III. Negative Impacts of Satellite Auctions

A. When Should Auctions Be Used?

Treatment of auction revenues as a goal might lead to inefficient restriction of the use and supply of spectrum in order to drive up its price and the resulting auction revenues.

Satellite auctions could lead to preassignment of spectrum by international regulatory bodies; no such danger exists with PCS or cellular.

We believe that auctions of radio licenses can serve a valuable purpose, and we were early proponents of the use of auctions and market mechanisms in spectrum management.[16] Nevertheless, one should recognize that auctions are a tool for spectrum management and are only a means to an end — fair and efficient radio services made available to the public — not an end in themselves. Treatment of auction revenues as a goal[17] might lead to inefficient restriction of the use and supply of spectrum in order to drive up its price and the resulting auction revenues. Also, arguments against auctions in the satellite industry extend beyond traditional arguments against auctions, because of the unique dangers posed. Dangers of auctioning satellites can be contrasted with, for example, auctioning a PCS or cellular license in San Francisco. Satellite auctions could lead to preassignment of spectrum by international regulatory bodies; no such danger exists with PCS or cellular.

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[16] For early examples of such advocacy, *see* "Technology for Spectrum Markets," Charles L. Jackson, MIT Ph.D. thesis, 1976, or "Improving Use of the Spectrum," House Commerce Committee, Staff Options Paper, 1977. Dr. Jackson was also an architect of the spectrum market plan in New Zealand. The New Zealand plan led to the world's first significant spectrum rights auctions, but recommended against auctioning satellite spectrum. *See Management of the Radio Frequency Spectrum in New Zealand*, Ministry of Commerce, November 1988, p. 166. More recently (but before being contacted by SIA to undertake this project), Dr. Jackson testified to the House Commerce Committee:

> [L]et me offer a warning. The pendulum may have swung too far. A few years ago it appeared that auctions of radio licenses were politically unthinkable. Now, the budget process puts strong pressure on this committee to find large amounts of spectrum for further auctions. While I feel auctions are generally sound, and I applaud the Committee for its contributions in putting that policy in place, we should not let the budget process force bad spectrum policy.

Federal Management of the Radio Spectrum, House Commerce Committee, September 7, 1995, Serial No. 104-35, p. 15.

John Haring served on the staff and then as Chief of the FCC's Office of Plans & Policy (OPP) during a formative period in which that office espoused the administrative efficiency of spectrum auctions and their revenue-producing potential. Early OPP papers on this topic include: Evan Kwerel and Alex D. Felker, *Using Auctions to Select FCC Licensees*, Working Paper #16, May 1985 and John O. Robinson, *Spectrum Management Policy in the United States: An Historical Account*, Working Paper #15, April 1985.

[17] In fact, the statute states that such treatment of auction revenues as a goal is prohibited. 47 U.S.C. Section 309(j)(7)(A).

Auction of satellite spectrum raises the specter of multiple non-U.S. fees or sequential auctions whose complexity and unpredictability could stifle industry growth; there is no parallel danger of sequential auctions for PCS or cellular.

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Auctions are most appropriate when certain conditions exist. The more of the following conditions that exist, the more appropriate auctions are likely to be:

- The radio application requires exclusivity or other usage limitations to control interference[18];
- There are more applicants than spectrum available;
- There are no incomplete markets, market failures or other "second-best" considerations;
- There are no anticipated negative international results; and
- Auctions have no other deleterious effects.

Consider PCS — a case where many of these conditions did exist. In PCS, the FCC defined technical rules that created large regions (in bandwidth and geography) where a single firm could internalize interference decisions. PCS still required coordination between firms at the boundaries of license regions to control interference. Under these rules, practical exclusivity could be provided. At the same time, there were no serious market failure considerations arguing against auctions and no apparent disabilities of an auction *per se*. Thus, auctions in that context were an administratively efficient tool to determine which entity got each specific resource block.

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[18] In fact, the Commission is permitted to conduct auctions only where there are mutually exclusive applications:

> If mutually exclusive applications are accepted for filing for any initial license or construction permit which will involve a use of the electromagnetic spectrum described in paragraph (2), then the Commission shall have the authority, subject to paragraph (10), to grant such license or permit to a qualified applicant through the use of a system of competitive bidding that meets the requirements of this subsection.

[*See* 47 U.S.C. § 309 (j)(1).]

