the telephone and telegraph equipment field that year.

There appears to be some positive correlation between R&D expenditures and industry success in meeting foreign competition effectively both at home and abroad. Comparing industry R&D expenditures, however, is at best an imperfect art. Among other things, companies and statisticians differ regarding what appropriately constitutes R&D. Nevertheless, there is general agreement that U.S. R&D expenditures in electronics, information processing, semiconductors, and telecommunications are substantially higher than those of other nations. Indeed, in certain lines of commerce, they are reportedly greater than all other nations combined. Most also agree continued R&D efforts are important if we wish to maintain our position in these particular "sunrise" fields. See Table T-23, below.

Table T-23
 U.S. Electronics and Related
Industry R&D Expenditures (1985)

<u>Sector</u>	<u>Expenditures</u> (\$ millions)
Electronics	\$ 2,293.6
Information Processing	
Computers	7,553.5
Office Equipment	412.4
Peripherals	1,379.9
Software	413.8
Semiconductors	6,491.2

Source: Business Week.

Specific foreign R&D expenditures, particularly by company, tend to be elusive. Reporting requirements vary and current information is often unavailable. Reported figures both here and overseas also may not take government R&D support programs fully into account. Some insight into the magnitude of the apparent U.S. lead may be gained, however, by noting that total R&D expenditures by Japan's six largest electronics and information firms in the most recent year available were less than those of just AT&T and IBM combined in 1985, according to publicly reported R&D expenditures. See Table T-24, below.

Table T-24

Japan R&D vs. AT&T and IBM

<u>Firm</u>	<u>Expenditures</u> <u>(1983)</u> (¥ billions)	<u>Firm</u>	<u>Expenditures</u> <u>(1985)</u> (\$ millions)
Hitachi	210	IBM	\$ 3,457.0
Matsushita Electric	195	AT&T	<u>2,209.7</u>
NEC	190	TOTAL	\$ 5,666.7
Toshiba	150		
Fujitsu	<u>120</u>		
TOTAL	865		

(Conversion @ 1983
exchange rate) \$5,400 million

Source: Nikon Keizai Shimbun, June 17, 1984;
Business Week.

At present, the Bell companies' direct expenditures on R&D average about 30 percent of the average for all U.S. industry (\$1,445 per year per employee, compared with \$3,758). Of the industries recently surveyed by Business Week, only the steel, textiles and apparel, food and beverages, containers, tobacco, and home appliance industries spent less per employee in 1985 on R&D than the Bell companies did directly. The small direct expenditures by the Bell companies on R&D are noteworthy given that these firms constitute between two-thirds and three-quarters the size of AT&T and IBM combined by nearly any measure. Indeed, all of the Bell companies rank among the 100 largest firms in the world measured in terms of their stock market valuation. See Table T-25, below.

The Bell companies obviously help support research and development undertaken by other firms through their purchases. As AT&T's largest customers, Bell companies presumably are a primary source of the funds which AT&T relies upon today to

maintain its competitiveness in domestic and world product markets. Bell companies, as major customers of some small, entrepreneurial U.S. firms, indirectly support research by companies other than AT&T. Of course, as major customers of foreign-based firms, the Bell companies also provide support for those firms' R&D efforts as well.

The low direct R&D expenditures on the part of the Bell companies are a result of deliberate government policymaking. In effect, the firms are limited to conducting R&D which is pertinent to their permissible activities. We are aware of no other country which, as a matter of deliberate government policy, currently restricts (or seeks to inhibit) permissible R&D activities on the part of its leading telecommunications firms. Indeed, in most other countries, precisely the opposite is true. The individual Bell companies are approximately the same size as (or larger than) Bell Canada, the Deutsche Bundespost, or Japan's Nippon Telegraph & Telephone, for example. Each of these foreign enterprises has an extensive R&D program and, in some cases, engages in cooperative research with indigenous equipment suppliers.

Given the broad scope of the general prohibition against "manufacturing" now contained in the AT&T consent decree, the individual Bell companies apparently have shied away from conducting a significant amount of R&D in this particular sector. Indeed, it has even been suggested that ordering equipment made independently to Bell company-provided specifications might constitute impermissible "manufacturing." The Bell companies' central services organization, Bell Communications Research Corporation (Bellcore), moreover, has tended to restrict its own R&D activities. Bellcore is a cooperative. As individual Bell companies have come to regard each other increasingly as actual or potential competitors, they have been reluctant to commission, support, or sanction Bellcore activities which might yield competitively significant results.

