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19 Promoting Competition Between International Telecommunication Cables and Satellites

January 1986

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PROMOTING COMPETITION BETWEEN INTERNATIONAL TELECOMMUNICATION CABLES AND SATELLITES

Evan Kwerel
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I. INTRODUCTION AND SUMMARY

The FCC's regulatory policies have prevented competition between international satellite and cable facilities. Instead of letting AT&T freely choose between cables and satellites, the Commission has required AT&T to send a share of its international traffic on satellite circuits leased from the Communications Satellite Corporation (Comsat).

This policy may have served some historical purposes, such as fostering the establishment of a worldwide satellite system. But, it is argued here that there is little justification for its continuation.

The paper is organized as follows: Section II provides background information on the history of FCC regulation of international facilities. Section III discusses the objectives of facility regulation. It suggests that policy should focus on the cost and pricing of international facilities and not on the allocation of profits among U.S. firms. Since the major determinant of the cost of international transmission services is investment, a key element in evaluating regulatory policies should be their effect on future investment decisions.

Section IV examines nine possible reasons for requiring AT&T to use Comsat facilities for a portion of its traffic. One approach is to ask why AT&T might choose cable facilities when satellites are the least costly mode. The reason cited most often is that AT&T is biased towards using facilities under its control because it has market power both as a major supplier of international telephone service and as Comsat's primary customer. Another common allegation is that AT&T has an incentive to favor cable because it is a manufacturer of cables. It is argued here that absent rate-of-return regulation AT&T would have no incentive to behave in this way. It is possible, however, that under certain conditions rate-of-return regulation could induce AT&T to favor cable over satellite circuits because cable investments enter in its rate base while satellite lease charges do not.

Even if AT&T were not biased there may be a public policy rationale for requiring it to use Comsat circuits. One reason might be to subsidize the establishment of a worldwide satellite system. But, now that this system has been operating for twenty years it is questionable whether such a subsidy is still appropriate. Another possibility is to permit cross-subsidies within that worldwide satellite system. We argue that if such subsidies are desirable they should be financed in some other way. Several additional reasons for mandating that AT&T use Comsat's circuits are examined, including the possibility that it is necessary to offset biases of foreign Administrations of Posts, Telegraph, and Telephones (PTTs), with whom AT&T must jointly plan its international facilities.

Section V makes the theoretical argument that the FCC's circuit loading policies may have increased both the costs and prices of international facilities. The requirement that AT&T send a portion of its traffic by satellite gave Comsat the incentive to set higher prices for its circuits. Faced with high prices for satellite circuits, AT&T had the incentive to build additional international cables, even when satellites were technologically the least costly way to transmit international telephone messages.

Section VI examines empirical evidence that sheds light on three of the central questions discussed in the previous sections. The questions are: Is AT&T biased towards cable? Has Comsat charged above cost on certain routes? And, have the Commission's circuit loading policies lead to excessive investment in cable facilities?

To test whether AT&T is biased we compared AT&T's cost of three cable systems with estimates of the cost it would have incurred if it had leased satellite circuits. There is no evidence of bias for either of the Atlantic cables that we examined (TAT-5 and TAT-8). Between 1970 and 1984, the present value of AT&T's savings from constructing TAT-5 was approximately $36 million. Similarly, TAT-8 is likely to pay for itself within the first five years of its twenty-five year life expectancy. In contrast, the Pacific cable system is consistent with the view that AT&T is biased.

Between 1974 and 1988, it cost AT&T $16.6 million more to serve Australia and Japan by HAW-3 and TPC-2 than if it had leased satellite circuits from Comsat.

There are three sources of evidence that Comsat's prices have exceeded cost on certain routes. The first is engineering cost studies. Two cost studies found that during the 1970's satellites cost the same or less than cable for serving the Atlantic Ocean region. Yet Comsat's prices exceeded cable costs in the Atlantic for this period. This suggests that satellite circuits were priced above cost on this route. The second source of evidence is that several unregulated satellite firms have recently applied to provide international private line service in competition with Comsat. There is no reason to expect that these firms would wish to enter unless they believed that they could provide some services at a lower price than Comsat. This does not prove that Comsat is charging more than its own cost. But it does suggest that Comsat is charging more than the minimum cost of providing those services. The third source of evidence is that Comsat's rates for video service exceed the rates for equivalent domestic service.

The third major issue addressed in Section VI is whether circuit loading policy caused excessive investment in cable facilities. We were not able to empirically prove that Commission policy distorted investment, but we were able to provide evidence that there was excessive investment. We found that the entire demand in both the Atlantic and Pacific ocean regions for

the period 1970-1984 could have been handled using only the satellite facilities in place during that period and no cable facilities. Moreover, a National Academy of Engineering study (1968) found that investing only in satellites would have been the least costly way to meet demand during that period. Thus, from the viewpoint of cost minimization, all the cable facilities built during this period were unnecessary.

Since shortly after the first INTELSAT satellite went into service, the Commission has been actively involved in the allocation of traffic among international facilities, but has exercised only limited control over pricing and investment of these facilities. In Section VII it is argued that if the Commission wishes to create a more economically efficient system of international communications facilities it must either exercise more active control over investment and pricing of international facilities, or it must create the conditions under which the private sector will voluntarily invest and price more efficiently. It is argued here that deregulation will create the conditions for efficient private choices, and that this approach is preferable to increased regulation.

Section VIII provides a possible plan for deregulating international facilities. There are three basic elements to the plan. First, Commission-specified circuit loading should be phased out. An essential objective of the plan is to free <u>future</u> facilities from circuit loading requirements. It is proposed that circuit loading requirements be frozen at

the level prevailing at the time current loading plans expire. The loading requirements would gradually be phased out on a fixed schedule. Second, rate-of-return regulation of Comsat should be ended. It would be necessary, however, to maintain some form of price regulation during the transition period for those circuits subject to FCC loading requirements. One way to do this would be to set a price ceiling at the current lease rate for those circuits AT&T is required to lease from Comsat. Comsat would be free to set the terms, charges, and conditions for those circuits not subject to loading requirements. The third element of the plan is to eliminate possible sources of bias in carriers' choices of facilities. If there is any such bias, the most likely cause is rate-of-return regulation. The best way to correct this potential problem is to eliminate rate-of-return regulation of all international service carriers, including AT&T. If this is not feasible, another option would be to allow Comsat to sell limited ownership shares in satellites (IRUs) and permit these investment shares to enter carriers' rate bases. Other options are discussed as well.

The final portion of Section VIII addresses three difficult issues raised by our proposal for deregulating international facilities. The first is whether foreign telecommunications authorities will be able to appropriate most of the benefits of competition among U.S. providers of international transmission services. The second issue is whether it is in the national interest to subsidize certain international routes, and if so what is the best way to finance such a subsidy. The third is how should the Commission

deal with routes served only by Comsat, in designing a plan for deregulating Comsat.

Section IX provides several concluding remarks and reiterates our recommendations.

II. REGULATORY BARRIERS TO COMPETITION BETWEEN CABLES AND SATELLITES

In 1962 Congress enacted the Communications Satellite Act to promote the establishment of a global satellite communications system. The Act created Comsat, a Congressionally chartered private Corporation. Comsat negotiated with foreign telecommunications administrations to establish an international satellite communications cooperative. In 1964 the International Telecommunications Satellite Organization (INTELSAT) was created under Interim Arrangements. Definitive Arrangements were reached in 1973. Comsat is the only United States signatory to these Arrangements. Carriers wishing to use INTELSAT circuits must go through Comsat.

In 1965 INTELSAT put into service the first commercial telecommunications satellite. One year later, the Commission authorized the construction of both a Comsat earth station on Puerto Rico and an additional submarine cable between the United States mainland and Puerto Rico. To assure Comsat a share of the traffic the Commission required carriers to activate one Comsat

circuit for each circuit activated on the new cable.[1] In 1968, the Commission ruled that carriers must activate five satellite circuits for every circuit activated on the proposed trans-Atlantic cable, TAT-5. In 1971 the Commission changed this formula. AT&T was subsequently required to activate only one satellite circuit for each cable circuit. The international record carriers were permitted to activate twenty percent of their remaining TAT-5 circuits every six months.[2]

In 1977, and upon reconsideration in 1978, the Commission adopted the "balanced loading" methodology for allocating traffic among international facilities.[3] Balanced loading is designed to equalize the number of circuits on each transmission facility between the U.S. and a given foreign country. Under balanced loading new facilities are allocated all new traffic until they are carrying the same amount of traffic as existing facilities. Once this level is reached, additional traffic is allocated equally among all facilities that have not reached capacity. Traffic in the Atlantic Ocean region will continue to be allocated according to the

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1 ITT Cable & Radio Inc.-Puerto Rico, 5 FCC 2d 823, 8 RR 2d 1314 (1966), AT&T, ITT, RCA, 7 FCC 2d 959 (1967).

2 Proposed TAT-5 project, 11 FCC 2d 957 (1968), AT&T, ITT, RCA, 13 FCC 2d 235 (1968), Comsat, AT&T, ITT, 29 FCC 2d 252 (1971), Comsat, AT&T, ITT, 32 FCC 2d 103 (1971).

3 Overseas Communication, 67 FCC 2d 358 (1977), Memorandum Opinion and Order, Overseas Communications, 71 FCC 2d 1090 (1978).

balanced loading methodology until the end of 1985. Recently the Commission decided that AT&T should be allowed to increase Atlantic Ocean region traffic on either satellite or cable by two percent per year for three years (1986-1988). "Prior to the end of this three year period [the Commission] will review the loading question to determine what, if any, methodology should be utilized after 1988 in the North Atlantic region for circuits used by AT&T to provide IMTS."[4]

In addition to allocating traffic, the FCC regulates the construction of new facilities. Under Section 214 of the Communications Act, common carriers must obtain FCC approval to construct and operate telecommunication facilities. Such regulatory control over new construction could be used to prevent competition among alternative international facilities. In practice, regulation of new construction does not appear to have been a significant barrier to entry. The FCC has never ultimately rejected a request to build a major international common carrier cable or satellite facility. The Commission did initially reject the TAT-7 submarine cable as unnecessary but reversed itself under intense political pressure from foreign PTTs and U.S. carriers.[5]

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4 CC Docket No. 79-184, Second Report and Order, August 7, 1985, para. 2.

5 TAT-7 rejected, Overseas Communications, 67 FCC 2d 358 (1977), but later approved, Overseas Communications, 71 FCC 2d 1178 (1979).

III. OBJECTIVES OF FACILITY REGULATION

One objective of FCC policy towards international facilities should be to minimize the cost of providing a given level and quality of service. The major determinant of the cost of international transmission services is investment -- both the mix of satellite and cable capacity and the total level of capacity. The allocation of usage among existing facilities has little direct effect on total cost, since most of the cost is fixed. In other words, shifting a circuit from cable to satellite will have virtually no influence on total short run cost. The cost saving to AT&T from deactivating a cable circuit would be approximately zero, while the added cost to INTELSAT of activating an additional circuit would also be approximately zero (assuming circuits are available).

Regulation of new construction can, in principle, directly influence cost by shaping both the mix and total level of facility investment. Circuit loading policy, however, has little direct effect on cost because it regulates only the allocation of circuits among existing facilities. Nevertheless, in the long run, circuit loading policy may be an important determinant of cost through its indirect influence on investment decisions. For example, mandating that AT&T must load a given percentage of its traffic on satellites may give Comsat an incentive to charge more for satellite circuits, which in turn may increase AT&T's incentive to invest in cable

facilities. We shall elaborate on this point later in the paper.[6]

The Commission should also be concerned about pricing of international facilities. Even if international transmission services were produced at the least cost, there could still be a social loss if carriers could not acquire those services at cost. To the extent that carriers face excessively high prices for international facilities and pass these costs on to customers, the prices of international services would be too high, and output too low.