In contrast, consider the early days of AM broadcasting. The FCC was faced with mutually exclusive applications with vastly different potential impacts on consumers. Suppose that the FCC received two mutually exclusive AM broadcasting applications — one for service to a town of 30,000, the other for service to a town of 100,000. It is quite possible to imagine that an auction would have assigned the license to the larger city, while considerations of consumer welfare and fairness would assign the license to the smaller city. Of course, the optimal solution would be to require each potential broadcaster to modify its technical design and operating parameters so that both could operate without interference.[19] Indeed, in the case of satellites, technical solutions have been used to resolve mutual exclusivity, thus permitting the market to be served by a larger number of firms. Technical solutions, as well as market competition, have brought about extensive innovation in the satellite industry.

B. The Harms Created by Satellite Spectrum Auctions

Auctions of the rights to operate satellite systems run the risk of harming both U.S. interests and the interests of others around the world.

Auctions of the rights to operate satellite systems run the risk of harming both U.S. interests and the interests of others around the world. First, auctions in the U.S. could prompt authorities in other countries to impose auctions for landing rights in each country, creating the potential for extortion and promoting uncertainty and inefficiency in the satellite industry.[20] Such harms could affect authorized U.S. systems that do not yet have all the needed licenses and spectrum assignments in other countries. Second, a move to auctions could temper the strong push for expanded output and increased efficiency that has historically been the heart of the FCC's

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[19] In the late 1920s, when these decisions were first started, the (Federal Radio) Commission had only limited tools (*i.e.*, ordering the use of directional antennas) available to implement this option.

[20] Here we note that the Commission recently amended its rules to allow domestic satellite systems to provide international service. Similarly, providers that had previously been limited to providing international service may now provide domestic service. *See Amendment of the Commission's Regulatory Policies Governing Domestic Fixed Satellites and Separate International Satellite Systems*, FCC 96-14, released January 22, 1996 at ¶ 7. The analysis contained in this report turns on economic issues and consumer impacts, and does not delve into fundamental issues of international property rights law. Even so, it is perplexing that the FCC could auction rights to systems which may not even serve the U.S.

satellite policy. One of the greatest harms that could come from auctions would be a move to extensive *a priori* planning of the orbital arc. The U.S. has consistently opposed such *a priori* planning, arguing that it will limit technology and harm consumers by restricting output.[21] Third, there are likely to be multiple negative consequences in the international spectrum-management community — including an erosion of U.S. leadership. Fourth, the delay and uncertainty of auctions will harm consumers by delaying or denying services.

The incidence of sequential auctions to collect all the necessary international rights provides an opportunity for extortion by individual countries, and would promote inefficiency and uncertainty in the satellite industry.

1. Harms from Sequential Auctions

U.S. satellite auctions may induce other nations to hold auctions for the assignment of spectrum and rights to transmit and receive signals in that country (spectrum assignments, or "landing rights"). The incidence of sequential auctions to collect all the necessary international rights provides an opportunity for extortion by individual countries, and would promote inefficiency and uncertainty in the satellite industry.

Sequential auctions may deter system operators from beginning operations.

Sequential auctions may deter system operators from beginning operations. It is important to emphasize that satellite operations require securing a bundle of rights rather than a single right. Authorization of a spacecraft to orbit at a particular location, granted through national licensing and ITU coordination of the space segment, are among those rights. This authorization is required to control interference and otherwise manage the orbit-spectrum resource. Rights to transmit signals to and receive signals from the satellite in each individual country reachable by the satellite (spectrum assignments, or landing rights) are separate. Procurement of such rights is an important aspect of the *economics* of satellite licensing. The potential for individual countries to withhold such rights in demand for payment provides an opportunity for sequential auctions — *i.e.*, separate negotiations with each country covered by the satellite "footprint." As a result, although sequential auctions do not

The potential for individual countries to withhold landing rights in demand for payment provides an opportunity for sequential auctions.

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[21] For an example of this U.S. position, *see* U.S. Proposal for WARC Malaga-Torremolinos, Spain, 1992. Reprinted as Appendix D of U.S. Congress, Office of Technology Assessment, *The 1992 World Administration Radio Conference: Issues for U.S. International Spectrum Policy — Background Paper* (Washington, D.C.: U.S. Government Printing Office, November 1991).

yield *technical* obstacles to satellite operation, they could well yield *economic* obstacles of such magnitude as to stifle an enterprise entirely.