Modifying the AT&T consent decree restrictions on manufacturing, or eliminating them altogether, could theoretically result in increased direct R&D expenditures by the individual Bell companies (or, conceivably, Bellcore as well) over time. It may be appropriate as a matter of general policy, moreover, to remove current judicial constraints on the scope of these companies' R&D activities independent of what positive results Government might forecast. Our appraisal of the current situation suggests, however, that it is unrealistic to expect major surges in commercial results from any such increased expenditures during the 1986-90 period, even if changes in the

AT&T consent decree were made immediately. Statistics regarding U.S. R&D spending might look much better; but for a variety of reasons, major results are unlikely for some time to come.

The principal basis for this assessment is that the supply of first-class U.S. engineering, scientific, and other research personnel in telecommunications and related sectors tends to be limited in the short run. No matter the sums devoted to a given project, therefore, it is difficult quickly to increase the aggregate level of concrete R&D results. Some individual company gains might be accomplished, as skilled researchers at one organization were hired away, provided greater incentives and ability to increase their efforts, and thus become more productive. One company's gain, however, probably would but offset another's losses. Human resources, in sum, tend to be a prime limiting factor in the short run.

In the longer term, telecommunications, computer, and information industry research and development programs also tend to entail very substantial financial commitments. The cost of developing a new digital telecommunications switch, for example, has been estimated to exceed \$1 billion, as previously discussed. Even what appear to be less ambitious projects -- the development of improved "wafer steppers" in the semiconductors field, for example -- can routinely implicate very large R&D and product development costs. The shrinkage of the U.S. "merchant market" in semiconductors, for example, and increased use of foreign-made chips by major U.S. computer companies, is attributable in part to the fact that not even IBM can always cost-justify the very large initial capital outlays which developing additional sources of certain products would entail.

Only firms which individually or collectively have some reasonable chance to amortize R&D costs over substantial output seem willing or able to incur such upfront costs. Indeed, in recent months several U.S.-based companies with a significant telecommunications equipment market position have all but withdrawn (or sought to withdraw) from the field.

GTE Corporation, for example, in October 1986 concluded an earlier preliminary agreement with Siemens AG and sold control of most of its offshore equipment manufacturing and domestic transmission systems operations for some \$420 million. GTE has reportedly reached agreement to sell most of its domestic manufacturing operations to Fujitsu, retaining only its electronic switch facilities. This is despite the fact that GTE telephone companies currently account for some 8 percent of the U.S. telephone exchanges market, and the firm had achieved reasonable success in securing foreign market sales as well. Larger than the largest of the Bell companies when its Canadian,

Dominican Republic, and other offshore holdings are taken into account, GTE management evidently concluded that it would be insufficiently profitable for it to remain in most of the equipment manufacturing business.

The effective withdrawal of GTE from the telecommunications equipment manufacturing business is relevant when it comes to assessing the likelihood of any diversification by the Bell companies into manufacturing and associated R&D undertakings. Again, GTE is approximately as large and fundamentally as profitable an enterprise as any of the Bell companies. It is thus reasonable to assume similar management perspective and results.

It is true that GTE's heavy capital investment in its long-distance and enhanced services subsidiaries (now consolidated with those of United Telecom) has tended recently to produce reported earnings which understate the firm's fundamental profitability. With 50 percent of its telephone revenues derived, however, from three major "sunbelt" states -- California (24 percent), Texas (11 percent), and Florida (11 percent) -- GTE in some ways is better positioned than any of the Bell companies both to capitalize on projected rapid future growth in key regions and, by virtue of its nationwide diversification, to cushion the effect of any regional recessions.

A reason for the firm's withdrawal may be that it has a higher incidence of electronic and digital switches today than the Bell companies. Hence the internal equipment market which was previously the mainstay of its equipment manufacturing subsidiaries stands to decline over the next few years. By year's end 1985, for example, 60 percent of GTE telephone lines were switched electronically and 30 percent digitally. GTE has stated it expects to get these numbers to 92 percent and 72 percent, respectively, by 1990. It seems counterintuitive to hypothesize significant, and successful de novo diversification into manufacturing on the part of the Bell companies in view of the recent GTE experience.