IV. RATIONALE FOR MANDATING THE USE OF SATELLITE FACILITIES

Before examining specific arguments that have been made for requiring AT&T to use satellite circuits, it is helpful to distinguish between two general reasons that AT&T might wish to use cable facilities even if satellites are the least costly mode. First, AT&T may be biased, so that it would choose incorrectly even if satellite facilities were correctly priced. That is, AT&T might choose cable facilities even if satellite facilities were priced below the cost of cable facilities. An example of an argument of this form is that AT&T is biased in favor of cable because cables enter its rate base while satellite circuits do not. Second, Comsat's prices may give AT&T the

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6 See Section V. A.

wrong signals about costs. That is, although satellite costs may be below the cost of cable facilities, Comsat's prices may exceed the cost of cable facilities. If this were the case AT&T would not choose the least costly facility even if it were a perfectly competitive profit maximizing firm. An example of an argument of this form is that Comsat charges above cost on dense routes in order to cross-subsidize low density routes. Thus the prices on the dense routes may attract inefficient entry. In other contexts, such entry has been referred to as "creamskimming" or "uneconomic bypass."

Now we will consider several specific arguments that have been made for involving the Commission in AT&T's loading of international facilities.

A. To offset distortions caused by AT&T's market power.

AT&T's market dominance and Comsat's reliance upon AT&T for almost all of its traffic are cited by the Commission as the main reasons it must continue to mandate the distribution of AT&T's circuits between cable and satellite facilities. "That is, the market is not now sufficiently competitive to assure that loading decisions are based on the price and availability of a particular facility rather than on some other, non-marketplace factors... Our analysis indicates that as of year-end 1984, AT&T employed approximately 89 percent of all circuits in service between the U.S. and CEPT [Conference for European Posts & Telegraph] and 99.8 percent of all

circuits used for IMTS between the U.S. and CEPT."[7]

Suppose for the sake of argument that AT&T were the sole U.S. provider of international telecommunications and that it were also Comsat's only customer. To focus on the issue of market power, assume that AT&T is not subject to any regulation and acts in concert with its foreign correspondents to maximize joint monopoly profits. We will also temporarily ignore the role of INTELSAT and assume Comsat is the sole producer of international satellite services and has complete flexibility in setting charges and contractual terms for its circuits. Finally, assume for the moment that satellites and cable circuits are equivalent (i.e., there are no quality differences).

As a profit maximizing monopolist, AT&T would wish to minimize the cost of providing whatever output it chose to produce.[8] Thus dominance in the

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7 CC Docket No. 79-184, Second Report and Order, August 7, 1985, para. 48.

8 Most western economists find the profit maximization hypothesis a useful description of firm behavior. There is a considerable literature examining this hypothesis. In his industrial organization textbook, Scherer (1980, p.41) concludes that "after examining the voluminous published evidence and interviewing many managers, the author believes that assuming profit maximization provides a good first approximation in describing business behavior. Deviations, both intended and inadvertent, undoubtedly exist in abundance, but they are kept within more or less narrow bounds by competitive forces, the self-interest of stock-owning managers, and the threat of managerial displacement by important outside stockholders and takeover raiders." He does point out, however, that "there is reason to

IMTS market would not bias AT&T towards cable facilities. Nor would the fact that AT&T is the only buyer necessarily create a distortion. Comsat would be the sole seller of international satellite services facing a single buyer. Economists refer to such a situation as a bilateral monopoly.[9] It is clear that under voluntary bargaining AT&T would not pay more for using satellites than the cost of providing the service using cables. But if Comsat offered AT&T a long term contract guaranteeing AT&T satellite circuits for less than the cost of constructing and operating a new cable, AT&T would have the incentive to use satellites because doing so would increase its profits. Moreover, if satellites were truly less costly than building a new cable, it would be in Comsat's interest to make AT&T such an offer. Thus it is quite likely that absent regulation, AT&T would choose the least costly mode.

The negotiations between Comsat and AT&T could affect the level of output as well as the cost of producing that output. One possible outcome of the

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expect greater leeway for departure from profit maximization when firms enjoy appreciable monopoly power than when competition is intense" (p.39). In assessing whether a deregulated AT&T is likely to profit maximize, one should not place much weight on observations of AT&T's past behavior under regulation. As a regulated firm AT&T had little incentive to minimize costs. With its profits limited by regulation, it was quite rational for AT&T to pursue other objectives than cost minimization. Regulation could well have induced AT&T to invest in the development of cable technology and manufacture beyond the profit maximizing level.

9 See Scherer, 1980, pp.299-303.

bargaining between AT&T and Comsat would be that Comsat and AT&T (and the foreign PTTs) would maximize joint profits. Under this scenario, Comsat would extract a share of the profits in a way that would not reduce output below the level chosen by a fully integrated monopolist. For example, Comsat might charge AT&T some annual fee not based on usage, plus the marginal cost of any satellite facilities it used. Comsat would not mark up the price of satellite circuits over marginal cost because that might cause AT&T to produce less than the profit maximizing level of end-to-end service.

B. To offset distortions caused by the fact that AT&T is a manufacturer of submarine cables.

It has been argued that "AT&T can be expected to prefer cable use as a cable manufacturer," regardless of relative cost.[10] To separate out the influence of rate-of-return regulation, we will first examine this proposition on the assumption that AT&T is an unregulated monopolist. Would such a firm favor the use of inputs it manufactured itself over purchased inputs, regardless of relative cost? Clearly it would not if it wished to maximize its profits, since profit maximization requires cost minimization.

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10 CC Docket No. 79-184, Second Report and Order, August 7, 1985, para. 48.

In the short run, AT&T might view much of the cost of cable manufacture as fixed, so to minimize cost it would compare the variable cost of constructing and operating a new cable with the cost of acquiring satellite circuits. This cost comparison would result in the economically efficient choice provided that satellite circuits are also priced close to variable cost. In the short run, Comsat would have an incentive to negotiate such a price schedule, since its profit would be higher if it provided circuits at a price that slightly exceeded variable costs than if it charged more but lost all the traffic to cable.

In the long run, AT&T would not consider any of the cable manufacturing costs fixed. It would not remain in the cable manufacture business if it were certain that it could acquire equivalent satellite circuits for less than the cost of cable circuits. In other words, the fact that it could manufacture cable circuits would not bias its choice.

C. To offset distortions caused by rate-of-return regulation of AT&T.

In theory, rate-of-return regulation could bias AT&T towards cable facilities because cable circuits enter its rate base while satellite circuits do not. As a regulated firm, AT&T is entitled to a return on its capital investment but not on its expenses. By expanding its rate base with additional capital expenditures, a regulated firm can increase its profits, provided that the cost of capital is less than the allowed rate of return, and that regulation has kept the firm's price below the profit-maximizing

level. In other words, under these conditions, a regulated firm can increase its allowed revenue by more than its costs by enlarging its rate base.[11] This suggests that AT&T may have an incentive to favor investing in cable facilities over leasing satellite circuits.

It is important to note that if the allowed rate-of-return were just equal to the cost of borrowing, there would be no advantage to investing in cable relative to leasing satellites. And if the allowed rate were below the cost of borrowing, this theory suggests that AT&T would prefer leasing satellite circuits over owning cable circuits (provided it stayed in business). In practice the allowed rate-of-return is adjusted infrequently but the cost of borrowing fluctuates so the allowed rate is sometimes above, sometimes equal, and sometimes below the cost of borrowing. In this situation, AT&T must compare the expected profits over the life of a cable with the expected profits of leasing satellites. A bias in favor of cable would generally require that, on average, the allowed rate were above the cost of borrowing.

For the Averch-Johnson effect to bias AT&T towards cable it must also be true that the Commission enforces its rate-of-return regulations. If the Commission infrequently reviews AT&T's earnings and does not require it to give back profits that exceed the allowed rate, AT&T might have little

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11 See Averch and Johnson (1962).

incentive to excessively favor inputs that enter its rate base. In other words, to the extent that rate-of-return regulation is not binding, AT&T would not be biased towards cable investments.

If, however, rate-of-return regulation were binding, AT&T might be biased in its choice of whether to manufacture cables as well as in its choice between satellites and cables. The AT&T division that manufactures cables, AT&T Technologies, is not regulated, while the division that pays for the cable, AT&T Communications, is. It is possible that AT&T could shift profits from a regulated division to an unregulated one by paying AT&T Technologies more than the true cost of manufacturing the cable. In other words, manufacturing its own cables might help AT&T evade rate-of-return regulation. It is difficult for regulators to completely prevent this even with jurisdiction over transfer prices because they cannot easily determine the cost of manufacturing a specialized cable. It should be noted, however, that AT&T's ability to charge more than cost for the manufacture of cables is limited by the desire of the other cable co-owners to minimize their costs. AT&T has generally been required to bid against foreign manufacturers for the contract to manufacture international cables.

D. To offset distortions caused by artificial differences in contractual arrangements. -- AT&T owns cable circuits but leases satellite circuits on a monthly basis.

Carriers can own cable facilities but lease satellite circuits on a short

term basis. Long term contracts for satellites would provide AT&T with the correct basis for comparing the cost of satellites and cables. When AT&T invests in a cable facility it has a good notion of what its costs will be over the life of the facility. But, when it chooses to forego a cable facility in favor of satellites, it has little assurance of its long term costs. To some extent, rate-of-return regulation is a substitute for long term contracts. Under rate-of-return regulation of Comsat, the current price of satellites reflects the average cost of satellite circuits at current loading. If AT&T chose to load substantial additional traffic on satellite, the price per circuit should fall provided INTELSAT did not decide to add costly capacity. But AT&T cannot be sure that the Commission will indeed make Comsat lower its price as average costs fall or that INTELSAT will refrain from adding unneeded capacity.

Even if the current monthly tariffs for satellite services were very much less than the monthly cost of owning shares in cable facilities, AT&T might still prefer ownership of cable to avoid being vulnerable to price increases by Comsat in the future. AT&T can avoid such dependence on Comsat by owning enough facilities to handle a substantial portion of their traffic. The scale of cable investment may be relatively large because of the substantial economies of scale in producing cable circuits. Moreover, the long time lag in building new cable facilities does not permit carriers the luxury of waiting until after Comsat increases its prices to start planning a cable facility.

The lack of long term satellite contracts is not a reason for requiring AT&T to use satellites but may instead be a result of the circuit loading policy. If Comsat had to attract AT&T's business it would have a strong incentive to offer long term contracts. Moreover, without FCC mandated circuit loading, INTELSAT would want long term contracts to assist it in planning its investments and to assure high utilization of its facilities. Absent regulation or long term contracts, the demand for satellite circuits might be highly unstable. Every time a new cable facility is put into service, carriers would have an incentive to offload satellite circuits onto the cable. From the viewpoint of an owner of an idle cable circuit, the cost of using the circuit is approximately zero, while the cost of leasing a satellite circuit is the rental payment that can be saved by terminating the satellite lease. Given free choice, carriers would drop most leased satellite circuits in favor of idle cable circuits they already own. They would keep only the minimum number of satellite circuits necessary to serve routes not connected by cable and to meet the concerns they and foreign telecommunications authorities have about diversity of routes.

Nevertheless, some (but not all) satellite circuits might still be offered on a short term basis. One would expect there to be a price at which Comsat would be willing to supply satellite services on a short term basis even in the absence of FCC circuit loading requirements. Comsat would wish to charge a premium to compensate it for bearing the risk of allowing carriers

to end leases on short notice. Comsat's need for such a premium, however, might be partially offset by the advantage of being able to raise prices in the future.

Carriers too might wish to hold some short term leases of satellite circuits. While ownership or long term leases protect carriers against future price increases, such contracts may lock carriers into holding facilities in the face of unexpected declines in traffic or reductions in the costs of new facilities. A carrier would weigh these risks in considering the contractual arrangements for obtaining facilities.

E. To subsidize the development of a worldwide satellite system (INTELSAT). The purpose of the Communications Satellite Act of 1962[12] was to establish a global communications satellite system. Requiring AT&T to use satellite circuits may have been a way of subsidizing the development of such a system. Now that satellite technology is well established and INTELSAT has been providing service for twenty years there would seem to be little need for a general subsidy.