Potential harms from sequential auctions can be easily illustrated. Consider a simple example. Suppose that a firm has identified a satellite service that will generate net *profits* with a discounted present value of $50 million. Further suppose that this service will be offered using a single satellite system (costing $200 million)[22] that provides service to both the U.S. and Canada and that the revenues will be generated equally by sales in the U.S. and Canada ($125 million in each country). First, the FCC auctions off the right to serve the U.S. from a particular orbital slot, and the firm wins with a bid of $20 million. But, let us further assume (realistically) that the Canadian government is smart. They recognize that this system is very valuable in Canada, so they set a minimum bid of $30 million in the auction for landing rights. Under our assumptions, the company will make no profit at the minimum bid. But, without the Canadian market they lose money. So they bid $30 million and only break even. Of course, the Canadians may set the reservation price in the auction higher — say $49 million. At this point, the company will lose $19 million if it meets the Canadians' minimum bid. But, if it drops out it will lose $20 million (the sunk cost of the winning bid paid in the U.S.). The company would still choose to meet the Canadians' terms; the company's best strategy becomes to no-bid in the auction in Canada and absorb the loss of the $20 million it bid in the U.S. only if the Canadians raise their minimum bid to $51 million.

In this example, the bidding process in the U.S. is complicated by considerations of how well other nations will run their auctions. Even in a simple example with only two nations, rational behavior by the second nation to conduct the auction in the fashion that maximizes its financial benefits can seriously distort the decisionmaking process. A company should not bid $20 million in the U.S. if it anticipates a good chance that the auction process in other nations will impose costs of greater than $30 million.

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22 For simplicity's sake, all costs are expressed in net present value terms.

Of course, the administration in the second country may take an entirely different tack. They may wait until the system is operational and the investment in the space segment is sunk. Once the space segment is in place, a savvy opportunistic (and unscrupulous) second country could set a spectrum fee (or minimum bid in a landing rights auction) that takes into account the marginal profitability of the satellite business — ignoring any sunk costs. In the above example, the entire $125 million revenues from the second country are at risk if fees are assessed after the space segment is in place. If the company has spent the $200 million to launch, then an "auction" payment of $50 million is far better than being denied access to the second country's market and losing $125 million.

. . . a major source of harm to consumers from such sequential auctions would be the delay created as satellite system operators tried to contend with the increased uncertainty . . . .

To recapitulate, a major source of harm to consumers from such sequential auctions would be the delay created as satellite system operators tried to contend with the increased uncertainty flowing from multiple auctions. Additionally, one can easily envision scenarios where attempts by individual nations to maximize their own revenues from the auction process make satellite projects unprofitable. It is also not hard to envision scenarios where auctions in multiple countries create confusion and delay such that some companies may abandon currently-planned projects. In addition, small countries may be denied service by U.S. systems if the revenue potential were lower than the auction cost.

The condition of mutual exclusivity is critical to any consideration of auctions. However, in the satellite industry the FCC has been resourceful in promoting output expansion while also accommodating new entrants, thus avoiding that condition.

2. Output Restriction

The condition of mutual exclusivity is critical to any consideration of auctions. However, in the satellite industry the FCC has been resourceful in promoting output expansion while also accommodating new entrants, thus avoiding that condition. Worldwide satellite capacity has burgeoned during the past 30 years. Complex tradeoffs between power, bandwidth and satellite spacing make it difficult to precisely quantify progress in satellite technology, but it is enormous by any measure. For example, the first-generation satellites could support only about 240 voice circuits while the latest-generation can support 112,500 voice circuits. Satellite equipment costs have fallen and technological innovations allow more satellites to operate within the same orbital space. These factors have combined to place 2,105 C- and Ku-band

transponders in orbit worldwide, as estimated by Arianespace in 1995. To accommodate the U.S. share of this vast growth, the FCC has historically employed two primary means to reconcile conflicting demands in the satellite industry.

First, it has encouraged the industry to adopt more efficient technology. Use of more efficient technology has, in turn, permitted rapid expansion of output and multiplied the number of satellite orbital locations as well. Industry/government cooperation in resolving spectrum conflicts has made the satellite industry more competitive with terrestrial systems, made each satellite vendor a stronger competitor, and, simultaneously, avoided the delay and economic arbitrariness of comparative hearings or lotteries in the choice of satellite system operators.

The history of the satellite industry reflects the Commission's overriding interest in the provision of an efficient satellite service.

The history here is quite remarkable. Our nation's first domestic satellite was *Westar 1* — a 12-transponder C-band bird. Today's C-band satellites typically carry 24 transponders and are packed twice as tightly together — for a four-fold increase in efficiency in the C-band. To promote the use of more efficient satellite communications technologies, the Commission approved the use of spread-spectrum technology and small-diameter earth stations in the C-band as well as the Ku-band — a step that was important in the growth of the VSAT industry.

The second means the Commission has utilized to provide efficient satellite services has been timely release of substantial additional spectrum resources. The FCC has opened up the Ku- and Ka-band, DBS spectrum, L-band for MSS, and will soon be authorizing digital audio broadcasting satellites at the S-band.