The sale of most of ITT Corporation's domestic and offshore telecommunications manufacturing operations to the French Government-owned CGE organization also affords insight into Bell company claims that, absent restrictions on manufacturing, they would enter the field, and, in so doing, increase their expenditures on R&D. ITT, formerly the second-largest telecommunications manufacturer in the world, never achieved significant U.S. switch sales, despite an antitrust settlement with the former Bell System in the 1970s that envisioned substantial AT&T purchases of ITT-manufactured gear. While it did secure a substantial sales base in other countries, growing

price competition worldwide and its disastrous effort to enter the highly concentrated U.S. switch market presumably persuaded management to exit from the field.

While ITT for the time being will retain a 37 percent interest in CGE's Alcatel subsidiary, most do not see ITT as a long-term player in the equipment manufacturing field. Yet ITT in 1985 had total sales and revenues of \$11.9 billion, compared to \$10.7 billion in revenues for BellSouth, the largest of the Bell companies. Indeed, ITT's reported 1985 R&D expenditures of \$1.09 billion alone were larger than the net earnings of six of the Bell companies.

If major multinational firms with abilities, resources, and manufacturing experience as great as GTE Corporation and ITT have, in effect, withdrawn from telecommunications equipment production, it seems unrealistic to assume rapid, substantial expansion by each of the Bell companies into such endeavors. If engaging in large-scale manufacturing is a necessary concomitant to maintaining a major R&D program, it is not reasonable to assume that altering the consent decree promptly would produce changes in either regard. Over time, there could be positive developments. It is unlikely, however, that there would be appreciable international trade gains due to any increased direct R&D expenditures by the Bell companies through 1990, the general time horizon for this report.

Bell company R&D expenditures and programs, in conclusion, have been linked to the issue of diversification chiefly into communications equipment manufacturing. There are other limiting variables, however, relevant to assessing the likelihood of short-run or long-term gains. These include short-run scarcity of first-class personnel, the sheer magnitude of the upfront capital outlays typically involved, and the time necessary to organize any program of meaningful dimensions, much less to produce concrete results. This does not necessarily justify continuation of current Government restrictions. The sooner Bell companies may initiate serious R&D efforts, the faster any results may be forthcoming, given the substantial outlays and long lead times entailed. A rapid surge in direct R&D expenditures and concrete product results on the part of the Bell companies, nevertheless, cannot reasonably be forecast through this decade.

Foreign Agreements

Many assume that, absent the manufacturing restrictions placed on the Bell companies under the AT&T consent decree, these firms individually (or, perhaps, collectively) would enter into

joint ventures, teaming agreements, co-production, or "leader-follower" agreements with one or more foreign-based firms. Such agreements, increasingly commonplace in telecommunications and related industries worldwide, generally are believed attractive for four reasons. First, they aid in spreading the risks of new commercial undertakings. Second, such agreements can lead to the establishment of joint or combined production facilities which, in turn, may yield greater efficiencies of operation. Third, such joint endeavors can facilitate internal capital formation, and improve access to world capital markets. Fourth, such agreements can allow team members or joint venturers to undertake programs too extensive -- and too expensive -- for any one firm alone.

At present, most leading U.S. telecommunications and information industry companies have one or more joint ventures underway with foreign-based firms. AT&T, for example, has joint ventures with Philips, Korea's Gold Star Ltd., Fujitsu, the principal Italian telephone organization, STET, three large Taiwan-based electronics firms, Telefonica (Spain), and holds a controlling interest in Olivetti & Co. AT&T is also now negotiating to acquire part of CGCT, a French telecommunications firm.

Virtually all of the other major players in the communications and information sector worldwide are engaged in a diversity of multinational joint ventures and related commercial arrangements. Siemens, for example, has longstanding cooperative agreements with Fujitsu, dating back to collaborative agreements reached between Barons Siemens and Fujitsu early this century. Northern Telecom and Ericsson recently joined forces reportedly to develop electronic banking equipment. Northern Telecom also manufactures digital switches in partnership with the Turkish posts and telecommunications administration, and that enterprise, in turn, has made some equipment sales overseas, chiefly in Africa. GTE has joint ventures with units of France's Thomson organization as well as Telettra, the communications arm of the Fiat organization. Publicly disclosed joint ventures involving U.S. and Japan-based firms in communications and other fields are particularly extensive, as shown in Table T-25, below.