F. To permit cross-subsidies within the worldwide satellite system. AT&T may not choose the least costly mix of satellite and cable facilities

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12 47 U.S.C. 701-744.

if satellite prices give it the wrong signals about costs. One reason satellite prices may not be aligned with costs is that INTELSAT's globally averaged pricing structure tends to charge above cost on high traffic routes and below cost on low volume routes. In the short run, allowing AT&T to freely choose its mix of facilities might result in it constructing cable when satellites were the least costly mode. In the long run, allowing AT&T to "creamskim" on the high density routes would limit INTELSAT's ability to cross-subsidize its light routes. These routes tend to involve traffic originating in or terminating in relatively small and lesser developed countries.

To assess this argument one must first determine the magnitude (if any) of such cross-subsidies, and then evaluate whether it is in the U.S. interest to maintain these subsidies. Even if the subsidies turned out to be large and were generally going to countries the U.S. wished to support, it is doubtful that this is the best system for providing the subsidies. Some form of direct aid financed from general revenues would likely be better than "taxing" users of heavy international routes to subsidize users of light ones.

G. INTELSAT is an unsustainable natural monopoly.

A firm is a "natural monopoly" if the market demand can be produced at the lowest cost by a single firm. Under these circumstances it would be inefficient to have more than one firm supplying a market. One would think

that if a firm were a natural monopoly, there would be no need for the government to restrict entry since the incumbent firm would be able to set a price which would deter additional firms from entering. Nevertheless, Baumol, Panzar, and Willig (1982) have shown that under certain conditions a natural monopoly may be unable to deter entry, that is, the natural monopoly may be "unsustainable". If this were so, restrictions on entry may be justified.

This argument could not possibly justify the FCC's circuit loading policy. To simplify the analysis we will initially assume that satellite and cable circuits are perfectly equivalent and that there are large economies of scale in both satellite and cable facilities. If this were the case, the economically efficient outcome would be for all service to be provided by a single firm, using either all satellites or all cables, whichever is cheaper. But FCC circuit loading policies have attempted to spread traffic between satellite and cable facilities. Alternatively, assume that cable and satellite circuits are not perfectly fungible. In this case, the issue of natural monopoly is whether, because of "economies of scope," both types of circuits could be produced at least cost by a single firm. But the circuit loading policy is not designed to establish a single firm providing both cable and satellite circuits. Thus, the possibility that INTELSAT is an unsustainable natural monopoly cannot justify existing circuit loading policies.

The existence of an unsustainable natural monopoly could, however, be used to justify the establishment of a single provider of international facilities. This single entity would be free to choose between satellites and cables, and would be protected from competition. There are several reasons to be cautious about accepting such a conclusion. First, Brock (1983) has raised serious questions about whether an unsustainable natural monopoly could exist. He argues that in the model developed by Baumol, Panzar, and Willig, the incumbent is limited to maintaining an announced price when faced with potential entry. If the incumbent is allowed to cut his price when faced with entry, a natural monopoly may always be sustainable. Second, in practice, it may be virtually impossible to determine whether the conditions for unsustainability are met. Finally, while there may be benefits to restricting entry, there are also costs. The major cost is the loss of the discipline of the market. Competition places pressure on a firm to hold down costs and prices. Eliminating the possibility of entry increases burden on the regulatory process to prevent the single entity from charging excessive prices and incurring excessive costs.

H. To assure high reliability of service.

One justification the Commission gave for adopting balanced loading as the circuit loading formula was that it would "provide service reliability benefits such as reducing to a minimum the number of circuits interrupted

upon failure of a major transmission facility."[13] Before concluding that FCC regulation is needed to assure high reliability of service, one must first demonstrate that carriers would be unlikely to provide sufficient reliability absent such regulation. But the conventional wisdom is that AT&T has tended to put too much emphasis on reliability.[14] In any case, the Commission's balanced loading methodology does not maximize reliability, given investment decisions. It takes no account of differences in reliability across facilities, or the existence of restoration equipment that allows one facility to act as a backup for another. For example, if there were two facilities, balanced loading would put an equal number of circuits on each even if one facility were 99.9 percent reliable and the other 10 percent reliable.

I. To offset biases of foreign correspondents.

It is important to remember that U.S. carriers cannot unilaterally decide on international facilities investments and circuit loading. All such

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13 CC Docket No. 79-184, Second Report and Order, August 7, 1985, para. 51.

14 "Perhaps the largest overinvestment occurs, therefore, because the trade-off between cost and service quality has not been made in the market. If service reliability has been set at a level at which the costs exceed the value consumers place on reliability, all who subscribe are paying more than necessary for the service, and some may fail to subscribe because less costly options are unavailable." Cornell, Kelley, and Greenhalgh (April 1980), p.20.

decisions must be made jointly with their foreign correspondents. One might think that PTTs would have the incentive to choose the least costly mode since they own both satellites and cables. This would be true if the ownership arrangement for satellite circuits were the same as for cable circuits, but it is not. While PTTs can purchase shares of individual cable facilities, they must pay the average cost of circuits in the entire INTELSAT system. To the extent that the INTELSAT system cross-subsidizes high cost routes and incurs excessive costs, PTTs may prefer owning cable facilities to acquiring space segment from INTELSAT for dense routes such as the North Atlantic.

Moreover, once a PTT has invested in a cable, it has the incentive to shift traffic from satellites to the cable since the marginal cost of using additional cable circuits it owns is zero, while the cost of using INTELSAT circuits is approximately the average cost of an INTELSAT circuit.[15] In

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15 INTELSAT is a cooperative whose expenses are shared in proportion to each member's usage. Because of this financial arrangement, the cost to an individual member of using an additional circuit depends on how many circuits it is already using. If a member were using no circuits, the (marginal) cost of using one circuit would be INTELSAT's average cost per circuit. If it were already using some circuits, the member's cost of using an additional circuit would be somewhat less, because it would benefit from a slight reduction in the amount it was paying per circuit on the circuits it was already using. The reduction in the price per circuit would be the result of spreading INTELSAT's fixed costs over a larger number of circuits. Finally, if the member were the sole user of INTELSAT capacity, its cost of using an additional circuit would be INTELSAT's marginal cost of providing that circuit, since the member would be fully responsible for paying INTELSAT's fixed costs regardless of its usage.

other words, the PTT can reduce its contribution to INTELSAT's fixed costs by cutting back on its usage.

The best way to address this issue would be for INTELSAT to revise its financial structure to more closely parallel that of cable facilities. Then INTELSAT's prices would provide correct signals about costs to both foreign and U.S. carriers. Comsat has proposed a revision of INTELSAT's charging policy that would move in this direction. Comsat suggested that INTELSAT offer "an integrated lease through which Signatories would obtain access to a share of the overall space segment resource. This share would consist of a mix of different types of transponder capacity on different satellites in different operating regions, all under a single lease payment. Such leases would offer Signatories the option of acquiring their space segment capacity from INTELSAT on a bulk package basis rather than circuit-by-circuit or

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(Footnote 15 continued.) This can be illustrated mathematically. Suppose INTELSAT's total costs are given by $F+cx$, where F is the fixed cost of the system, c is the marginal cost of using a circuit, and x is total system usage. A member's payments are assessed in proportion to its usage. Thus a member's total payments are $p_0=(x_i/x)(F+cx)$, where x_i is the member's usage. If it uses an additional unit its total payments are $p_1=[(x_i+1)/(x+1)][F+c(x+1)]$. Its marginal cost of using the additional unit is given by $p_1-p_0=[(x-x_i)/(x+1)x]F+c$. Thus if the member is the sole user of the system $x_i=x$, so $p_1-p_0=c$, INTELSAT's marginal cost. But if the member were not using any circuits initially, $x_i=0$, so $p_1-p_0=F/(x+1)+c$, INTELSAT's average cost per circuit, since $F/(x+1)+c=[F+c(x+1)]/(x+1)$. Finally, if $0<x_i<x$ the member's cost of using another circuit is greater than INTELSAT's marginal cost, but less than INTELSAT's average cost.

transponder-by-transponder."[16]

Some PTTs may also favor cables over satellites to support domestic manufacturing interests. England and France both have large cable manufacturers while satellite manufacture is dominated by U.S. firms. Part of TAT-8 will be constructed by "STC" of the United Kingdom and "Submarcom" of France. It may be politically advantageous for PTTs to support these domestic cable interests even if equivalent international service could be provided for less using satellites. This possible bias does not, however, justify the FCC requiring AT&T to use satellite circuits. It would be better to create the conditions for unbiased choices by U.S. carriers and to let them jointly represent U.S. interests in direct negotiations with PTTs.

V. UNINTENDED CONSEQUENCES OF THE CIRCUIT LOADING POLICY

A. High prices and high costs.

The FCC's circuit loading policies have given Comsat the incentive to charge higher prices than if AT&T had been free to substitute cable circuits for satellite circuits. Absent such regulation Comsat would have been unable to

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16 Contribution of Comsat (the U.S. Signatory) to INTELSAT's review of charging policy, INTELSAT document BG-60-85E W/9/84, September 17, 1984, p.1.

price its circuits above the cost of cable circuits (assuming the quality of satellite circuits was not superior). But by requiring AT&T to allocate a share of its traffic to satellite, the FCC may have induced Comsat to set the price of its circuits above the cost of constructing new cable circuits on dense routes.

Higher prices on dense routes may have been the intended result of a policy designed to foster the development of a global satellite system that cross-subsidized high cost routes. But Commission-specified circuit loading may also have had the unintended consequence of allowing Comsat to earn above normal profits and to incur excessive costs. Whether this actually occurred depends on how well the FCC was able to regulate Comsat's rates and expenses. In any case, if circuit loading requirements raised the price carriers paid for acquiring circuits on high volume routes, this would have tended to increase the price paid by users for end-to-end service on those routes.

The FCC's circuit loading policies may also have inadvertently raised the cost of providing international service by giving AT&T the wrong signals about the relative cost of cable and satellite circuits. Requiring AT&T to use satellites gave Comsat the incentive to set its prices above the cost of cable circuits. Faced with high prices for satellite circuits, AT&T would have an incentive to build cable facilities even if satellites were technologically the least costly mode. Without the FCC guaranteeing it

traffic, Comsat might have offered AT&T long term contracts on satellite circuits priced below the cost of new cable facilities. Faced with such an offer, AT&T might have chosen the satellite facilities. Ironically, the FCC's regulation of loading, which limited AT&T's ability to use cable facilities, may have ultimately resulted in AT&T constructing and using more cable circuits than if it had been free to use as many cable circuits as it wished.

B. Inhibits Comsat from entering the IMTS market.

In arguing against the continuation of the balanced loading methodology, the Commission stated that "we are not persuaded that guidelines which guarantee Comsat and INTELSAT approximately one-half of AT&T's growth circuits provide a strong enough incentive for Comsat vigorously to pursue entry into the U.S. CEPT message telephone market..."[17] The Commission never explains the basis for this conclusion. Presumably, the Commission is assuming "satisficing" behavior on the part of Comsat. That is, if Comsat is achieving some acceptable level of profits it will not bother to enter new markets even if doing so would increase its profits.

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17 CC Docket No. 79-184, Second Report and Order, August 7, 1985, para. 51.

There is another way, however, that Commission-specified circuit loading can inhibit Comsat from entering the IMTS market. The Commission seems to be conditioning its withdrawal from circuit loading upon competition in the IMTS market. In its recent Second Report and Order on North Atlantic facilities the Commission concluded that "We affirm our tentative finding that the U.S.-CEPT message telephone service market is not yet sufficiently competitive to permit us to withdraw from decisions concerning the distribution of AT&T circuits used to provide that service."[18] But, the circuit loading requirements have benefitted Comsat, so linking their termination with increased competition in the IMTS market would penalize Comsat for entering this market.

VI. EVIDENCE

A. Is AT&T biased?

In the previous section we discussed the theoretical possibility that AT&T might be biased in favor of cable circuits. In this section we will examine whether there is any evidence of such a bias. If cable and satellite circuits were perfectly equivalent one could say that AT&T were biased if it chose cable circuits when it could obtain the same number of circuits at

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18 CC Docket No. 79-184, Second Report and Order, August 7, 1985, para. 49.

less cost using satellites. It is important to realize that this historical analysis will only tell us whether AT&T preferred cable to satellites given the regulatory regime that existed when it chose between the modes. If we were to find no evidence of bias when AT&T was subject to rate-of-return regulation, we surely would expect no bias when such regulation were removed. If, however, we were to find some evidence of bias in past decisions, this would not imply that AT&T will show such bias if rate-of-return regulation were removed.