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The history of the satellite industry reflects the Commission's overriding interest in the provision of an efficient satellite service. The history of the satellite industry includes many firms and projects that failed to prosper: SBS, Comsat's DBS, National Exchange, and Equatorial Communications, to name a few. These commercial failures should be counted as Commission successes in terms of its spectrum management functions. In an environment more like the computer industry than most of the communications industry, firms were permitted to enter the market and test their products and market ideas. Some succeeded; others failed. The FCC gave them all room to try.

One of the dangers of moving to auctions for satellite licenses is to reduce or eliminate the incentives that have driven the spectrum regulators to induce efficient growth and output expansion in the satellite industry.[23] Because satellites wear out approximately every 15 years, the FCC has the opportunity to require operators to adopt new, more efficient technology and to coordinate their systems with new and existing operators. Auctions may limit moves to require new technology by generating greater renewal expectancy. For example, a recent Heritage Foundation study has called for auctions with flexible spectrum use (*i.e.*, auction winner can use spectrum for whatever purposes and via whatever technology desired) — such an approach would interfere with the renewal process. In the simplest case, one can envision government decisionmakers saying, "Why worry about pushing increased capacity? Auctions and markets will solve the problems."[24] Auctions can *resolve* demand conflicts, but not *solve* them. Relaxation of scarcity constraints through increases in the supply of spectrum and improvements in the technologies utilized to harvest the spectrum resource are what ultimately solve the problem.

There is a danger that auctions may relax pressure to promote efficiency or worse, distort incentives so as to promote inefficiency.

There is a danger that auctions may relax pressure to promote efficiency or worse, distort incentives so as to promote inefficiency. While policymakers assert that auctions are merely an assignment mechanism and that auctions should not affect the development of policy, the ability of auctions to raise money for the Treasury has been the focal point of community and political interest. But, raising money can be the enemy of efficiency. Consider a future Commission facing a choice between two satellite plans. Industry support is roughly divided between two plans: *Plan A*, which will accommodate six new systems and *Plan B*, which will accommodate eight new systems. A decisionmaker might well take into account the fact that an auction of six satellite slots might raise more revenues than an auction of eight satellite slots,

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23 While such a revenue maximization approach seems unlikely at the FCC, its far more likely in some of the international fora.

24 This view ignores the fact that markets will trade in the units defined by the FCC. For example, there is no easy market transaction that leads to moving from four-degree to two-degree spacing (yielding increased capacity), but the FCC was able to effect this transition in the C- and Ku-bands.

understanding that scarce resources are more valuable. Indeed, to the extent that the Commission is gaining positive publicity and being otherwise rewarded by its success in raising revenues, it has incentives to create higher auction revenues.

. . . auctions of the right to operate satellite systems by the U.S. government could elicit numerous other negative international repercussions.

3. International Repercussions

The potential for sequential auctions, discussed earlier, poses a significant threat to U.S. satellite interests with respect to the international community. However, auctions of the right to operate satellite systems by the U.S. government could elicit numerous other negative international repercussions.

To the extent auctions provide pressure to deviate from the current system, the U.S. is likely to end up with fewer orbital slots.

First, auctions will disrupt existing dynamics of the international regulatory regime. Currently, numerous frequency bands allocated internationally for satellite services are managed under an international coordination and registration process based, to a large measure, on a principle of first-come, first-served. Thus, as international satellite spectrum (except BSS) is currently treated, it is not allocated as the property of the U.S. to auction. However, the U.S. — being the leader in satellite technology and implementation of satellite systems — has effectively been the primary beneficiary of these bands under the current "as needed" system. To the extent auctions provide pressure to deviate from the current system, the U.S. is likely to end up with fewer orbital slots. One needs to consider that international regulation of spectrum is not a static process. Increasingly, within the International Telecommunication Union (ITU), a United Nations agency which allocates frequencies internationally and adopts principles for their use, countries have sought to revise the system of first-come, first-served. This dynamic arises out of concerns of many countries that the developed world, and the U.S. in particular, is garnering the lion's share of the economic and other benefits under the current system. As a result of pressure from such countries, *a priori* plans have already been devised for certain frequency bands and satellite system services. These plans do not afford the technical, operational and market flexibility that has characterized U.S. regulation. In fact, the planned satellite bands are lightly used relative to spectrum available for evolutionary implementation of satellite systems. It should be noted, in addition, that an international conference for *a priori* planning of satellite spectrum/orbit would unlikely be

as generous in allocation of remaining spectrum as was the case in DBS. The U.S. received 32 channels at each of *eight* DBS orbital locations, when most other countries in the world received only one orbital location. Such a result would have been unlikely if expectations had been that the U.S. would auction the DBS resource.