Table T-25

U.S.-Japan Communications and Related Joint Activities

<u>U.S. Firm</u>	<u>Japan-based Partners</u>	<u>Lines of Commerce</u>
AT&T	Ricoh, Matsui, KDD, Fujitsu, Toshiba	VANs, facsimile equip., computers, telecom. equipment, software
Alcoa	Fujikura, Hitachi	fiber optics, cables
Comsat	Shinwa	satellite earth stations
Contel (incl. Executone)	Mitsubishi Elec.	telecom. equipment
DEC	Mitsubishi Elec.	semiconductors
Datapoint	Fujitsu	telecom. equipment
Digital Switch Co.	KDD	switching equipment
GTE (includes Telenet)	Sumitomo Elec., Fujitsu, Marubeni	VANs, telecom. equip., PBXs
General Electric	NEC	telecom. equipment
General Motors (includes Hughes)	NTT, Mitsui, C. Itoh & Co.	satellites
Harris	Matsushita Elec.	transmission systems
IBM (includes Rolm Corp.)	NTT, Mitsubishi Elec., Tateishi Electric	VANs, PBXs
Motorola	NTT, Daini-Denden, Toshiba	semiconductors, radio equip.

<u>U.S. Firm</u>	<u>Japan-based Partners</u>	<u>Lines of Commerce</u>
Northern Telecom Inc.	Iwatsu, OKI, Mitsui	telecom. equip., PBXs
RCA & Ford	Sony, Mitsubishi, Marubeni, Nissho Iwai	satellites
United Technologies	NTT	"smart" buildings
United Telecom	Konematsu	VANs
Westinghouse	Toshiba	computer products
Westinghouse & GE	Mitsubishi Elec.	semiconductors

At least three of the seven Bell companies to date have publicly announced international agreements with foreign-based telecommunications organizations. Southwestern Bell, for example, has an agreement with the Deutsche Bundespost relating to development of packet switched networks. NYNEX and Pacific Telesis have agreements with NTT regarding communications network management. At least two Bell companies have also established foreign offices and acquired foreign communications and information industry operations. BellSouth, largest of the Bell companies, has established corporate offices both in London and Hong Kong. BellSouth also has a 40 percent ownership interest in Britain's largest paging service operation. Pacific Telesis has acquired several European specialty communications and computer-related firms and has opened a Tokyo office. Bell companies have a number of proposed or consummated agreements with foreign-based organizations that have not yet been publicly announced.

There is no good reason to assume that Bell companies would not follow the path already pioneered by AT&T and other U.S. firms, and establish additional commercial relationships with foreign-based telecommunications and computer industry firms, if the consent decree restrictions were altered. All the reasons which make such relationships attractive to other U.S. companies would presumably apply in the case of the Bell companies as well. There are also relatively few restrictions under the AT&T decree applicable to such arrangements today. The judgment court, as indicated, has authorized foreign manufacturing for foreign markets and indicated support for expanded international trade

ventures by these companies. While ad hoc waivers are needed, such foreign undertakings are already generally permissible and seem likely to increase.

Additional joint ventures among and between Bell companies and foreign-based telecommunications firms are likely to prove contrary to long-run U.S. trade interests only under certain conditions. This could be the case, first, if the Bell companies as a group or individually: (a) prove less able to deal effectively with foreign-based firms than U.S. industry generally; or (b) prove less able to purchase the professional assistance needed to strike mutually beneficial, but balanced agreements. Joint ventures with foreign-based firms might also be undesirable, second, if they were to result in foreclosing U.S.-based company access to Bell company procurement dollars. The view has been advanced, for instance, that the Bell companies would, in effect, "sell" preferred access to their internal markets to foreign firms and, in the process, freeze out other companies including U.S.-based firms. Any such transaction could also have an adverse impact on ratepayers; the company could, in effect, subordinate ratepayers' interests in a competitive equipment suppliers market to shareholders' interests, which might be advanced by such arrangements with a foreign-based firm.

We do not have facts which demonstrate that the Bell companies are necessarily less lacking in business acumen or ability to deal with foreign-based firms than U.S. business generally. Nor do we have information that the Bell companies are unable to purchase consulting, legal, and other advice or to reinforce any existing corporate trade and commercial negotiating talent. In addition, regulatory safeguards -- together with the open procurement requirement now in the decree -- appear adequate to protect ratepayers' interests.