There are several difficulties carrying out such an analysis. First, satellite and cable circuits may not be perfectly fungible. For example, it takes conversations about one quarter of a second to be transmitted via satellite because satellites are twenty two thousand miles from the earth. This delay can result in one party continuing to talk without realizing that the other party has already begun to respond. Some telephone users find this problem objectionable. Suboceanic cables do not have this delay problem since the distance a message must travel via cable is much shorter. Cable messages may also be less susceptible to interception by third parties. Consequently, the military generally prefers cable circuits to satellite circuits.

Second, since there were no long term contracts for satellites, there is no way of knowing precisely what it would have cost AT&T to use satellites. Thus, to determine whether AT&T was biased one must compare cable costs with

estimates of satellite prices. Predicting satellite prices requires one to predict FCC regulation of Comsat's prices. If rate-of-return regulation were strictly followed, the observed price of satellite circuits would be an overestimate of the price AT&T would pay for additional circuits. Assuming Comsat were initially earning its allowed rate-of-return, the cost to AT&T of using additional satellite circuits would be just the additional cost to Comsat of providing these circuits. This would be approximately Comsat's cost of acquiring the circuits from INTELSAT. As a first approximation this is $390, the current level of the INTELSAT utilization charge.[19] The actual marginal cost to Comsat of acquiring circuits might be somewhat lower than the current per circuit charge. As the total usage of INTELSAT circuits increased, INTELSAT would be able to reduce the charge per circuit. Only a portion of the benefits of the reduction would accrue to Comsat,

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19 With minor exceptions, the total cost to an owner of using INTELSAT circuits is its share of INTELSAT's capital and operating expenses. The marginal cost to a member of obtaining additional circuits under such such a financial arrangement is approximately the average cost of an INTELSAT circuit. (See footnote 15 for a detailed discussion of this point.) INTELSAT has also established a "utilization charge" to cover cases where ownership is not perfectly aligned with usage. The utilization charge is set to approximate the average cost of an INTELSAT circuit. "The level of the utilization charge is set so as to recover amortization of capital (depreciation), the operating expenses of the system and compensation for use of capital at a designated rate." (Testimony of Richard Colino, before Senate Foreign Relations Committee, October 1983, Appendix No.12.) To the extent that the interest rate paid on capital by INTELSAT equals a member's opportunity cost of capital, the utilization charge is a good approximation of the member's cost of obtaining a circuit by expanding its ownership share.

however, since the reduction would apply to all INTELSAT half-circuits while Comsat uses only about 23% of the half-circuits.

In other words, under strict rate-of-return regulation, as AT&T used more circuits the FCC would require Comsat to lower its price on all circuits, so that the effective marginal cost to AT&T of the satellite circuits would be the marginal cost to Comsat (including its allowed rate of return). There is one minor qualification to this. AT&T's marginal cost of acquiring satellite circuits would be slightly higher than Comsat's marginal cost when one takes into account the fact that the Comsat price reductions would apply to some circuits not used by AT&T. But since about 85% of Comsat's revenue is from AT&T, most of the benefit of a general rate reduction would accrue to AT&T. In any case, this is an idealized version of rate-of-return regulation. Given that it took the Commission 13 years to settle its first investigation into Comsat's charges there is little reason to expect Comsat's rates to be set in precisely this way.[20]

Third, if AT&T is risk averse, showing that the expected cost of cable is greater than the expected price of satellites is not sufficient to show a

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20 The FCC began an investigation into Comsat's charges in June 1965 (38 FCC 1296). An agreement between FCC and Comsat staff was reached in February 1978. The Commission approved the agreement in May 1978 (68 FCC 2d 941).

bias. One must also take into account the greater uncertainty about satellite prices than cable costs.

Finally, a full analysis of the issue should account for differences in tax treatment of capital investments versus expenses. Whether tax considerations favor cable investments over satellite lease charges depends in part on the rate at which AT&T is allowed to depreciate its investments and on the size of various tax incentives for investment such as the investment tax credit. A preliminary analysis sugests that from AT&T's viewpoint there is no significant tax advantage of one mode over the other.

In light of this discussion it should be clear that no unambiguous determination of a bias is possible. Nevertheless, we shall present some observations that shed some light on the question. First, we note that if there were a strong bias in favor of cable one would expect AT&T to have proposed cable service to all coastal countries with significant communications with the U.S. If rate-of-return regulation were binding but assured AT&T an above normal profit on all investments, why would AT&T have passed up the opportunity to expand its rate base? Yet AT&T has passed up opportunities for laying more cables. For example, in 1985 AT&T planned to use 226 satellite circuits to South Africa. Why hasn't it proposed cables to such points if it prefers cable to satellite "regardless of cost"?

To gain more insight into the question of bias we compared AT&T's (before tax) cost of three cable systems with the (before tax) cost it would have incurred if it had paid satellite lease charges. For historical periods we used the actual satellite lease charge. As was discussed above, this is only an estimate of the charges AT&T would have paid to use more satellite circuits. For future periods we used AT&T's forecasts of Comsat charges. Using this methodology, there was no evidence of bias for the two Atlantic cables that we examined. Both TAT-5, an old generation cable, and TAT-8, the latest generation fiber optic cable, were unambiguously cheaper for AT&T than the satellite lease charges.

Table 1 compares AT&T's cost of TAT-5 for 1970-1984 with the cost it would have incurred if it had paid satellite lease charges for the circuits actually loaded on TAT-5. Yearly lease charges if AT&T had used satellites were estimated by multiplying the average number of circuits in service on TAT-5 times the Comsat charge per (half) circuit for that year. Between 1970 and 1984, the cumulative present value of the expenditures AT&T made for circuits on TAT-5 was $39 million. The cumulative present value of the satellite lease charges for this period would have been about $74.5 million.

Given our assumptions about satellite prices, this difference may understate the amount AT&T saved by using cable. First, the cable is expected to operate for another 10 years at minimal expense. Second, the actual number of circuits carried by TAT-5 is somewhat greater than indicated in Table 1.

TABLE 1

AT&T's (Before Tax) Cost of TAT-5 for 1970-1984
vs.
The Cost it Would Have Incurred if it Had Paid Satellite Lease Charges
For the Circuits Actually Loaded on TAT-5

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
TAT-5 COSTS $M															
TAT-5 investment	30.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TASI	0	0	0	0	0	0	0	0	0	0	0	0.2	0.3	0	0.1
Operations & Maintenance	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Transit	0	0.2	0.5	0.6	0.6	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7
Total TAT-5 cost	31.5	0.8	1.1	1.2	1.2	1.3	1.2	1.2	1.2	1.2	1.2	1.4	1.5	1.2	1.4
Present Value of Costs	31.5	0.7	0.9	0.8	0.8	0.7	0.6	0.5	0.5	0.4	0.4	0.4	0.4	0.3	0.3
Cumulative PV of Costs	31.5	32.2	33.1	33.9	34.7	35.4	36.0	36.5	37.0	37.4	37.7	38.1	38.5	38.7	39.0
COST IF HAD LEASED SATELLITE CIRCUITS															
No. TAT-5 Circuits															
At End of Year	0	383	426	480	519	530	446	510	510	510	478	478	503	504	550
Added During Year	0	383	43	54	39	11	-84	64	0	0	-32	0	25	1	46
Average Ckts. in Service	0	192	405	453	500	525	488	478	510	510	494	478	491	504	527
Sat'l Chgs/Half Ckt ($K)	45.6	45.6	34.2	34.2	34.2	34.2	22.4	22.4	18.9	16.1	15.3	13.5	13.5	13.5	12.7
Sat'l Lease Charges ($M)	0	8.7	13.8	15.5	17.1	17.9	10.9	10.7	9.6	8.2	7.6	6.5	6.6	6.8	6.7
Pres. Value Sat'l Charges	0	7.7	10.9	10.8	10.6	9.8	5.3	4.6	3.7	2.8	2.3	1.7	1.6	1.4	1.2
Cumulative PV Sat'l Chgs	0	7.7	18.6	29.4	40.0	49.9	55.2	59.8	63.5	66.3	68.5	70.3	71.8	73.3	74.5

Notes

1. Operation and maintenance costs are estimated as 2% of TAT-5 investment costs.
2. Transit charges are estimated as $1250 per half circuit year for the average number of circuits in service.
3. The average number of circuits in service is estimated as the number of circuits at the end of the previous year plus half the total number of circuits added during the year.
4. TASI derived circuits are not included in the number of circuits shown on TAT-5. This omission tends to understate the cost AT&T would have incurred if it had leased satellites instead of constructing TAT-5.

TABLE 2

AT&T's (Before Tax) Cost of TAT-8 for 1987-1991
vs.
The Cost it Would Incur if it Were to Pay Satellite Lease Charges
For the Circuits Expected to be Loaded on TAT-8

	1987	1988	1989	1990	1991
TAT-8 COSTS $M					
TAT-8 investment	123	0	0	0	0
CME	6	2.3	3	5.7	5.3
O&M	0	2.5	2.5	2.5	2.5
Transit	0	0.2	0.5	0.8	1.2
Total TAT-8 cost	129.0	5.0	6.0	9.0	9.0
Present Value of Costs	129	4.4	4.7	6.3	5.6
Cumulative PV of Costs	129	133.4	138.2	144.4	150.0
COST IF WERE TO LEASE SATELLITE CIRCUITS					
No. TAT-8 Circuits At End of Year	0	2413	5318	8770	12924
Added During Year	0	2413	2905	3452	4154
Average Ckts. in Service	0	1207	3866	7044	10847
Sat'l Chgs/Half Ckt $k	11	10.7	10.4	10.1	9.8
Sat'l Lease Charges $M	0	12.9	40.2	71.1	106.3
Pres. Value Sat'l Charges	0	11.4	31.6	49.6	65.8
Cumulative PV Sat'l Chgs	0	11.4	43.1	92.7	158.5

Notes

1. Data source for cable costs and projections of annual tariff rate for satellite half circuits : Comments of AT&T, CC Docket No. 79-184, May 10, 1985, Attachments 2, and 5.
2. All cable CME (circuit multiplication equipment) investment expenses starting in 1987 were attributed to TAT-8.
3. Transit expenses attributable to TAT-8 were estimated as the increase over the level in 1987.
4. Interest rate used in present value calculation was 12.75%
5. Traffic on TAT-8 was estimated as all new cable traffic starting in 1988 under the FCC's "2 percent increased flexibility per year" loading guidelines as described in CC Docket 79-184, Second Notice of Proposed Rulemaking, Appendix 2.

TABLE 3

AT&T's (Before Tax) Cost of HAW-3 AND TPC-2 for Australia and Japan for 1974 to 1988
vs.
The Cost it Would Have Incurred if it Had Paid Satellite Lease Charges
For the Circuits Loaded on HAW-3 and TPC-2 for Australia and Japan

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
CABLE COSTS $M															
Australia															
HAW-3	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TPC-2 Hawaii-Guam	0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SEACOM-2 (IRU)	1.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Australia	3.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Japan															
HAW-3	8.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TPC-2 Hawaii-Guam	12.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TPC-2 Guam-Okinawa	5.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Japan	26.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Investment	29.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TASI	0	1.8	0	0	0	0	0	0	0	0	0	0	0	0	0
O&M	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Total Cable Costs	30.0	2.4	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Present Value of Costs	30.0	2.1	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1
Cumulative PV of Costs	30.0	32.1	32.6	33.0	33.4	33.7	34.0	34.3	34.5	34.7	34.9	35.0	35.2	35.3	35.4
COST IF HAD LEASED SATELLITE CIRCUITS															
Number of Cable Circuits															
Japan	0	0	21	69	107	147	176	176	176	285	375	375	375	375	375
Australia	0	15	24	44	61	81	89	100	113	113	113	113	113	113	113
Total (at End of Year)	0	15	45	113	168	228	265	276	289	398	488	488	488	488	488
Added During Year	0	15	30	68	55	60	37	11	13	109	90	0	0	0	0
Average Ckts. in Service	0	8	30	79	141	198	247	271	283	344	443	488	488	488	488
Sat'l Chgs/Half Ckt $k	58.8	58.8	22.4	22.4	18.9	16.1	15.3	13.5	13.5	13.5	12.7	12.7	11.5	11	10.7
Sat'l Lease Charges $M	0	0.4	.7	1.8	2.7	3.2	3.8	3.7	3.8	4.6	5.6	6.2	5.6	5.4	5.2
Pres. Value Sat'l Charges	0	0.4	.5	1.2	1.6	1.7	1.8	1.6	1.5	1.6	1.7	1.7	1.3	1.1	1.0
Cumulative PV Sat'l Chgs	0	0.4	.9	2.2	3.8	5.5	7.4	9.0	10.4	12.0	13.7	15.3	16.7	17.8	18.8

The table shows cable capacity without the use of time assignment speech interpolation equipment (TASI). This "circuit multiplication equipment" doubles the number of voice conversations carried on a basic voice circuit. Beginning in 1981 TASI was used on some circuits. If these TASI derived circuits had been included in the number of TAT-5 circuits in service shown in table 1, the cumulative present value of satellite lease charges would have been greater, as would be the amount AT&T saved by using cable.