If much of the world perceives the U.S. as "taking for itself" auction revenues from assignment of satellite spectrum and orbital locations, it will seek to change the regulatory regime so as to secure more revenue for countries outside the U.S.

The implementation of auctions for satellite licenses will almost surely fuel the pressure for change in the international allocation and regulatory regime for satellite communications. If much of the world perceives the U.S. as "taking for itself" auction revenues from assignment of satellite spectrum and orbital locations, it will seek to change the regulatory regime so as to secure more revenue for countries outside the U.S. One possibility is more *a priori* planning (as with DBS), which would sharply limit access to spectrum/orbit by U.S. firms and which would limit the spectrum/orbit subject to the U.S. auction process. Another is adoption of an international licensing and/or auction process (even for domestic systems) with the proceeds to be used by or divided up in accordance with the political imperatives of the international organization. Yet another possibility is establishment of high fees for international notification, coordination and registration. Such fees would impose the greatest burden on the U.S., as it is the heaviest user of these processes. U.S. government and military satellites would likely be subject to any such future requirements as well, as they are subject to current international procedures.

. . . we can expect system operators to choose to operate under administrations that offer less onerous licensing mechanisms.

Second, we can expect system operators to choose to operate under administrations that offer less onerous licensing mechanisms. There would be little incentive for a prospective satellite operator to seek an operating license from the U.S. if it could obtain an operating license more cheaply from another country. Consider an example:

> Suppose a firm is considering building a satellite system to serve the Pacific. Suppose further that, after studying markets and technology it determines that a satellite operating anywhere on the arc from 160° W Longitude to 160° E Longitude will reasonably serve their business purpose. The firm has a choice of administrations through which to obtain a license — many nations lie in view of the proposed satellite. Suppose it narrows candidate administrations to two — the U.S. and the Philippines. Although the U.S. has substantially more experience with satellites, both administrations have the necessary technical capabilities and are familiar with the ITU process. Suppose, further,

that the U.S. subjects applicants to an auction while the Philippines will attempt to accommodate as many applicants as possible, using rules similar to those of the ITU coordination process.

Which administration should the firm choose? If it elects to apply through the U.S. it is certain to face an auction; only after that expense, delay and risk can it proceed to ITU coordination with others who seek to operate in the same part of the arc. However, the firm runs only a risk of an auction if it chooses to apply through the Philippines. If no auction occurs, it can begin the ITU coordination process sooner.

Over time, the satellite is authorized by the Philippines at 160° W Longitude and is properly registered at the ITU. The firm desires to provide service to and from points in Alaska, Hawaii, and some of the western continental U.S. Is it now viable for the FCC to auction off the rights to provide service from that slot? No — a downlink signal is already operating from that slot. No other entity could use those same frequencies for a different service— say, land mobile radio —without creating interference with the incumbent satellite services. Similarly, no one can use the uplinks except people taking service from the satellite. Relevant spectrum management decisions have now been made by the Philippines administration and the ITU process. At this point, it would be hard, probably impossible, to define an additional economically valuable satellite service to operate at 160° W Longitude that would not interfere with service from the Philippines-sponsored satellite. As a result, the FCC has no valuable spectrum right to auction and so has effectively dropped out of the coordination process. In this example, institution of a U.S. auction of 160° W Longitude satellite service rights has actually served to reduce or preclude U.S. input into efficient spectrum management decisions.

Third, we can expect auctions in the U.S. to change the incentives of individual administrations. Currently, U.S. authorization of a satellite system that serves markets outside the U.S. does not deny the administrations in those nations any revenue. If a system is registered with the ITU, then any other nation that tries to auction off the same slot (or the right to use that slot in their jurisdiction) will run into the interference problems alluded to in the example described above. With the advent of auctions, however, other nations may try to stake their claim to prospective auction revenues by claiming slots that U.S. systems need through "paper applicants" that never actually come to be built.

Fourth, auctions may pollute the current cooperative environment to the extent that all satellite and spectrum coordination reverts to the ITU. One rational

approach to preventing races among jurisdictions is to pre-allocate the orbital arc. The ITU could engage in *a priori* planning for *all* satellite services in the same fashion that they do in the DBS and certain FSS frequency bands. This would assure that each nation would get its "fair share" of revenues from the auctions. Of course, auction revenues can be counted on to be higher if the technical plans adopted restrict entry and create scarcity rents. International auctions and preallocation would replace the pressures that exist today to increase technical efficiency with pressures to increase scarcity rents. With expanded *a priori* planning nations would not compete with each other for the right to auction any specific slot. Any such move towards monopoly and away from competition is suspect. In fact, a major basis for the United States' historical opposition to *a priori* planning is the inefficiency inherent in any plan that freezes technology.