The Bell companies in some instances are substantially larger firms than many of their potential foreign partners, measured by stock market valuation. See Tables T-26 and T-27, below. Not only is there thus no apparent reason to assume disparity of negotiating capability but, given relative corporate dimensions, the Bell companies may actually have the better position in any further bargaining with foreign-based firms.

Table T-26

Bell Company Rankings Among
the World's Top 100 Firms
(\$ Millions)

<u>Rank</u>	<u>Company</u>	<u>Market Valuation</u>
17	BellSouth	\$19,246
32	Bell Atlantic	13,882
34	NYNEX	13,649
43	Ameritech	13,184
52	Pacific Telesis	12,050
61	Southwestern Bell	10,908
66	US West Inc.	<u>10,602</u>
	TOTAL	\$93,521

Source: Wall Street Journal.

Second, in order to assume that any Bell firm would necessarily lose in negotiations with a foreign company, it would also be necessary to assume the Bell companies: (a) lack full understanding of the commercial advantages they could potentially confer on a foreign-based partner; (b) lack leverage relative to those firms; and (c) thus are unable or unlikely to extract commensurate concessions. Bell companies individually may lack sufficient leverage with potential foreign partners to be able to secure major, across-the-board, market-access concessions. A single Bell company, for example, probably could not impose as a condition to their contracting with a Japan-based firm that it pressure its government further to open its domestic market, with any real chance of success. While significant, none of the Bell companies currently commands such potential broad-scale leverage. Again, however, we have no information indicating the Bell companies are unaware of the potential value liaisons with them might conceivably yield. The firms, therefore, are as likely to prove reasonably hard and successful bargainers in any negotiations with foreign-based firms as U.S. firms generally.

It is possible that any joint ventures among Bell companies and foreign-based manufacturers could result in the provision of special network information to those foreign-based firms, or the establishment of "preferred supplier" relations. Any concerns in this regard, however, exist in significant degree independent of the issue of possible consent decree changes.

The nature of the telephone business is such that any supplier of switching and related apparatus must necessarily have some considerable knowledge of the network's operations. As Bell companies expand the number of firms supplying them equipment, therefore, so too will the dispersion of network information grow. FCC regulations, moreover, currently require Bell companies to disseminate a broad range of network information. At least one of the Bell companies has undertaken an aggressive supplier development program in compliance with the consent decree's open procurement requirements. The Bell companies can also provide whatever expertise and commercial status affiliation with them implies, so long as any manufacturing joint ventures are offshore and target overseas markets. It is thus unclear what additional, incremental information might be provided if the consent decree restrictions on domestic manufacturing for the U.S. market were altered.

Foreign joint ventures, in conclusion, are as likely in the case of the Bell companies as in the case of other U.S. communications and information industry firms. Such undertakings, however, are likely to prove no more risky to U.S. trade, employment, or other interests in the long-run than is true of other joint ventures involving U.S. firms and foreign-based companies generally. Any risks, moreover, may already have been incurred due to existing purchasing arrangements and network information flows mandated under the decree and by FCC regulations.

Many of the concerns some foresee as a result of formal Bell company joint ventures are possible today. A Bell company could, in theory, circumvent the decree's requirements and establish a "preferred supplier" relation with a foreign-based firm. There is nothing to prevent a Bell company from purchasing from firms other than its traditional suppliers and, indeed, the Bell companies have every incentive to do so. Some benefits might inure to a Bell company's foreign partner.

While foreign joint ventures may not engender substantial new concerns in the long-run, they do have short-run trade policy implications. The 1984 Bell System breakup eliminated a significant non-tariff trade barrier with regard to certain equipment categories. At the same time, U.S. efforts to secure more open telecommunications equipment and services markets have not yet proven very successful. Permitting Bell companies to engage in joint manufacturing ventures with foreign-based firms without qualification could again be tantamount to our unilaterally relinquishing a potential source of some leverage to secure further foreign market access. In view of the telecommunications trade problems that we now face, however, it is legitimate to ask why any potential source of leverage that could be used to open foreign markets should be unilaterally foregone.

As indicted, the leverage which the Bell companies individually represent may be of special interest to foreign-based firms seeking to secure a greater share of the U.S. market. Given the magnitude of current telecommunications trade deficits and the substantial difficulties encountered securing foreign market access, it may be appropriate to consider whether conditions might not be placed on possible Bell company joint ventures as a matter of trade policy.