Table 2 compares AT&T's cost of TAT-8 for 1987-1991 with the cost it would incur if it pays satellite lease charges for the circuits expected to be loaded on TAT-8. TAT-8 has not yet been constructed, so actual satellite lease charges cannot be used as an estimate of the cost saving to AT&T of not using satellites. Based on AT&T's forecast of satellite charges, Table 2 shows that TAT-8 will pay for itself within the first five years of its twenty-five year life expectancy. That is, the cumulative present value of AT&T's expenditures on TAT-8 between 1987 and 1991 are projected to be $150 million. In contrast the cumulative present value of the satellite lease charges for these circuits would be approximately $158.5 million. This assumes that AT&T follows the circuit loading plan specified by the Commission in its meeting of August 7, 1985. If AT&T were allowed to load a greater number of circuits on cable, the cost savings over satellite lease charges would be greater.

In contrast to the Atlantic cables, the Pacific cables do not appear to have saved AT&T more in satellite lease charges than they cost. Table 3 compares AT&T's cost of HAW-3 and TPC-2 for circuits to Australia and Japan for 1974-1988 with the cost it would have incurred if it had paid satellite lease charges for these circuits. Between 1974 and 1988 the cumulative present value of the expenditures on HAW-3, TPC-2 (and related cable IRUs) was $35.4 million. The cumulative present value of the satellite lease charges on these circuits would have been $18.8 million. Extending these calculations over the entire projected life of the cables, even assuming no further reduction in satellite lease charges, does not reverse the result that these cables cost AT&T more than satellites. Whether one concludes that this shows AT&T was biased depends, however, not on the actual experience, but on what AT&T expected when it planned the cable. There is greater reason to believe that AT&T overestimated future satellite lease charges in the Pacific than in the Atlantic. There are two reasons for this. This is because the reduction in satellite lease charges during the mid-nineteen seventies was much greater for circuits in the Pacific than the Atlantic. When HAW-3 and TPC-2 were being planned Comsat's annual lease charge per half circuit was $34,000 in the Atlantic region and $58,800 in the Pacific. But in 1976, one year after the Pacific cables were put into service Comsat adopted a uniform tariff of $22,400 per half-circuit for both

the Atlantic and the Pacific.[21] Another reason that benefits from building the Pacific cables may have been less than expected is that AT&T may have greatly overestimated demand. It is unlikely that AT&T foresaw the abrupt end of U.S. involvement in Vietnam in 1975, and the resulting drop in communications with the Pacific region. Nevertheless, the evidence suggests that AT&T constructed the Pacific cables when it was likely that using satellites would have been less expensive. Satellite lease charges would have had to remain at $58,000 per year through 1982 for the cumulative present value of cable costs to have been less than that of satellite lease charges (at actual traffic levels). As discussed in Section IV, rate-of-return regulation is the most likely reason AT&T invested in cables in the Pacific despite the fact that leasing satellite circuits would have been cheaper.

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21 At the end of 1975 the Commission ordered Comsat to file new rates. These rates were to generate less revenue than the existing rates and were not to be distance sensitive (56 FCC 2d 1101 (1975)). The decision was stayed by the Court pending Court review (Communications Satellite Corp. v. FCC, D.C. Cir. No. 75-2193, June 16, 1976). The District of Columbia Circuit generally upheld the FCC decision of 1975, but remanded several issues to the Commission (Communications Satellite Corp. v. FCC, 611 F.2d 883 (1977)). Finally, in 1978 the Commission adopted a negotiated settlement of the Comsat rate structure investigation (68 FCC 2d 941 (1978)).

B. Have Comsat's prices given AT&T the wrong signals about costs?

1. Has Comsat charged above cost on certain routes?

There are three sources of evidence that Comsat's prices exceeded cost on certain routes. One is engineering studies of the cost of satellite systems. The second is the existence of unregulated (and presumably unbiased) firms wishing to compete with Comsat. The third is comparison with domestic satellite rates.

a. Cost studies.

Cost studies may provide evidence that Comsat circuits were priced above cost. This would be the case if satellite prices exceeded cable costs on a given route, but a cost study indicated that satellites could have provided service on that route at a lower cost than cable. A cost study by a Committee of the National Academy of Engineering (NAE) supports such a conclusion. In 1968 the President's Task Force on Communications Policy requested that the NAE establish a committee on communications to examine the relative costs of cable and satellite communication facilities.[22] As part of its study the Committee compared the cost of TAT-5 with that of a modified INTELSAT III system providing point-to-point transmissions between the United States and England. It was assumed that four identical

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22 Committee on Telecommunications, National Academy of Engineering (1968).

satellites, each lasting five years, would be used to provide service for the same twenty year period as the cable. The cost of the satellite system included two earth stations and an in-orbit spare satellite. Allowances were made for launch failures. The TAT-5 cable has a capacity of 720 circuits, while the modified INTELSAT III satellite would have a capacity of about 10,000 circuits. The Committee chose this capacity because "the saving in cost for a smaller capacity would be negligible."[23] The Committee concluded that "up to 720 circuits may be provided for 20 years for trans-Atlantic distances at approximately the same annual cost, whether a satellite system or a cable system is used. The slight saving due to the satellite system (especially at higher interest rates) may be improved, if only 720 circuits are required, by using smaller earth antennas and less costly equipment. However, if more than 720 circuits are required, the satellite system has a decided cost advantage."[24] In fact, Comsat was providing more than 720 full time circuits between the U.S. and Europe from 1972 onward. Thus if Comsat were serving only this market it should have been able to price its circuits below the cost of TAT-5.

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23 Committee on Telecommunications, National Academy of Engineering (1968), p.100.

24 Committee on Telecommunications, National Academy of Engineering (1968), p.101.

One might argue that Comsat and INTELSAT were not serving only this market so that such an analysis is irrelevant. But this reaction would be wrong. INTELSAT could have served this route using such a separate system, but it chose not to do so. Presumably the added cost of serving this route as part of a global system was less than establishing a stand-alone system. In any case, the issue is whether Comsat's prices on the North Atlantic route exceeded the least costly method of serving that route via satellite. The NAE study suggests that Comsat's prices did.

A later study by the Office of Telecommunications Policy (OTP) also found that satellites cost the same or less than cables for serving the Atlantic Ocean region.[25] The study compared the per circuit cost of a hypothetical point-to-point satellite system with two alternative cable systems. One system used a "SF" cable, similar to TAT-5, and the other a "SG" cable, similar to TAT-6. The satellite system used INTELSAT IV satellites and was designed to have 100% redundancy through the deployment of a spare satellite. The launch failure rate was assumed to be one in four launches. The study found "that a point-to-point satellite system using existing technology can be built and operated over 24 years at a cost per circuit in use which is less than the cost of SF cable technology for the same quality of service, by a ratio of about 3 to 1, at 1976 traffic levels. In this

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25 Office of Telecommunications Policy (1971).

same range of traffic, INTELSAT IV technology and SG cable technology are sufficiently close in cost that we can reach no conclusion on their relative merits."[26]

The OTP study also compared the cost of a cable system between the U.S. and Europe with "that part of the global satellite system which serves the same traffic and routes."[27] It concluded that "INTELSAT IV satellite systems can provide the required quality of service at relevant traffic levels more cheaply than SF cable technology. Indeed, in this mode, INTELSAT IV costs are lower than SF costs for all levels of capacity utilization. As before, comparative INTELSAT IV - SG cable costs appear to be within the margin of uncertainty of the data used in the analysis."[28]

b. Entry.

The fact that private, unregulated, cable and satellite systems wish to enter the international facilities market suggests that the new entrants believe they can provide certain services at less cost than Comsat. This may be either because the prices Comsat is charging for its existing services exceed the new entrants' costs or because Comsat is not offering

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26 OTP (1971), p.43.

27 OTP (1971), p.54.

28 OTP (1971), p.56.

some specialized services at any price. The Commission recently authorized RCA American Communications, Pan American Satellite Corp., and International Satellite Corp. to provide international private line service. The Commission deferred action on the applications by Orion Satellite Corp. and Cygnus Satellite Corp.[29] The Commission has also determined that Tele-Optik and Submarine Lightwave Cable Company meet its requirements for receiving a Cable landing license for an Atlantic fiber optic cable system.[30]

Given that under Authorized User II, Comsat can directly serve users, one can rule out the possibility that the only reason these firms wish to enter is to avoid additional markups imposed by international carriers.[31] Prior to the Authorized User II, policy most end users could not purchase satellite circuits directly from Comsat. Instead they had to go through a carrier. Under that regime, it would have been possible that private systems would have wished to enter the market to avoid a markup by international carriers, and not because of an excessive markup by Comsat.

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29 Report and Order, CC Docket No. 84-1299, July 25, 1985.

30 Tele-Optik Limited, 100 FCC 2d 1033 (1985); SLC, Cable Landing License, mimeo No. 5241, released June 19, 1985.

31 Second Report and Order, Readopting the Commission's Authorized User II Policy, CC Docket No. 80-170, December 19, 1984.

c. Comparison with domestic satellite rates.

The rates for domestic satellite circuits may be a useful benchmark to compare with Comsat rates. The domestic market appears to be relatively competitive and thus rates should tend to be driven down to cost.[32] We have no data on domestic rates for voice circuits. But a recent study by Dale Hatfield Associates compared rates charged by four U.S. domestic satellite companies for video transponder service with (double) Comsat's half-circuit rates for international television service. They found that "a video service customer may have to pay more than twice as much for international service than he would pay for domestic service," and that "there are no technical differences between domestic and international satellite service that would cause one to predict such a large price differential. In fact, satellite space segment costs are not sensitive to distance, so that it would not be unreasonable to expect domestic and international satellite space segment rates to be approximately equal."[33]

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32 In the Fifth Report and Order of the Competitive Common Carrier Rulemaking, the Commission deregulated domestic satellites (i.e., the FCC will "forebear" from regulating their rates) based on evidence that domsats do not possess market power (98 FCC 2d 1191).

33 Dale Hatfield Associates (1985), pp.2-3.

2. If so, how did Comsat use the excess revenue?

Evidence suggests that Comsat did charge above the minimum cost of serving the Atlantic market by satellite. This conclusion raises the question of how Comsat used the excess revenue. There are three possibilities: (1) Comsat kept the revenue as profits. (2) Comsat used the revenue to cross-subsidize high cost routes. (3) Comsat used the revenue to pay high costs. One possible source of high costs may be chronic excess capacity.

From the viewpoint of public policy, there would be little concern about allowing cables to compete freely with satellites if any revenue in excess of cost were currently going to monopoly profits or wasteful expenditures. In that case, competition would do no more than elimate such profits and waste. There might be some concern about allowing free entry if, instead, the revenue were being used to hold down prices to "worthy" parties communicating on high cost routes. In this case, competition would eliminate the current source of funding for such subsidies.