International auctions and preallocation would replace the pressures that exist today to increase technical efficiency with pressures to increase scarcity rents.

An alternative response to prevent races among jurisdictions or sequential auctions would be for the ITU itself to hold global auctions. Even then, two economic problems arise. First, how are the proceeds to be distributed? Would proceeds from U.S.-based firms flow back to the U.S. or would they be used to fund the ITU or distributed *pro rata* to all ITU members? Second, would the ITU have the proper incentives to encourage efficiency? Or would the ITU, lured by the prospect of additional revenues, restrict the supply of spectrum in order to increase auction revenues?

We judge that expanded *a priori* planning is a more likely result than a global auction run by the ITU. *A priori* planning has been used before. It would assure each nation of a share of the bounty. The greatest harms to consumers would come from the rigidity of *a priori* plans which restricts innovation and stifles expansion and from any ITU restriction on supply.

Auctions of satellite rights in the U.S. also create incentives that may harm consumers by delaying and denying service.

4. Delay and Denial of Service

Auctions of satellite rights in the U.S. also create incentives that may harm consumers by delaying and denying service. Suppose sequential auctions do occur. What then is the decision process facing a system operator? How can it estimate the total costs of a project until landing-rights auctions have been conducted in all

countries? If the economic feasibility of a project depends upon the service revenues in other countries, then firms must wait until all (or at least many) nations have completed their authorization process before they safely forecast the profitability of the project. Clearly, five or fifteen nations cannot conduct their auctions as quickly as one nation. This will cause delay in services, at the least. Moreover, because it will be impossible to calculate the costs associated with these sequential auctions, firms cannot forecast the total system cost or whether a system will be profitable. This uncertainty may make it more difficult for firms to obtain financing or cause cancellation of the venture entirely.

5. Distributional Issues

There are two significant distributional effects of auctions. First, let us consider effects on U.S. government revenues. As other authors have noted, the auction revenues gained by the Treasury are offset by later reductions in corporate income taxes (a dollar of auction revenue reduces tax income by $0.25 to $0.33).[25] But, auction payments to non-U.S. administrations reduce a company's profits without any corresponding payment to the U.S. Treasury. Predicting the jurisdictional impact of expenses for international corporations is complex. Similarly, there are issues involving the timing of such charges against taxes. Nevertheless, it is quite reasonable to conclude that auction payments to foreign governments would reduce the taxable income of U.S. corporations. In these circumstances, a dollar of foreign auction revenues results in a loss to the U.S. government of $0.25 to $0.33 in present value. Considering proposed worldwide systems such as Galaxy/ Spaceway™ or Teledesic and making the conservative assumption that auctions in foreign countries are proportional to the investment shares in either *Inmarsat* or *Intelsat*, which are proportional to usage of Inmarsat and Intelsat systems, then we can expect that each dollar of auction revenue will be offset by a reduction of a dollar

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[25] *See* Eli Noam, "Taking the Next Step Beyond Spectrum Auctions: Open Spectrum Access," *IEEE Communications Magazine*, December 1995, pp. 66-73, at p. 67. Also, we are informed that the Joint Committee on Taxation adjusts estimated revenue increases for some special taxes (*e.g.*, Superfund excise taxes) down 25 percent to reflect reductions in taxable income caused by the excise tax.

or more of tax income.[26] Thus, the fiscal incentive for conducting auctions — raising revenues — is illusory. At best, auctions do not result in *any* net gain in revenue to the Treasury. At their worst, auctions may cause a *substantial* loss in revenues to both government and industry.

At best, auctions do not result in *any* net gain in revenue to the Treasury. At their worst, auctions may cause a *substantial* loss in revenues to both government and industry.

Second, let us consider the effect on U.S. investors and U.S. jobs. Firms obtaining satellite licenses from the FCC are predominantly U.S.-led. If FCC auctions of satellite rights lead to a worldwide use of such techniques, then U.S. firms will pay overseas for rights that they would previously have received for free. This is a net transfer from the U.S. to those foreign governments. Such policies may be good for taxpayers in Mexico or Brazil, but are bad for retirees in the U.S. whose pension funds hold the stock of the U.S. satellite operators.[27]

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6. Quantification of Negative Impacts

a. Disaster scenario

This section analyzes the impacts of auctions on preventing authorized Ka-band systems from coming to market. It examines the consequences of imposing auctions that entail costs so excessive or incalculable, or that cause uncertainty and delay so severe that some Ka-band ventures do not proceed. It should be noted that our calculations conservatively estimate only the more direct losses from cancellation of Ka-band systems. They do not reflect the specific benefits to the economy resulting from facilitating business through improved satellite telecommunications. They also do not completely capture the tremendous impact satellite technology has on closely-related industries, such as cable television, programming, consumer

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[26] In 1995, shares of non-U.S. countries were three times that of the U.S. in Inmarsat, and over four times that of the U.S. in Intelsat. So if the U.S. were to raise $1.00 in auction revenues, then one can anticipate, at a minimum, $3.00 to $4.00 in non-U.S. auction revenues. The auction winner would pay, in total, $4.00 to $5.00 to secure its auction rights, and the winner's taxable income would decline by $4.00 to $5.00. If tax collections decrease $0.25 to $0.33 for each $1.00 reduction in taxable income that is attributable to auction payments, then the total reduction in tax collections would be at least $1.00 ($4.00 x $0.25).

[27] For illustration, CalPERS, the California Public Employees' Retirement System, has significant investments in satellite licensees AT&T, GE, Hughes Electronics and Motorola. (*See* California Public Employee's Retirement System, 1994 Annual Investment Report, pp. 77-96.)

electronics, and data communications applications. These industries rely heavily upon satellite communications and would suffer from reduced or less advanced satellite facilities resulting from auctions. Cancellation of Ka-band systems would also thwart development of entirely new services and associated markets (*e.g.*, low-cost, remote and universal data services from ultra-small terminals). The potential loss of these new markets and services represents a substantial loss of opportunity for U.S. industry in a field where the U.S. currently has a clear lead. Forfeiting development of these markets will sacrifice availability of affordable communications services that would stimulate business activity — particularly in the developing world.

The potential loss of these new markets and services represents a substantial loss of opportunity for U.S. industry in a field where the U.S. currently has a clear lead.

(1) Effect on GDP

First, we reviewed applications filed at the FCC for proposed Ka-band satellite ventures to obtain information on satellite system characteristics and estimated development costs. We used that information to construct a hypothetical satellite system representative of the applicants for purposes of illustration. This representative system would have 5 to 6 satellites and would cost about $1.7 billion to develop. Assuming the satellite is developed in the U.S., development of this one system will constitute a direct increase in the U.S. Gross Domestic Product (GDP) of $1.7 billion.

Once the satellite is developed and launched, there are additional expenditures for operation and maintenance. We reviewed instances where operating costs were disclosed by applicants and estimated cost for 10 years of satellite operation as approximately 85 percent of the development cost, or another $1.5 billion per system. Thus, direct effects on the economy from both development and operation of one system are $3.2 billion.

. . . direct effects on the economy from both development and operation of one system are $3.2 billion.

There will also be indirect effects on the economy flowing from that satellite program. For one, there will be economywide effects ("multiplier effects") of additional demand for all goods and services by the workers whose income increases due to the program. Some of the indirect effects can be estimated by using a multiplier of 1.4, a multiplier value typical in macroeconomic models. Applying the

1.4 factor to capture some of the indirect effects yields an impact on GDP of $4.5 billion for one system alone.

In estimating the total GDP and jobs placed at risk by cancellation of proposed Ka-band ventures, we consider both proposed geostationary satellite ventures and the proposed Teledesic LEO satellite system. It is unrealistic to assume that every one of these systems will go forward — some applicants may be unable to get funding and/or their perceptions of the market might change. The actual percentage of satellite systems that will actually be launched is at this point unknown. Readers can generate their own estimate of the total loss to the economy using the factors generated above for a representative system and their own assumptions regarding the probable number of successful system deployments and timing of deployments. Assume, for illustrative purposes, that only 50 percent of the geostationary systems would actually be deployed in the absence of auctions. We feel that this is a reasonable point estimate from which to gauge the magnitude of the GDP and jobs being placed at risk by auctions. Further, we assume that Teledesic (with an estimated $9 billion in development costs alone) will be deployed. The result is that the combined direct and indirect impacts (exclusive of effects on general productivity and related industries) on GDP would be $60 billion over a 10-year period. Thus, the disaster scenario would result in the loss of $60 billion in GDP for the U.S.

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(2) Effect on jobs

The preceding subsection estimated the impact of the disaster scenario on GDP. In this subsection, we estimate the impact on jobs. To do so, we use the same ratios we used before of employment to revenues in the various economic sectors.

The space and missile sector of the economy employs 4.56 employees per million dollars of sales.[28] We use that ratio to estimate the employment impact related to both development and annual operating costs.

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[28] Aerospace Industries Association, "1995 Year-end Review and Forecast," Tables 1 and 9, 1994 data.

The multiplier effect pertains to the entire economy — not just the satellite sector. We estimate the employment effect by assuming 10 employees per million dollars of sales, a ratio typical in macroeconometric models. It reflects the marginal impact on jobs, related to an increase in value added. This economywide ratio is significantly higher than that in the satellite industry, which is capital-intensive.

We estimate that the disaster scenario would cost American workers 370,000 years of employment over the next 10 years.

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b. "Optimistic" scenario

In the "optimistic" scenario, we assume that foreign governments act reasonably. They do not exact exorbitant spectrum fees. They simply seek their "fair share" of the proceeds from selling satellite spectrum rights.

We estimate the fair share as proportional to the investment shares in either *Inmarsat* or *Intelsat* owned by a country. *Inmarsat* and *Intelsat* ownership shares are proportional to the relative usage made by member countries of the *Inmarsat* and *Intelsat* global systems. In this regard, shares of non-U.S. countries were three times that of the U.S. in *Inmarsat* and over four times that of the U.S. in *Intelsat* in 1995. Even under an "optimistic" scenario, foreign governments can be expected to demand U.S. firms pay $3.00 to $4.00 to each $1.00 raised in FCC spectrum auctions; *i.e.*, their "fair share" of the value of the spectrum as reflected in their 3-4:1 ownership share in *Intelsat* or *Inmarsat*.

. . . foreign governments can be expected to demand U.S. firms pay $3.00 to $4.00 to each $1.00 raised in FCC spectrum auctions; *i.e.*, . . . the $3.00 to $4.00 loss would be a net loss to the American economy.

It is worth noting that the $1.00 of spectrum fees is not a net gain to the U.S. economy. It is simply a transfer from the private sector to the government. On the other hand, the $3.00 to $4.00 loss would be a net loss to the American economy. Put another way, the spectrum auction proceeds constitute an extremely inefficient tax in this scenario.

The lost taxes could well outweigh the proceeds of the spectrum auction.

Furthermore, it unlikely that even the U.S. Treasury would come out ahead in the long term. Spectrum fees would probably be tax deductible — either immediately or over time, as spectrum properties are depreciated. Payments by U.S. firms to foreign governments for spectrum rights would reduce profits which are taxable in the U.S. The lost taxes could well outweigh the proceeds of the spectrum

auction. The Treasury would come out *far* behind if spectrum fees in foreign countries cause some companies to abort their satellite ventures.

7. Synopsis

. . . international auctions can be expected to transfer wealth from U.S. taxpayers and investors to governments in other nations.

Auctions in the United States for satellite operating rights will likely spill over into the international community. This spillover will harm consumers by creating incentives to restrict output and by creating institutions that will delay decisionmaking and could impose incalculable costs. Further, international auctions can be expected to transfer wealth from U.S. taxpayers and investors to governments in other nations. There are other options available to the FCC for licensing satellite systems that have substantial benefits and avoid the risks created by auctions.

IV. Conclusions

The combined efforts of the satellite industry and the FCC have substantially expanded satellite capacity, brought new services to market rapidly and provided substantial benefits to consumers.

The FCC has taken steps to avoid scarcity and thereby has obviated the need to choose among competing applicants. The FCC's track record in this respect has been remarkable. The combined efforts of the satellite industry and the FCC have substantially expanded satellite capacity, brought new services to market rapidly and provided substantial benefits to consumers.

The satellite industry itself has been an American success story. The U.S. is a world leader in the satellite industry that has created tens of thousands of jobs in manufacturing and services, and has aided our nation's balance of trade. The growth of the markets for satellite services and equipment has been the direct result of enlightened FCC policy and the cooperative efforts of the industry itself. As we have explained, these achievements could be put at risk by a budget-driven rush to auction satellite licenses.

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A critical factor that sets this area apart from others is that satellite communications systems are inherently international. Consequently, the FCC's approach to regulation of satellite systems necessarily has international implications. For example, the use of auctions could make it virtually impossible for the U.S. to forestall the use of auctions by other nations on these same systems that, in turn, could cripple new satellite services, reduce opportunities for new jobs, and adversely affect U.S. competitiveness in global markets.

Given its successful history of accommodating entry, and in light of the international implications, decisionmakers should make every effort to avoid auctions for awarding satellite spectrum, especially since there are a wide variety of tools to avoid the need for auctions (or, for that matter, any other process for choosing between mutually exclusive satellite applications). These alternatives should be fully explored and carefully considered. It would be ironic — and unfortunate — if the Commission were to cripple our own satellite industry by abandoning its successful past satellite policies to create an artificial spectrum scarcity that then "requires" the use of auctions.

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