Foreign Dependency Concerns

Some forecast longer-term, adverse consequences for the United States should restrictions on the Bell companies be further relaxed without any qualifications. Writing to the Senate Commerce Committee on July 3, 1986, the president of AT&T, for example, stated,

If removal of the manufacturing prohibition were to mean that BOCs would engage in ventures that move domestic manufacturing offshore (and that the BOCs favor their affiliates in purchasing equipment), the result would be fewer jobs for Americans and greater foreign trade deficits.

Under a hypothetical propounded by their principal supplier, AT&T, Bell companies would simply establish manufacturing subsidiaries in partnership with foreign-based firms, if allowed to do so. While some U.S. assembly, "metal bending," or limited manufacturing operations might subsequently be established, increased competition and possible market

"flagship" U.S.-based manufacturers. With its domestic sales base eroding, AT&T would, in theory, become less effective a competitor both at home and abroad. Eventually, a majority of U.S. telecommunications manufacturing might be foreign-owned, which, in turn, could create difficult technology transfer issues, and also have significant U.S. national defense implications.

This, fundamentally, is a protectionist argument that necessarily calls into some question the long-term viability of the firms that propound it. If AT&T or other U.S.-based companies are unable to survive in a competitive world market without special Government protection, "hard market" advocates might well suggest those protections be abandoned promptly. These concerns are nevertheless legitimate in certain regards, given the strategic importance of maintaining a strong, indigenous, U.S.-owned telecommunications manufacturing sector, and the fact that in most other countries, communications manufacturers are now protected from international competition and, in some instances, significantly subsidized.

It is easy to deprecate concerns regarding the viability of strategically important sectors. Not only Government but also the private sector in the recent past have failed to accord sufficient weight to predictions of very strong foreign-based competition. The serious challenges the United States today confronts in semiconductors are a case in point.

Concerns already have been raised regarding the increasing ownership of certain critical parts of the U.S. semiconductor industry by foreign-based firms. At present, for instance, Japan-based companies supply about two-thirds of the principal ingredients of semiconductor wafers. This has been achieved chiefly through acquisitions, most recently, Mitsubishi Metal Corporation's purchase of Monsanto Electronic's Siltec subsidiary. In addition to controlling the supply of vital components, Japan-based firms have increasing control over U.S.-based chip makers. Fujitsu's announced purchase of control of Fairchild Industries' semiconductor operations, for example, has been the focus recently of substantial Government concern.

There is already some basis for concern, however, given prevailing policies in this particular area. At present, Bell companies may lawfully manufacture abroad for foreign markets and three have already applied for (or obtained) permission to do so (Ameritech, Pacific Telesis, and Southwestern Bell). These offshore projects typically are undertaken in connection with efforts to rebuild or modernize foreign communications systems, where the sponsoring government has made indigenous manufacturing

of some products a contract requirement. Once foreign manufacturing facilities are constructed, however, that may heighten the potential for more offshore operations at such future time as the current bar on manufacturing for the U.S. domestic market is lifted.

Part of the U.S. telecommunications manufacturing business in recent years has come under control of foreign-based companies by virtue of acquisitions. Britain's Plessey, for example, purchased Stromberg-Carlson from General Dynamics in 1983. Fujitsu in 1980 purchased American Telecommunications, a leading supplier of specialty terminal equipment to AT&T. Fujitsu also has reportedly entered into an agreement to purchase most of GTE's domestic manufacturing operations. West Germany's Siemens organization has acquired a number of small computer and telecommunications-related companies over the past decade. British Telecom recently purchased the Dialcom enhanced services communications network from ITT. At present, moreover, Canadian interests reportedly are considering a possible takeover attempt of GTE Corporation.

The two principal U.S. telecommunications manufacturing companies today are substantially larger, in aggregate, than their principal U.S. market challengers. In a recently published tabulation of the 100 largest companies in the world, for instance, the stock market valuation of U.S.-based AT&T and GTE was nearly 60 percent that of their five major listed foreign-based competitors combined. See Table T-27 below. Individually and in aggregate, moreover, several of the Bell companies are significantly larger by this common measure than these potential foreign-based partners, as mentioned before. As these figures indicate, however, foreign-based firms are certainly large enough to mount effective competition. Indeed, only a single U.S.-based firm, AT&T, is clearly larger than any of our foreign-based trade rivals.