C. Has circuit loading policy distorted investment?

Based on the discussion above, it appears that circuit loading policy has permitted Comsat to charge above cable costs. It is likely that this in turn induced AT&T to increase its investment in cable facilities. There is no simple way to measure the magnitude of the investment distortion caused by FCC circuit loading requirements. The first step in addressing this issue is to examine the history of satellite

and cable investment.

Tables 4 and 5 show capacity and message service usage for satellite and cable facilities in the Atlantic and Pacific Ocean regions respectively. In both regions, utilization rates have tended to drop when new facilities were put in service and have gradually risen as demand has caught up to capacity. Utilization rates were more variable in the Pacific than the Atlantic. In the Pacific total utilization ranged from a low of 13% in 1975 to a high of 72% in 1981. In the Atlantic it ranged from a low of 24% in 1976 to a high of 62% in 1980. These figures tend to overstate utilization because they understate available capacity. Cable capacity is shown without the use of TASI, which doubles the capacity of the circuits on which it is used. Not accounting for TASI also explains the fact that in 1984 cable utilization in the Pacific was 116%. Satellite capacity is understated as well. The figures presented in tables 5 and 6 exclude what INTELSAT calls "limited performance satellites." These tend to be older satellites that are no longer being used. While these satellites cannot operate at their maximum designed capacity, they may still have a significant number of usable circuits.

These utilization figures suggest that there has been serious excess capacity in international facilities. Another way to illustrate the possible excess capacity is to note that between 1970 and 1984 unused satellite capacity consistently exceeded cable usage. (See table 6).

TABLE 4

Atlantic Ocean Region
Capacity and Message Service Usage
(Full Time Voice Circuits at End of Year)

	SATELLITE (INTELSAT)			CABLE (AT&T)			TOTAL		
Year	Usage	Capacity	Utilization	Usage	Capacity	Utilization	Usage	Capacity	Utilization
1965	75	240	31%						
1966	86	240	36%						
1967	209	560	37%						
1968	360	560	64%						
1969	914	1440	63%						
1970	1316	2640	50%	610	1219	50%	1926	3859	50%
1971	1757	6400	27%	691	1219	57%	2448	7619	32%
1972	2374	8000	30%	720	1219	59%	3094	9219	34%
1973	3145	8000	39%	749	1219	61%	3894	9219	42%
1974	3847	12000	32%	1089	1592	68%	4936	13592	36%
1975	4431	12000	37%	1112	1592	70%	5543	13592	41%
1976	5391	24000	22%	1661	5592	30%	7052	29592	24%
1977	6502	30000	22%	2155	5592	39%	8657	35592	24%
1978	8127	26000	31%	2633	5542	48%	10760	31542	34%
1979	10453	26000	40%	2856	5542	52%	13309	31542	42%
1980	13765	22000	63%	3187	5542	58%	16952	27542	62%
1981	16946	42000	40%	3659	5542	66%	20605	47542	43%
1982	19632	42000	47%	4019	5494	73%	23651	47494	50%
1983	21352	54000	40%	4698	9694	48%	26050	63694	41%
1984	22935	60000	38%	6337	9694	65%	29272	69694	42%
1985	28091	63000	45%						
1986	31206	64500	48%						
1987	36156	118500	31%						
1988	39132	106500	37%						

TABLE 5

Pacific Ocean Region
Capacity and Message Service Usage
(Full Time Voice Circuits at End of Year)

	SATELLITE (INTELSAT)			CABLE (AT&T)			TOTAL		
Year	Usage	Capacity	Utilization	Usage	Capacity	Utilization	Usage	Capacity	Utilization
1967	135	560	24%						
1968	211	560	38%						
1969	452	1440	31%						
1970	656	1200	55%	136	193	70%	792	1393	57%
1971	827	1200	69%	144	193	75%	971	1393	70%
1972	924	4000	23%	150	193	78%	1074	4193	26%
1973	1126	5200	22%	155	193	80%	1281	5393	24%
1974	930	4000	23%	168	1038	16%	1098	5038	22%
1975	963	8000	12%	180	1038	17%	1143	9038	13%
1976	986	8000	12%	266	1038	26%	1252	9038	14%
1977	1115	8000	14%	317	1038	31%	1432	9038	16%
1978	1470	8000	18%	444	1038	43%	1914	9038	21%
1979	1950	4000	49%	497	1038	48%	2447	5038	49%
1980	2338	4000	58%	609	1038	59%	2947	5038	58%
1981	2990	4000	75%	647	1038	62%	3637	5038	72%
1982	3629	12000	30%	700	1038	67%	4329	13038	33%
1983	4106	12000	34%	956	1038	92%	5062	13038	39%
1984	4834	12000	40%	1209	1038	116%	6043	13038	46%

TABLE 6

Comparison of Unused Capacity on INTELSAT Operational Satellites
with
AT&T's Cable Usage
(Full Time Voice Circuits at End of Year)

	ATLANTIC OCEAN REGION			PACIFIC OCEAN REGION		
Year	Unused Satellite Capacity	Cable Usage	Ratio Unused Capacity to Usage	Unused Satellite Capacity	Cable Usage	Ratio Unused Capacity to Usage
1965	165			---		
1966	154			---		
1967	351			425		
1968	200			349		
1969	526			988		
1970	1324	610	2.17	544	136	4.00
1971	4643	691	6.72	373	144	2.59
1972	5626	720	7.81	3076	150	20.51
1973	4855	749	6.48	4074	155	26.28
1974	8153	1089	7.49	3070	168	18.27
1975	7569	1112	6.81	7037	180	39.09
1976	18609	1661	11.20	7014	266	26.37
1977	23498	2155	10.90	6885	317	21.72
1978	17873	2633	6.79	6530	444	14.71
1979	15547	2856	5.44	2050	497	4.12
1980	8235	3187	2.58	1662	609	2.73
1981	25054	3659	6.85	1010	647	1.56
1982	22368	4019	5.57	8371	700	11.96
1983	32648	4698	6.95	7894	956	8.26
1984	37065	6337	5.85	7166	1209	5.93

TABLE 7

MAJOR AT&T CABLES

	TAT-5	TAT-6	TAT-7	TPC-2	HAW-3	Total
Date in Service	1970	1976	1983	1975	1974	
Voice Circuits non-TASI	845	4000	4200	845	845	
INVESTMENT COST						
Original Dollars ($M)[1]	79	197	180	123	69.6	
1984 Dollars[2]						
Total Cost ($M)	205.2	353.3	196.5	241.7	148.4	1145.2
Cost per Circuit ($K)	243	88	47	286	176	
Present Value In 1985 ($M)[3]	342.1	549.6	259.2	372.7	226.2	1749.8

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1 NTIA, 1984 World's Submarine Telephone Cable Systems

2 Calculated using the Gross National Product implicit price deflator: Council of Economic Advisers, Economic Report of the President, tables B-3. Investment costs were assumed to be incurred in the year prior to the date of service.

3 Total value in 1985 if the original investment cost of each cable had instead been invested in Aaa rated corporate bonds. The source of bond yields was: Council of Economic Advisers, Economic Report of the President, table B-66.

This means that the entire demand during the period could have been met even if none of the cable facilities had been built. The cost of these cable facilities to AT&T (present value in 1985) was approximately $1.75 billion (see table 7).[34]

There is some evidence that placing all new traffic on satellites during that period would have been the least costly way of meeting demand. The Committee on Telecommunications of the National Academy of Engineering examined the cost of various methods of meeting demand between 1975 and 1985 in the Atlantic Ocean region. If demand grew at 20% per year, dividing investment between cable and satellites was estimated to be about 50% more costly than concentrating all investment on satellites. And if traffic grew at only 10% per year the mixed strategy was approximately twice as expensive as the satellite-only strategy.[35] Actual traffic growth turned out to be somewhere between 10% and 20%.[36]

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34 Alternatively, given the cables that were constructed, INTELSAT's construction program could have been substantially scaled back.

35 Committee on Telecommunications, the National Academy of Engineering (1968), pp. 109 and 112.

36 Under their 10% growth forecast traffic was projected to be 17,996 circuits in 1984, and under the 20% growth forecast it was projected to be 45,307. Actual traffic in 1984 was 29,272 circuits.

Of course there are other criteria besides cost minimization. Satellites and cables may differ in service characteristics, reliability, and security. Because of the time delay in satellite transmissions, satellites may be inferior for transmitting high speed data between machines that must "talk" to each other in order to check for errors. This time delay may also make it difficult for the non-speaking party to interrupt a conversation. But high speed data traffic would not justify the current proportion of cable circuits because it comprises only several percent of total traffic.[37] Nor would the theoretically superior quality of cable circuits for transmitting voice conversations. A recent study by Washington Consumers' Checkbook (1984) rated SBS best in the quality of connection despite its heavy reliance on satellites.[38] Proponents of cables have also argued that cable facilities are necessary to provide high reliability of service. Diversity of modes and of facilities will increase reliability, but the increase is

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37 At the end of 1984, 89% of U.S.-CEPT circuits were used for message telephone service. The remaining 11% was used for telex, telegraph, leased voice lines, and high speed data.

38 Washington Consumers' Checkbook (Summer 1984) p.50. The study compared the quality of connection of AT&T, GTE Sprint, ITT, MCI, SBS, Western Union, Allnet, and Telesaver. Both test calls and a consumer survey were used to rate the service quality. Test calls were rated on six criteria: echo, static, crosstalk, tinny or metallic sounding voice, extraneous noise, or low volume. In the consumer survey customers were asked to compare the quality of connections to those of AT&T.

small. The INTELSAT system has proved to be virtually 100% reliable.[39] Finally, the Department of Defense has argued that cables are needed for national security because satellites can be jammed and conversations intercepted. But cables can be cut by trawlers and satellite conversations can be scrambled to avoid interception. Moreover, the entire volume of military traffic in the Atlantic could have been met by a single cable.[40] In any case, there is no way of knowing whether the value the Department of Defense places on a cable is sufficient to justify building it, since the DOD is not required to contribute directly to its construction cost.

This discussion suggests that investment in international facilities has not been optimal. From the viewpoint of providing service at the least cost, all the trans-Atlantic and trans-Pacific cables constructed between 1970 and 1984 appear to have been unnecessary. Perhaps the other considerations discussed above were important enough to justify constructing one trans-Atlantic cable during the period. But it is doubtful that they would justify the trans-Pacific cables given the high cost of these cables and the

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39 Between 1979 and 1984 the lowest figure for system continuity of service was 99.753% for 1983, "INTELSAT System Status Report for November 1984, Signatory Report SR/85-1-1, 23 January 1985, p. 8.

40 All secure military traffic is on leased private lines. At the end of 1984 there were 1442 U.S.-CEPT leased channels. Military traffic is under one-half of this total. Thus a cable of the size of TAT-5 could handle the entire U.S.-CEPT military traffic.

light traffic.

Our theoretical analysis suggests that the Commission's circuit loading policy and rate-of-return regulation could have lead to such investment distortions. Absent Commission involvement in circuit loading, it is likely that AT&T would have constructed fewer cables, and used more satellite facilities. And absent rate-of-return regulation, it unlikely that there would have been such excessive total investment in cable and satellite facilities. Unfortunately, theory does not provide us with a method for estimating the degree to which loading policy and rate-of-return regulation individually or jointly contributed to these distortions.

VII. MAJOR POLICY ALTERNATIVES: REGULATE BETTER OR DEREGULATE

It has been argued above that most of the traditional reasons for regulating the loading of international facilities cannot withstand careful scrutiny. And that such regulation may have raised the price of satellite circuits and distorted investment decisions. Nevertheless, one cannot completely dismiss the possibility that AT&T may be biased in favor of cables because of rate-of-return regulation or that INTELSAT's globally averaged pricing structure may give AT&T the wrong signals about costs.

There are two divergent paths the Commission might follow if it wishes to promote a more efficient structure for international transmission facilities. One path would have the Commission regulate business investment

and pricing more heavily. The other path would liberalize regulation and place increased reliance on improving the incentives of the affected companies. Either path might produce better outcomes than the Commission's current approach of heavily involving itself in the allocation of usage among facilities, but exercising little control over investment and pricing. We will argue that restructuring the incentives of carriers and suppliers of facilities is more likely to be a successful strategy, given the limitations on the FCC's authority and the limited ability of any regulatory agency to determine costs.