Table T-27

Relative Market Valuations -- World's Top
100 Firms Also in Telecommunications Manufacturing

<u>U.S.-based</u> (\$ Millions)		<u>Foreign-based</u> (\$ Millions)	
AT&T	\$27,138	Matsushita Elec.	\$16,210
GTE	11,466	Hitachi	14,923
		Siemens	13,469
		NEC	12,769
	_____	Fujitsu	<u>9,246</u>
U.S. TOTAL	\$38,604	FOREIGN-BASED TOTAL	\$66,617

Source: Wall Street Journal.

The U.S. telecommunications industry, long a relatively closed economic system, is increasingly becoming "internationalized." In this regard, it is following trends which have already reshaped other major industries such as electronics, computers, automobiles, and aerospace. This overall trend, moreover, is emblematic of changes resulting from the incorporation of the United States into the world economy generally.

The United States has a tradition favoring maximum free trade. In recent testimony before a Senate committee regarding U.S. trade policy, however, former U.S. Trade Representative Robert Strauss stated:

Trade today, as when the nation was founded, is a commercial process based on reciprocal treatment. It must be fair or it cannot work. We have exercised world leadership by keeping our markets open and our investment

climate unrestricted. Other nations have not always reciprocated. Now the message should go forth from your deliberations that those who wish to sell their goods and offer their services in our markets must extend similar treatment to us. To say it more dramatically, those whose ships loaded with products enter our harbors must make room for our ships in theirs.

Testimony by Robert J. Strauss before the Senate Committee on Finance, January 13, 1987, at p. 5.

It is important that Government have some ability to monitor developments in telecommunications, and take appropriate corrective action, as this process goes forward. The existing review of significant mergers, acquisitions, and joint ventures which takes place under the Hart-Scott-Rodino pre-merger notification process might prove a useful model. A requirement that U.S.-based firms provide information sufficient to enable Government to minimize any risks of joint ventures with foreign-based firms might be appropriate. While the risks of any new harms materializing might be relatively small, again the consequences of those adverse effects are sufficiently severe to warrant special Government concerns. Such an approach, moreover, would afford Government means of further opening now-closed communications markets overseas.

PART IV. SUMMARY AND CONCLUSIONS

In the final analysis, the real question which arises here is whether the current consent decree restrictions on the Bell companies are part of the problem, or part of the solution, to America's telecommunications trade difficulties. The detailed and extensive report on U.S. domestic communications policies which NTIA released in July 1985 documents the problems, including the trade problems, which the present consent decree restrictions contribute to and, in part, create. This NTIA report endeavors to update, refine, and quantify the main conclusions of that earlier report and to provide a basis for estimating the results of possible consent decree changes.

The Bell companies, in aggregate, represent half the U.S. telecommunications industry's human and financial resources. This report reinforces our principal earlier findings; namely, that turning around the present adverse trade situation will require mobilizing all of our communications industry resources. The Bell companies can make a difference, and they ought to be afforded freedom to do so.

Our analysis here leads to the following major conclusions:

- o **Telephone Handsets.** Permitting Bell companies to manufacture telephone handsets will have virtually no negative trade consequences during the 1986-90 period. It could have positive trade effects in the short run and yield greater gains in out-years.
- o **Key Telephone Systems.** Bell company manufacturing of key telephone handsets is also unlikely to have a negative trade effect. To the extent that key systems manufactured by foreign-based firms are displaced, there could be some positive trade consequences in the short run. Removing restrictions today could yield positive effects in the future.
- o **PBXs.** Allowing the Bell companies to manufacture PBX equipment is likewise unlikely to have any adverse and indeed, could have positive trade effects. Bell companies already are permitted to distribute, retail, install, and maintain PBX and other telecommunications equipment. Allowing them to diversify further into the actual manufacturing stage should have little, if any, adverse effect. Over time, there could be positive trade results from such change, although not all Bell companies may choose to manufacture this kind of customer premises equipment.