More extensive regulation would involve better control of both new construction and the prices charged by regulated firms. Tight control over entry is particularly important if the FCC wishes to allow Comsat and INTELSAT to price above cost on certain routes in order to cross-subsidize other routes. Without such entry restrictions, firms whose costs are below Comsat's prices will enter. Some of these "creamskimmers" may even have costs above those of Comsat. For regulation of investment to be effective, the FCC must have control over construction of all satellite and cable systems, including private systems. But the FCC has only indirect control

over INTELSAT's investment.[41] While it does have direct authority over common carrier cable facilities, in the end it has never rejected authorization of any of AT&T's international cables. And in approving the Tel-Optik and SLC licenses the FCC indicated it was not going to exercise firm control over private systems.

Even if the FCC were willing and able to control all facility construction and use, there is a fundamental problem with entry prohibition. It may exclude efficient as well as inefficient entry. Some new entrants may be able to provide service at lower cost than the incumbents. Moreover, restrictions may allow the protected firms to earn excessive profits or to incur excessive costs. In other words, entry barriers shelter the protected firms from the discipline of competition. This would not be a problem if the FCC could accurately determine Comsat's costs and do a good job of regulating its prices, but it cannot.

In the next section we will discuss alternative paths to a more efficient structure for international facilities. The idea is to create the

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41 The Commission's leverage over INTELSAT comes through its authority over Comsat. Comsat must obtain the Commission's permission to participate in the launches of INTELSAT satellites. The Commission has never denied such permission. It is unclear what would happen if permission were denied. INTELSAT could carryout launches and other investment without Comsat's approval and Comsat would still be obliged to pay its share of the costs under the provisions of the INTELSAT agreements.

conditions for unbiased choices of international facilities. If carriers are not biased, and cross-subsidies are either dropped as a policy objective or financed directly, there is no justification for future Commission involvement in circuit loading. Without regulatory entry barriers INTELSAT and Comsat will be under competitive pressure to minimize costs and to align their prices with the cost of serving each route.

VIII. PROMOTING UNBIASED INTERMODAL COMPETITION

A. Phasing out Commission-specified circuit loading.

To achieve the efficiency benefits of deregulation it may be sufficient to end all Commission involvement in the loading of future facilities. There would be little additional cost savings from immediately terminating all circuit loading requirements because to a large extent the costs of current facilities are sunk.[42] But a sudden end of circuit loading requirements for existing facilities might result in Comsat losing

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42 Facilities under construction or contract for construction present some complications for phasing out circuit loading requirements. The costs of such facilities are only partially sunk. In deciding whether to complete such projects as originally scheduled, only the variable costs should be considered. In some cases it would be economically efficient to cancel a contract to construct a satellite or to sell the satellite to another user.

substantial traffic and revenue.[43]

Some form of transition is needed to move from the current loading requirements to the absence of such requirements when all existing facilities are no longer in service. The precise form of the transition is largely a question of equity, but may also have efficiency implications. A simple transition methodology would be to guarantee each Comsat facility the number of circuits in place at the expiration of current loading plan that applies to that facility. The loading requirement would expire when the facility is replaced. Literally following this plan might, however, provide Comsat and INTELSAT with perverse incentives. First, they would have an incentive to prematurely replace satellites prior to the expiration of the current loading plans. Having new facilities in place at the expiration of the current loading plan would extend the time AT&T would be obliged to use Comsat facilities because the new facilities would operate longer than the ones they replaced. Second, after the expiration of the current loading plans, INTELSAT would have an incentive to excessively extend the life of facilities in order to extend the loading requirements.

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43 Without mandated circuit loading, Comsat would be likely to lose traffic because carriers own cables but lease satellite circuits on a short term basis. See Section IV. D. above for a discussion of why this difference in contractual arrangements could result in a large shift from satellites to cables in the short run.

To avoid creating such artificial incentives, it would be better to establish a schedule for phasing out loading requirements that is independent of satellite deployment decisions. A fixed schedule could be established that allowed Comsat to recoup most of its sunk costs. For example, the transition might begin by requiring AT&T to use the number of satellite circuits currently forecast for the last year of the current loading plan, and then allow AT&T to reduce its usage of satellite circuits by ten percent of that amount over the next ten years. Such a gradual transition would ease the adjustment to the end of all circuit loading requirements.

B. Deregulating Comsat.

If the Commission is to allow free competition with Comsat it is absolutely essential that Comsat have downward flexibility in pricing on those routes on which it is facing actual or potential competition. The sooner the Commission announces that it will encourage such pricing flexibility the better. AT&T and investors in private satellite and cable systems appear to have based their investment plans on the assumption that Comsat's prices will remain high. If, however, Comsat were to announce price cuts (guaranteed by long term contracts) before these facilities are built, many might not be built and much investment cost could be saved. The public would still benefit since it would be able to obtain lower prices from Comsat. But once private facilities are in place, their owners are likely to put severe pressure on the Commission to assure that Comsat's prices stay

high.

As part of this proposal the FCC should end all rate-of-return regulation of Comsat. This, along with a policy of promoting free entry, would eliminate Comsat's incentive to support INTELSAT's investing in unneeded satellite facilities.[44] As INTELSAT's largest member, Comsat is likely to have a significant degree of influence on INTELSAT's decisions. An end to rate-of-return regulation would be a two-edged sword for Comsat. The benefit would be an end to regulatory limitations on its maximum profits. The cost would be an end to the Commission's practice of guaranteeing that Comsat have sufficient traffic to earn its allowed rate-of-return.

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44 Tables 4 and 5 suggest that there has been excessive capacity in both the Atlantic and Pacific ocean regions. The Commission's circuit loading requirements do not explain why INTELSAT persistently invested in so much capacity, given that AT&T continued to build cables. It is possible that early circuit loading formulae contributed to the problem by using capacity as a factor in determining traffic distributions. For example, a formula that attempts to equalize utilization percentages on all facilities allocates more traffic to larger facilities. The balanced loading formula, which attempts to equalize the amount of traffic on all independent pathways, does not allocate more traffic to larger facilities (except when a facility is so small that it is no longer allocated traffic because it has reached capacity). This formula does, however, create an incentive to launch additional satellites since it automatically allocates traffic to each new path. But there is no evidence that INTELSAT has pursued a policy of splitting its traffic over an excessive number of small satellites. It has generally attempted to use a single primary satellite to handle most of its traffic in a region. Rate-of-return regulation may have given Comsat an incentive to support INTELSAT's rapid expansion of its capital base. Such regulation does not, however, explain why other INTELSAT members supported such growth in capacity, because these other members were not subject to such regulation.

Some form of price regulation, however, would be necessary for those circuits that continue to be covered by any FCC loading requirements. Absent any price regulation, Comsat could extract AT&T's entire profits from IMTS by setting a sufficiently high price for those satellite circuits AT&T is required to use. Setting a price ceiling at the lease rate in force prior to deregulation would be a simple way to protect AT&T and its customers from Comsat exploiting the market power derived from FCC circuit loading requirements. As circuit loading requirements are phased out, the number of circuits covered by price controls would fall. The price controls would end completely when the loading requirements are completely phased out.

Under this proposal Comsat would have complete freedom in setting charges, terms and conditions for circuits not covered by loading requirements. Comsat would have a strong incentive to set a low price for these circuits on all routes on which it faced potential competition. Lowering the price of the deregulated circuits would not reduce Comsat's revenue on those circuits covered by the FCC loading requirements since the two classes of

circuits could be priced independently.[45] Any circuit price above marginal cost would add to Comsat's profits. Setting a low price for long term satellite circuits may attract traffic that would otherwise go to private facilities such as the proposed Orion satellite or the Tel-Optik cable, or to future common carrier cable facilities such as TAT-9. Providing additional service with existing satellite facilities instead of constructing new facilities could save hundreds of millions of dollars. Some of these savings would accrue to potential users of the proposed alternative facilities because the price of Comsat's circuits would need to be lower than the price that would be charged by these alternative facilities if customers are to buy Comsat's circuits.

Despite the efficiency benefits of Comsat offering idle capacity at close to marginal cost, it is inevitable that potential entrants will characterize such pricing as predatory. For example, PanAmSat has recently complained to the FCC that INTELSAT's plan to sell Venezuela a transponder for domestic

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45 This difference in prices could be considered reasonable under Section 202(a) of the Communications Act if limited to the transition period. See CC Docket No. 83-1145, FCC 84-524, November 9, 1985 in which the Commission proposed a phase-in of special access tariff rates. The Commission adopted the phase-in on March 1, 1985 in a Memorandum Opinion and Order in the same docket. It was argued that the transition was justified because of the unique circumstances of the OCCs.

use is predatory.[46] PanAmSat has just received FCC authorization for providing domestic satellite service in Latin America and presumably does not want to compete with INTELSAT. Earlier this spring, Orion Satellite Corporation, another potential competitor, argued that "INTELSAT should be permitted to offer non-switched services only on a fully allocated cost basis, including all direct costs of service, a full allocation of common costs and an appropriate return on capital. Under no circumstances should INTELSAT be permitted to price on an incremental or short term marginal cost basis. One can argue about the precise process for assuring that rates are based on fully allocated costs, but the full allocation of costs is essential to promote the public interest, ensure a modicum of equity, and prevent predatory pricing."[47]

The Commission should treat such claims of predation with great skepticism. It would seem far better to allow the public to benefit now from low prices for transponders (or low long term lease charges) than to maintain a floor on prices in order to protect the public against possible price increases in the future.

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46 Washington Post (September 13, 1985), p.E1.

47 Letter to William Schneider Jr. of the State Department and David Markey of NTIA from Christopher Vizas II of Orion Corporation, April 12, 1985.

C. Eliminating distortions in carriers' choices of facilities.

1. Deregulate international service carriers.

The best way to eliminate the possibility that rate-of-return regulation biases carriers towards cable is to eliminate such regulation for all international service carriers. This would require an accounting separation of AT&T's unregulated international telecommunications services from its regulated domestic long distance business (until such time as the domestic business is also deregulated). The assets used in providing international service would be assigned to the international business. The costs assigned to the international business would include settlements payments to foreign PTTs, payments to Comsat for facilities, as well as the costs of international facilities and personnel involved in providing international services. The cost incurred by the international business in using AT&T Communications' (ATT-C) domestic network in completing international calls could be estimated for accounting purposes using one of the ATT-C's bulk rate tariffs such as WATS or the proposed SDN or Megacom tariffs.

It is doubtful that eliminating rate-of-return regulation for AT&T's international business would result in higher prices. There are two reasons for this. First, as firms such as MCI, GTE, and SBS continue to enter the international market, competition will increasingly limit the amount that AT&T can charge. Second, rate-of-return regulation does not protect the interests of U.S. consumers of international telecommunications. The current system of rate-of-return regulation does not determine prices on

individual international routes. The constraint applies only to firms' overall rates-of-return. Even if rate-of-return regulation were strictly enforced, a firm could earn above a competitive rate-of-return on all its international routes as long as its domestic routes were earning below the allowed rate-of-return.[48] At the moment the FCC does not routinely collect sufficient information to determine whether this is the case. The FCC no longer requires AT&T to separately report the rate-of-return for its international business on a regular basis. However, in 1979, the last year such data was regularly reported, AT&T had a 36.5 percent rate of return on

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48 Such an accounting separation may be helpful in promoting competition in domestic as well as international markets. An accounting separation reduces the possiblity that AT&T will use high international profits to cross-subsidize domestic rates.

It would be unwise, however, to create such an accounting separation solely for the purpose of preventing such cross-subsidization. Applying traditional rate-of-return regulation separately to AT&T's international business could exacerbate AT&T's possible incentive to overinvest in its international rate base. Resale activities constitute a large part of AT&T's international business. Settlements payments for foreign connections, payments to Comsat, the cost of domestic local distribution and ATT-C long haul distribution absorb most of the revenue from this business. They are large relative to the investment in international facilities and other capital devoted exclusively to the international business. Moreover, much of the value of AT&T's international business arises from its efforts to develop long-term working relationships with the foreign correspondents with whom it jointly provides IMTS service. Any attempt to reward AT&T for its "intangible investments" by setting a high rate-of-return on its "tangible" capital base would give AT&T an incentive to excessively expand its tangible capital, including international facilities.

its overseas MTS investments.[49]

More importantly, rate-of-return regulation of U.S. international service carriers does not protect U.S. customers against the market power of foreign PTTs. A PTT's market power arises from its control over access to its domestic network.[50] At present, U.S. carriers as a group make net settlements payments to foreign PTT's. Under traditional rate-of-return regulation, any increase in a regulated carrier's payments to a PTT should increase the firm's allowed revenue requirement by an equivalent amount. As a result, a carrier regulated in this way would have little incentive to resist attempts by PTTs to raise settlements rates. Thus, instead of protecting U.S. consumers, rate-of-return regulation might only encourage PTTs to negotiate for higher settlements rates, thereby shifting profits abroad.

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49 U.S., Government Accounting Office (1983), p.7. While the Commission does not require that AT&T report a separate IMTS rate-of-return either as part of its Annual FDC Report or with its tariff filings, the Commission has on occasion specifically requested such information. For example, the Chief of the Common Carrier Bureau asked AT&T to report its IMTS rate-of-return in May 1984 to assist the Commission in its investigation of AT&T's request to offer international video teleconferencing (Overeas High Speed Switched Digital Service).

50 See Kwerel (1984).

It may be possible to eliminate rate-of-return regulation without ending all Commission regulation of AT&T's international tariffs. The Commission might establish a band within which AT&T must set its prices. The floor of the band might be set at the current average variable cost of service. This would include direct variable costs, Comsat lease charges, imputed domestic distribution costs, and settlement payments. Assuming average variable and average total costs are both declining, a ceiling might be based on the average variable costs during some previous period (say five to seven years). This system would give AT&T a strong incentive to negotiate for better settlement agreements since it could keep the gains for several years. Under this plan, investing in international facilities would not increase the ceiling except to the extent that it increased variable costs. Thus AT&T would not have an incentive to excessively invest in cable facilities. Indeed, the plan might even bias AT&T towards leasing satellite facilities, since such lease charges would be an element in determining the ceiling. A similar band could be established for the international record carriers. An alternative method of maintaining some FCC control over prices without creating the distortions associated with rate-of-return regulation would be to establish a percentage limit on the amount AT&T could adjust its prices upward or downward within a specified time period.

2. Options within the framework of rate base regulation.

If it is decided not to deregulate international carriers at this time, it may still be possible to correct potential investment biases caused by rate-of-return regulation. One option would be to allow satellite investments in carriers' rate bases. Under this option carriers would be able to own satellite circuits in a manner analogous to the current ownership arrangement for international cables. A carrier can now acquire the use of a cable circuit by making a one-time purchase of an IRU (indefeasible right of user) and paying an annual fee for its share of the the operating and maintenance costs. An IRU guarantees the owner the right to use a circuit for the life of the facility but gives him no voice in the day-to-day management of the facility. The new ownership rules would apply only to new investment, that is, facilities not currently in operation or under contract for construction. There is no benefit to changing ownership rules for existing investment, since decisions on past investment have already been made and cannot be undone. Moreover, allowing existing satellite circuits to enter carriers' rate bases might have the effect of increasing their revenue requirements, and hence regulated prices. As under the complete deregulation proposal, Comsat would be free to set the prices and terms of the new circuits.

Another alternative would be to establish an international cable carrier analogous to Comsat and require AT&T and the international record carriers (IRCs) to divest themselves of their cable holdings. This policy would also

put both modes on an equal basis. But in contrast to the previous alternative it would do so by ensuring that neither satellite nor cable would enter a carrier's rate base, and neither would be under the control of a carrier.

Requiring cable divestiture is a bad idea for two reason. First, it would result in the loss of the advantages of vertical integration. Vertical integration may allow a company to design specialized products, such as suboceanic cables, at lower cost and to better meet its internal requirements than if it were to purchase the inputs from an outside supplier. In the case of international facilities, vertical integration also allows greater operational coordination between domestic and international haul. AT&T has traditionally considered such control over design and operation of facilities extremely important for maintaining a high level of service quality.

Second, requiring such a divestiture might also create an additional bottleneck in the provision of international communications. Vertical integration assures that AT&T faces the marginal cost of providing additional cable facilities. If cables were provided by a separate entity analogous to Comsat, it is possible that an efficient bargain could be worked out between the entity and AT&T so that AT&T would make decisions based on marginal costs. It is also possible however, that such an efficient arrangement will not be arrived at. If AT&T paid more than

marginal cost for using cable circuits, its profit maximizing price for end-to-end service would be higher than if it were a fully integrated firm.[51]

D. Issues raised by promoting intermodal competition.

1. Will PTTs be able to appropriate all the benefits of intermodal competition?

Foreign telecommunications administrations are bottlenecks in the provision of international telecommunications. They control distribution within their countries. In OPP Working Paper 13, Kwerel (1984) argued that there is a long term danger that PTTs will appropriate the gains from competition among U.S. firms. Competition among suppliers of transmission facilities "will tend to drive the price of that component down to cost. But the price of the total service may remain the same if some other essential component of the service is controlled by a monopolist. The PTTs have a monopoly on access and may be willing to exercise their market power in order to provide revenues to subsidize domestic telephone and postal rates."[52] In other words, competition may do nothing more than shift profits to PTTs.

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51 Note that the same argument applies to the current prohibition against AT&T providing international satellite circuits. Allowing AT&T (and PTTs) to (jointly) provide satellite circuits would avoid the potential of INTELSAT/Comsat marking up the price of such circuits above marginal cost.

52 Kwerel (1984), p.2 executive summary.

This unfortunate outcome is unlikely for two reasons. First, the model on which it is based does not allow for efficiency gains from competition. The model assumed that prior to the introduction of competition, the joint suppliers of international telecommunications were acting as if they were a single profit maximizing monopolist (i.e. maximizing joint profits). As discussed in Working Paper 13, if the suppliers were not maximizing joint profits, introducing competition for a component of a service might increase economic efficiency and reduce the price of end-to-end service for U.S. users.[53] In particular, increasing competition in the supply of international facilities would be likely to increase economic efficiency because U.S. carriers, Comsat, and INTELSAT do not appear to be acting cooperatively. If they were, we would not observe the construction of cable facilities when virtually equivalent service could have been provided at lower cost by satellites. Under the current arrangement, AT&T sets its prices for international service based on Comsat's charges, not on INTELSAT's marginal cost of providing additional satellite circuits. This may have resulted in the current price of end-to-end service being <u>above</u> the long term profit maximizing level of a single supplier of end-to-end international telecommunicatons. Elimination of loading requirements would reduce the marginal cost to AT&T of expanding its international services,

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53 See Kwerel (1984), pp. 13-16.

leading it to reduce its prices. In this case, such a price reduction may also be in the interest of the PTTs since it might increase the total profits available for redistribution.

The second reason that such a shift in profits is unlikely to occur is that even with increased competition among U.S. suppliers of international facilities PTTs will still face some bottleneck (regulatory or market power) at the U.S. side of international circuits. No matter how competitive the U.S. international telecommunication industry becomes, the FCC can still assert its power over facilities authorization and settlements rates to assure that the efficiency gains from increased competition are shared fairly between the U.S. and its foreign correspondents.

2. Alternative policies to subsidize INTELSAT or cross-subsidize specific routes.

If maintaining a subsidy to certain routes, countries, or services is considered an essential U.S. policy objective, it is still possible to do so without restricting competition with Comsat/INTELSAT as a means of permitting Comsat/INTELSAT to cross-subsidize these activities. Ideally, the foreign aid objectives should be met through direct aid financed from general tax revenue. If this is not possible, the subsidy to high cost satellite routes could be financed by taxing all suppliers of international telecommunication services, including private carriers. This would permit financing the subsidy without excluding highly efficient entrants. Of course one must be

very careful about what is taxed. As we have seen in the domestic market, charging carriers for each minute of access to local switches has not proved to be a trouble free method of financing the fixed costs of local exchanges. Such usage-based charges may have created incentives for uneconomic "bypass" of such switches because the total access charges large users must pay exceeds the cost of using private lines to connect these users directly to a long distance carrier.[54]

3. How should the FCC deal with routes served only by satellite?

This paper has argued for replacing FCC regulation of Comsat with the discipline of competition. Yet competition between satellite and cable facilities may not be feasible on certain routes. In 1985, 26.2% of the countries served by AT&T were served only by satellite. But they accounted for only 6.9% of AT&T's international circuits. Most of these countries were in Africa and South America.

There are three basic options for dealing with this dilemma. One is to deregulate all markets despite the fact that some may not be competitive in the short term. The second is to continue regulating Comsat in all markets because a small percentage of the markets may not be competitive. The third is to deregulate only those markets that are deemed competitive.

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54 See Brock (1984).

Deregulating all markets appears to be the best option. Under the plan proposed in this paper, only Comsat circuits not subject to loading requirements ("new circuits") would be deregulated. A price cap would remain on those circuits covered by the loading requirements ("old circuits"). Thus price increases, if any, would be limited to new circuits. Any such price increases would gradually increase the average cost of serving these points as circuit loading requirements were phased out. If the price increases were substantial, there would be strong pressure from U.S. carriers and PTTs in the affected countries to avoid using Comsat circuits. One way of doing this would be to construct additional cables. Another would be to develop alternative satellite systems. If Comsat tried to price well above the cost of separate satellite systems on these routes, there would be great pressure both in the U. S. and abroad to allow private satellite systems to provide switched message service. The Commission would then need to directly face a restructuring of the INTELSAT arrangement. INTELSAT would no longer have a monopoly on the provision of switched voice satellite communications. At that point there would seem to be no reason to bar AT&T from having its own international satellite facilities. The fear of fostering such an unraveling of INTELSAT may constrain Comsat from setting excessive prices on routes now served only by satellite. If not, in the long run there is likely to be actual competition in virtually all markets.

The second option of continuing to regulate Comsat in all markets appears to be the least attractive. It would be a mistake to forego the benefits of competition in all markets because a number of low volume markets are currently served only by Comsat circuits. It is highly unlikely that the losses associated with price increases in markets with approximately 7% of the traffic would outweigh the benefits of price decreases in markets with 93% of the traffic.

The third option of market-by-market deregulation would be attractive except for the fact that it would present great administrative problems. Because satellites provide a joint product, there is no meaningful way to apportion costs to separate markets. Thus the Commission could find itself bogged down in endless debates about cross-subsidies between regulated and unregulated markets.

IX. CONCLUSIONS AND RECOMMENDATIONS

This paper makes a case for deregulating international telecommunication facilities. It proposes phasing out FCC circuit loading requirements, and ending rate-of-return regulation of Comsat and the international service carriers, including AT&T. It is argued that such deregulation would result in a more economically efficient level and mix of facilities investment, and in lower prices for using international facilities.

Deregulation is not without risks, however. The benefits of deregulation will not materialize without the cooperation of foreign PTTs. U.S. firms cannot unilaterally decide on the level or mix of international facilities. All such decisions must be made jointly with foreign telecommunications authorities. Introducing competition for the U.S. share of international facilities has the potential to benefit both U.S. consumers and foreign PTTs, by reducing the cost of providing service. Nevertheless, we cannot guarantee that PTTs will in fact cooperate in agreeing to a more efficient structure of international facilities. Cooperation of foreign governments will also be necessary to forge new policies towards INTELSAT. It is inevitable that promoting competition among international facilities will place new pressures on INTELSAT. It will no longer be possible to charge above cost on certain routes in order to charge below cost on others. If it is deemed desirable to continue such subsidies, new methods of financing them must be developed. Finally, it is possible that, in the short term, deregulation may result in higher prices on those few routes currently served only by INTELSAT facilities. But, as we argued above, it would be unwise to let 7% of the circuits determine policy for the remaining 93%.

Weighing the potential pitfalls with the likely benefits to the public, we believe that the Commission should deregulate international facilities and international carriers along the lines proposed in Section VIII.

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