- o **Information Services.** Allowing the Bell companies to offer so-called "category I" services (i.e., auxiliary communications services such as voice storage, call recordkeeping, etc.) almost certainly would have significant positive U.S. trade effects both now and in the long run. Allowing Bell companies to offer "category II" (computer database-related services) or "category III" (mass media-like services such as teletext) should have no negative trade consequences, especially in light of existing FCC rules.
- o **InterLATA Long-distance Services.** Allowing Bell companies to expand their long-distance operations could stimulate demand for switching and transmission equipment under certain conditions. It could also, however, adversely affect AT&T and its present R&D activities, and further polarize AT&T and the Bell companies. The net international trade effects of such a change are, at best, indeterminant. We cannot reliably forecast either appreciable positive or negative effects during the period at issue.
- o **Central Office Switching.** While only some of the Bell companies seem likely to diversify into central office equipment manufacturing, this could produce negative trade effects under certain circumstances. This would be particularly true if a Bell company established a joint venture with a foreign-based firm and overseas markets remained closed to other American firms. The consequences of our relinquishing leadership in the digital electronic switch field are sufficiently serious from a national competitiveness and security standpoint that special care should be taken in this respect.
- o **R&D.** R&D entails massive capital outlays and a significant lead time to yield positive results. The sooner changes are made in the decree that will facilitate greater R&D on the part of the Bell companies, the quicker we are likely to see positive results which would help our international trade situation.
- o **Foreign Joint Ventures.** The Bell companies are as likely to enter into joint ventures with foreign-based firms as other U.S. communications, computer, and information industry companies. There is, however a major difference in the telecommunications industry. The Bell companies have a franchised territory and most developed markets abroad remain closed to U.S. firms. A joint venture, therefore, between a Bell company and a foreign-based firm that targeted the central office switching sector and preceded the opening of overseas

markets to U.S. firms could pose the threat of destroying this country's indigenous central office equipment manufacturing capacity. Those effects could be minimized by adopting joint venture screening procedures which are less restrictive than the current flat prohibition.

In view of these conclusions, we believe that steps should be taken to liberalize or eliminate the current restrictions on Bell company manufacturing and provision of information services -- those restrictions which have the greatest and most direct trade consequence. In the case of central office switching apparatus, procedures should be established to review possible joint ventures with foreign-based firms. This is a matter that, ideally, would be pursued legislatively, although there are other approaches possibly available.

We think that such special procedures are warranted as a matter of general trade policy, given the persistence of unwarranted barriers to U.S. competition in key telecommunications equipment markets overseas. The AT&T consent decree had the effect of further opening to foreign-based firms a market that already had been opened due to regulatory changes. We should seek to avoid in the future unilateral concessions that have the result of further diminishing any leverage available to U.S. trade authorities in their effort to expand our market access overseas.

BIBLIOGRAPHIC DATA SHEET

	1. PUBLICATION NO. NTIA-SP 87-19	2. Gov't Accession No.	3. Recipient's Accession No.
4. TITLE AND SUBTITLE NTIA TRADE REPORT: Assessing the Effects of Changing the AT&T Antitrust Consent Decree		5. Publication Date February 1987	6. Performing Organization Code
7. AUTHOR(S) NTIA Trade Report Staff		9. Project/Task/Work Unit No.	
8. PERFORMING ORGANIZATION NAME AND ADDRESS National Telecommunications and Information Administration Washington, D.C. 20230		10. Contract/Grant No.	
11. Sponsoring Organization Name and Address U.S. Department of Commerce National Telecommunications and Information Administration Washington, D.C. 20230		12. Type of Report and Period Covered	
14. SUPPLEMENTARY NOTES		13.	
15. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.) This report examines the trade and related effects of possible changes in the 1982 consent decree. It evaluates the lifting of the three restrictions on the Bell Operating Companies (which were divested by AT&T in 1985.) - Manufacturing, Information Services and Inter-LATA long distance services. It discusses most of the significant communications equipment including handsets, PBX's, digital central office switching and transmission systems as well as the long distance and information services markets. The report provides a diversity of Government, industry, and commercial information showing the state of the markets today, and predicts their future development. The report assesses some of the more significant effects of past and present U.S. communications policies and makes certain recommendations for future Government actions in the telecommunications and information services area.			
16. Key Words (Alphabetical order, separated by semicolons)			
17. AVAILABILITY STATEMENT <input type="checkbox"/> UNLIMITED. <input type="checkbox"/> FOR OFFICIAL DISTRIBUTION.		18. Security Class. (This report) unclassified	20. Number of pages
		19. Security Class. (This page)	21. Price:

