




CBO MEMORANDUM

TWO APPROACHES FOR INCREASING
SPECTRUM FEES

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NOTE

Unless otherwise indicated, all years in this memorandum are fiscal years.

Numbers may not add up to totals because of rounding.

For-profit holders of the right to use the radio spectrum currently pay fees to cover the government's costs of processing applications and regulating use of the spectrum. Those fees total just under \$50 million annually. Some people have suggested that those fees should be increased to make the distribution of the airwaves among uses and users more economically efficient or to return to the public a larger share of the value of the right granted to private parties when they are allowed to use the radio spectrum.

This memorandum, prepared at the request of the Senate Committee on the Budget, examines two approaches considered during the 105th Congress that would have increased the payments made by those rights holders. One approach, a broad-based spectrum fee designed to raise \$400 million annually, would increase the payments made by most for-profit holders of Federal Communications Commission (FCC) licenses by increasing the current fees or instituting new ones. A second approach would create a new fee applied to a narrow class of FCC license holders using the spectrum for private wireless services. The proposed fee was designed to address congestion and overuse in the frequencies allocated for those services. Compared with the broad-based fee, it would raise a smaller but indeterminate amount. In accordance with the Congressional Budget Office's (CBO's) mandate to provide objective and impartial analysis, the memorandum contains no recommendations.

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CONTENTS

SUMMARY AND INTRODUCTION	1
The Radio Spectrum: Regulation, Allocation, and Fees	1
Evaluating Spectrum Fees	3
Current Fees	4
Broad-Based Fees	6
Narrow-Based Fees	9
EVALUATING SPECTRUM FEES	10
Equity	10
Economic Efficiency	12
Administrative Costs	16
DESCRIPTION AND EVALUATION OF CURRENT SPECTRUM FEES	17
FCC License Application Fee	17
FCC Regulatory Cost Fee	18
FCC Fee on Ancillary Services Provided by Digital Television Licensees	22
PROSPECTIVE BROAD-BASED SPECTRUM FEES	24
Distributing the Burden	24
Who Pays?	27
Equity	27
Efficiency	30
Administrative Costs	34
A PROSPECTIVE NARROW-BASED SPECTRUM FEE	34
Private Wireless Services and the Problem of Overcrowding	34
A Private Wireless Fee	36

TABLES

1.	Allocation of the Radio Spectrum to Federal, Nonfederal, and Shared Uses	3
2.	Receipts Collected from Spectrum Rights Holders in 1997 Under the Jurisdiction of the Federal Communications Commission	5
3.	Revenues of Selected Telecommunications Service Industries for 1997	14
4.	Application Fees Collected by the Federal Communications Commission	18
5.	Regulatory Fees Collected by the Federal Communications Commission	19
6.	Revenue Requirements by Service	20
7.	Allocating Regulatory Fees Among Radio Stations: Number of Fee Levels and the Ratio of Highest Fee to Lowest Fee In Practice and Proposed	22
8.	Distribution Among Services of the Burden of \$400 Million Spectrum Collections Based on Scaled-Up Regulatory Costs	26

FIGURE

1.	Three Radio Services Compared by the Defining Characteristics of Three Alternative Bases for Spectrum Fees, Calendar Year 1997	28
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SUMMARY AND INTRODUCTION

The first session of the 105th Congress considered two general approaches to increasing the annual charges that private, for-profit holders of licenses pay to use the radio spectrum. The proposed fees would have been in addition to the fees that licensees currently pay to cover the cost the government incurs in processing license applications and regulating use of the spectrum.

The first approach was to establish a new broad-based fee on all private, for-profit licensees that would have been set to raise revenues of \$2 billion over five years. That amount would have enabled the commerce committees in the Congress to cover a shortfall against the goal of deficit reduction required by the reconciliation instructions that preceded the Balanced Budget Act of 1997. The idea did not progress far enough to become a specific legislative proposal.

The second approach was to establish a narrow-based fee, unpegged to a specific revenue goal, that would apply only to the for-profit users of private wireless spectrum—pieces of the radio spectrum set aside for the internal communications needs of both public- and private-sector organizations. Unlike the broad-based spectrum fee, the private wireless spectrum fee became a specific legislative proposal, the Private Wireless Spectrum Availability Act (S. 741), that was considered both as stand-alone legislation and as part of the Balanced Budget Act of 1997.

This Congressional Budget Office (CBO) memorandum examines the two approaches considered by the 105th Congress. As background to the analysis, the memorandum first reviews the current fees that for-profit holders of spectrum rights pay and examines those fees against three criteria: equity, efficiency, and administrative cost. It then evaluates the two proposed spectrum fee concepts using the same criteria. That evaluation draws on the review of current fees and on the general observations offered by economic analysis about the effects of fees and taxes. The results of those evaluations are presented below, following a brief description of the radio spectrum. The analyses are discussed in greater detail in later sections of the memorandum.

The Radio Spectrum: Regulation, Allocation, and Fees

The radio spectrum is a conceptual tool used to organize and map a set of physical phenomena. Electric and magnetic fields produce waves that move through space at different frequencies (defined as the number of times that a wave's peak passes a fixed point in a specific period of time), and the set of all possibilities is called the electromagnetic spectrum. The subset of frequencies from 3,000 cycles per second to 300 billion cycles per second—or 3 kilohertz (kHz) to 300 gigahertz (GHz)—is

known as the radio spectrum. Governments have traditionally regulated the use of the radio spectrum to provide interference-free transmission and reception.¹

Since the 1920s, in the wake of scientific discoveries and technical innovations that made the radio spectrum a valuable resource, the federal government has faced the question of how to resolve competing desires to use the spectrum. The traditional answer is to allocate blocks of frequencies for specific uses under restrictive terms and conditions. Those terms and conditions include whether the frequencies are to be used on a shared or exclusive basis and what technical standards should apply to equipment for transmitting and receiving signals. For blocks of spectrum used by parties other than the federal government and allocated for exclusive use, licenses are granted or assigned to individual licensees. Typically, licenses grant the use of the frequencies they cover in a limited geographic area.

Since the Communications Act of 1934 was enacted, the Federal Communications Commission (FCC) has had responsibility for managing the nonfederal portion of the spectrum. The federal government's use of the spectrum is managed by the National Telecommunications and Information Administration (NTIA) of the Department of Commerce. NTIA and the FCC work closely together to harmonize federal and nonfederal use of the spectrum within and between bands of frequencies. Because radio waves do not stop at international borders, allocations are coordinated worldwide through the International Telecommunications Union at periodic gatherings called World Administrative Radio Conferences.

The radio spectrum is currently allocated predominantly for shared, non-exclusive use by more than one type of service and, in some cases, by both federal and nonfederal entities. The most intensively used and highly coveted bands, which are in the lower frequencies, are more likely to be allocated for a single type of service that is provided exclusively by a federal or nonfederal user (see Table 1). Both types of users share 93 percent of the spectrum below 300 GHz but only 63 percent below 30 GHz and 56 percent below 3.1 GHz. Exclusive nonfederal allocations—including those for broadcast television and radio, cellular telephone, paging, and personal communications services—account for another 30 percent of the frequencies below 3.1 GHz. Exclusive federal allocations used for public safety, national security, and other purposes occupy just under 14 percent of that area of the spectrum.

Both in the United States and in other countries, governments charge private holders of the right to use the spectrum. Current and prospective spectrum fees can

1. Congressional Budget Office, *Where Do We Go From Here? The FCC Auctions and the Future of Radio Spectrum Management* (April 1997), Chapters 1 and 5, presents more detailed information about spectrum management.

TABLE 1. ALLOCATION OF THE RADIO SPECTRUM TO FEDERAL, NONFEDERAL, AND SHARED USES

Frequencies	Federal		Nonfederal ^a		Shared	
	Megahertz	Percent	Megahertz	Percent	Megahertz	Percent
9 kHz to 3.1 GHz	426	13.7	940	30.3	1,734	56.0
3.1 GHz to 30 GHz	1,845	6.9	8,021	29.8	17,034	63.3
30 GHz to 300 GHz	<u>2,000</u>	0.8	<u>7,600</u>	2.8	<u>260,400</u>	96.4
All Frequencies	4,271	1.4	16,561	5.5	279,168	93.1

SOURCE: Congressional Budget Office based on data from the Department of Commerce, National Telecommunications and Information Administration.

NOTE: kHz = kilohertz; GHz = gigahertz.

a. Includes commercial uses as well as uses for state and local governments.

be evaluated in the general framework that economists use to evaluate other fees and taxes.

Evaluating Spectrum Fees

Equity, efficiency, and administrative costs are three general criteria that economists use to evaluate a tax or fee. Equity considerations include normative questions about the reason for a fee. The most important equity issue regarding spectrum fees is whether collections should be limited to the cost of services the government provides to licensees or whether they should also capture a part of the economic value of the license granted to the spectrum rights holder. Other equity issues include allocating the burden of a fee among different classes of payers (vertical equity) and standardizing a fee's burden over the same class of payers (horizontal equity).

The efficiency criterion requires the evaluation of the effects of a fee or tax against the standard of economic efficiency, a state in which the resources available to society are used to produce the bundle of goods and services most desired by consumers at the lowest possible cost. Under numerous restrictive assumptions, competitive market economies will generate that outcome, a characteristic of which is that the prices paid for goods and services accurately reflect the cost of the

resources necessary to produce them. A spectrum fee can cause efficiency gains or losses by changing that relation.

An analysis of how spectrum fees affect efficiency must recognize, however, that the markets in which new fees would be imposed deviate from the simple model of a competitive market. Conclusions about efficiency effects based on that model must be modified to reflect existing distortions and unique features in both the markets for licenses issued by the FCC and the markets for telecommunications services. Existing taxes, regulations, and the small number of competitors in some service markets are examples of such distortions.

This analysis does not compare the effectiveness of spectrum fees as a tool to promote an economically efficient allocation of the radio spectrum with other tools. Those tools include assigning new licenses by auction, allowing license holders to trade their permits, and defining the service options open to a licensee as broadly as technology permits. In most cases, those tools are superior to spectrum fees for achieving an economically efficient allocation of the radio spectrum.²

Administrative costs are less often the subject of economic analysis than are equity or efficiency in choosing among different types of fees, but sometimes they are as important in policy decisions about the type of fee to put into effect. Administrative costs include not only the government's cost of setting, administering, and collecting a fee but also the payers' cost of participating in rulemaking and, subsequently, in gathering and presenting to the collecting authority the information required to support their fee payment.

Current Fees

Most private-sector rights holders licensed by the FCC pay two types of spectrum fees—one for license applications and one for regulatory costs. Both fees are paid by major for-profit wireless licensees, including television and radio broadcasters as well as providers of commercial mobile radio services (paging, enhanced specialized mobile radio, cellular, and personal communications services), microwave relay services, and private satellite services.

The current application and regulatory fees can be described as “broad based” because they are paid by many different rights holders who provide many different radio services. Wireless licensees paid a total of about \$50 million in broad-based fees in 1997, the sum of roughly \$10 million in application fees and almost \$40 million in regulatory fees, as shown in Table 2.

2. Congressional Budget Office, *Where Do We Go From Here?* pp. 69-78.

TABLE 2. RECEIPTS COLLECTED FROM SPECTRUM RIGHTS HOLDERS IN 1997 UNDER THE JURISDICTION OF THE FEDERAL COMMUNICATIONS COMMISSION (In millions of dollars)

Type of Fee	Receipts
Application Fees	10.2
Regulatory Fees	
Commercial mobile radio services	11.4
Broadcast television	9.4
Broadcast radio	9.3
Satellite services	6.4
Other	<u>2.0</u>
Subtotal	38.5
Total	48.7

SOURCE: Congressional Budget Office based on data from the Federal Communications Commission.

Both fees are imposed under the rationale that the recipients of government services should pay for them. Fees for license applications cover the government's cost of processing new licenses and renewing or modifying existing licenses. The FCC has set application fees for more than 300 services and activities and is required by law to periodically adjust those charges to account for inflation. Regulatory fees cover the costs of the FCC's enforcement, policymaking, rulemaking, international, and user information activities. Total regulatory fee collections have been set by law each year since 1994 and have grown to cover a progressively larger share of the FCC's annual budget.

The burden of regulatory fees is divided among services by a formula that charges each major FCC constituency the cost of the regulatory services that it consumes. The cost of regulating exempted licensees, such as local law enforcement agencies, is also spread among the for-profit licensees.

Most licensees—notably television and radio broadcasters—pay an annual fee set by the FCC that is unrelated to the licensees' decisions about how much of the service to supply. That fee that is similar to what economists call a lump-sum payment. Broadcasters' share of regulatory costs—about half of the nearly \$40 million paid in 1997—is distributed among licensees on the equity principle that the licensees with the most valuable frequencies should pay more. Higher fees are paid by radio and television broadcasters, whose licenses permit them strong signals in the most populous markets. In contrast, holders of licenses for commercial land mobile telephone and paging services pay regulatory fees on a per-

customer basis, and thus the licensees' payment varies with the amount of services (or output) they produce.

The application and regulatory fees that FCC licensees currently pay probably do not cause a significant loss of efficiency, regardless of the form the payment takes. The lump-sum characteristic of the charges paid by most FCC licensees limits the effect of those charges on the prices of the services they sell and, accordingly, on the efficiency losses caused by the fees. The per-subscriber regulatory fees paid by commercial mobile radio service (CMRS) licensees cause a higher loss of efficiency, but only if producers reflect those costs by raising their prices and consumers respond by decreasing their purchases.

A third FCC fee, established by the Telecommunications Act of 1996 and being implemented by the commission, can be described as “narrow based.” That fee requires a specific group of licensees in one radio service—the holders of licenses to provide digital television (DTV)—to pay a fee if they choose to provide and receive payments for subscription television, computer software distribution, or any other services that are not entirely supported by advertisers. The fee will raise receipts, but it was adopted to achieve a twofold purpose: first, to ensure that DTV licensees focus their attention on the transition from analog to digital television broadcasting; and second, to prevent those licensees, who did not pay for their frequencies, from gaining a competitive advantage over other licensees who paid for their spectrum at auction.

The current rulemaking process to establish a base for a DTV fee illustrates the trade-off between potential efficiency losses and administrative cost and ease. That proceeding is moving toward a gross revenue charge and acceptance of the efficiency loss that could accompany it. The rationale is that a fee based on gross revenues is easy to calculate and sidesteps a number of accounting problems associated with alternatives fee bases.³

Broad-Based Fees

Raising broad-based spectrum fees is an option that the Congress could choose to increase receipts. Increasing fees to the levels discussed in the balanced budget negotiations—\$400 million annually, or a roughly tenfold increase over current collections—raises a set of related questions and issues. In general terms, what concerns about equity, efficiency, and administrative costs would accompany higher fees? More specifically, how would different approaches to distributing a

3. As this memorandum was being prepared for publication, the FCC decided that DTV licensees should pay a fee of 5 percent of the gross revenues resulting from the sale of ancillary or supplementary services requiring the use of the DTV spectrum. See Federal Communications Commission, *Report and Order*, MM Docket No. 97-247, FCC 98-303 (November 19, 1998).

heavier burden of fees among radio services and licensees compare when measured against the same criteria?

The rationale for increasing the fees paid by FCC licensees is an equity claim—spectrum rights holders should compensate the public for their use of a public resource according to the value of that resource. But licensees will strongly contest that claim, arguing that the value of their license is based on their activities, not the government’s grant of a use right. Licensees will also contend that the public captures a share of that value through other forms of taxation and the payments made by a growing number of licensees who bought their spectrum rights at FCC auctions. Moreover, rights holders who bought their licenses on the secondary market rather than at auction—a group that includes more than 70 percent of television licensees—and have therefore not paid the government for their spectrum rights will point out that they have paid the market value of the licenses and that additional payments to the government are therefore unfair.

Collecting an additional \$400 million annually from the for-profit holders of spectrum licenses by imposing a higher broad-based spectrum fee could probably be accomplished without a substantial loss of efficiency. The form in which the fee would be imposed would be an important factor in determining the presence or size of an efficiency loss. The effects of the current fees are instructive in that regard, even in the context of a tenfold increase in collections.

If new fees were imposed as lump-sum annual payments—the same form used to collect about 75 percent of the charges currently paid by wireless licensees—the efficiency cost of the increased fees would probably be small. Licensees that focus on maximizing profits (rather than sales or market share) would treat those payments as fixed costs that would not enter into their decision about how much service to offer, unless the fees were so high as to cause the producer to go out of business.

In contrast, a fee based on the amount of service offered (an output-based fee) would cause a greater loss of efficiency because the fee would increase each firm’s cost of producing an additional unit of service (its marginal cost) and decrease the quantity of the service that the producer paying the fee would offer at the prevailing market price. As markets adjusted, the price of the service would rise, and consumers would buy less. The efficiency loss would be the value to consumers of the services that they would have purchased without the fee, minus the cost of producing those services.

The main caveat to the proposition that a lump-sum charge will inflict only a small efficiency cost is that the fee not be set so high as to cause the firms paying it to shut down. In service or geographic markets in which a limited number of licenses lead to high license values, producers capture an economic rent (an above-normal, or pure, profit) solely as a consequence of the fixed supply of licenses

created by the system of spectrum management. In markets with a small number of competitors, individual producers can set the prices of the services that they sell and, accordingly, capture an above-normal profit. Producers in neither circumstance have an incentive to change the level of service they provide unless the fee charged is set so high that they would be forced to shut down. Since the fee is paid entirely from profits, no efficiency loss is incurred. Licensees in the most prominent telecommunications services—television and radio broadcasting and mobile telephone service—could probably pay the increased lump-sum fees without shutting down.

A recent study published by the National Bureau of Economic Research supports that conclusion. It illustrates the relatively low efficiency cost associated with lump-sum charges. That study looked at the form of the fee used to fund a mandated subsidy of the advanced telecommunications purchases of schools, libraries, and rural health care providers. It estimates that each dollar of receipts collected by the current output-based fee charged for long-distance telephone use inflicts an efficiency cost of just over one dollar compared with only 6 cents for an alternative lump-sum fee.

If new spectrum receipts are collected through an output-based fee rather than a lump-sum payment, deviations from the competitive standard introduced by the system of spectrum management will have implications for the effects that higher fees will have on efficiency. In markets with few competitors, each competitor recognizes how its decision about how much to produce affects market prices. Those markets are likely to be inefficient even before any spectrum charge is levied because, as a group, service providers are likely to produce less and charge more than they would if a large number of producers were serving the same market. Imposing an output-based fee on producers in those markets would cause an efficiency loss, just as in the competitive case, but that loss could be larger than the comparable loss incurred in a more competitive market, depending on specific market conditions. In markets in which producers pay very little to use the spectrum—primarily those markets dominated by providers of nontelecommunications services—additional fees could lead to efficiency gains because new fees would eliminate current subsidies. (Gains of that type are discussed below in the section on narrow-based spectrum charges.)

A spectrum fee may take a larger toll on efficiency over the long term, however, even if fees are paid in a lump sum or from above-normal profits. One reason is that above-normal profits may play a role in accelerating technical innovation. Raising fees that decrease licensees' profits could then delay the introduction of new services that increase overall economic welfare.

The minimum administrative cost associated with higher broad-based fees is comparable with the cost that currently arises in setting and collecting regulatory fees. Higher fees would require the FCC to explore alternative fee bases and

establish rate schedules that would define the specific horizontal and vertical equity characteristics of the fees. Private costs would be incurred as representatives of major service categories and individual licensees sought to minimize their burden in the course of regulatory proceedings.

Narrow-Based Fees

Spectrum fees may be established for more modest purposes than raising hundreds of million of dollars in receipts annually. Narrow-based spectrum fees apply to a specific service and group of licensees. Such fees are usually put into place with a specific spectrum management objective in mind, as illustrated by the DTV ancillary service fee included in the Telecommunications Act of 1996. The problem of overcrowding in the allocations of licenses to provide private wireless services (internal communications) is another area in which a narrow-based spectrum fee has been proposed as a solution.

Businesses, state and local governments, and other organizations have the right to use parts of the radio spectrum for private wireless services. The for-profit entities that have that right are licensed by the FCC to provide private mobile radio service. Those licensees contend that too little spectrum is allocated to private wireless services, pointing to problems with overcrowding in some bands in urban areas as evidence. They advocate additional allocations of frequencies as the solution to those problems. A narrow-based spectrum fee is an alternative.

Private wireless licensees currently do not pay the opportunity cost of the frequencies that they use. That cost is the value those same frequencies could generate in their best alternative use. Private wireless licensees will tend to use the “free” spectrum rather than invest in spectrum-conserving technologies or pay for commercial communications services as a substitute for a private wireless license. A solution to the congestion problem that simply allocates additional spectrum would not change the incentives to use the spectrum inefficiently. Charging for the use of the spectrum currently allocated for private wireless services would seem to be a preferred solution on efficiency grounds. Unlike providers of telecommunications services, who in general cannot change their demand for spectrum in response to a new charge, many private wireless licensees can and would decrease their demand. Efficiency gains would occur when the spectrum freed by the original rights holders’ declining demand was employed in alternative uses of higher value. That outcome would be expected on the basis of the general analysis of fees and taxes. In that analysis, fee payments that eliminate subsidies that are not justified on efficiency grounds—even invisible subsidies like free spectrum—will increase overall economic efficiency.

A number of institutional factors complicate the situation, however, and illustrate the problems likely to be encountered in imposing even a narrowly

defined fee. The private wireless bands are used in both the public and private sectors. Historically, public-sector licensees have not paid for the right to use the spectrum and would most likely resist any attempt to impose a charge. A fee restricted to for-profit licensees would have the desired effect in bands that are theirs exclusively, but it could distort allocations in bands shared with the public-sector licensees who would not have to pay. In recognition of such practicalities, legislation proposed during the 105th Congress—the Private Wireless Spectrum Availability Act—would have allocated new frequencies to private wireless services and imposed a fee on the for-profit licensees who chose to use the new allocation. That solution would certainly force the for-profit entities interested in using the new allocation to face its opportunity cost, but it would still not charge public-sector users and would probably have only a marginal effect on the far larger current allocations of spectrum in which congestion would remain a problem.

EVALUATING SPECTRUM FEES

Equity, economic efficiency, and administrative costs are three criteria that economists use to evaluate fees and taxes. A particular fee may register well in one dimension but not in another or be equitable when viewed in one way but not in another. For example, some people view the progressive income tax as equitable because it places a heavier burden on taxpayers who have higher income. Progressivity, however, may also have an efficiency cost compared with other forms of taxation. Economic analysis cannot endorse or reject progressivity or specify the correct distribution of a burden among different classes of payers because, as is typical of equity issues, a question of values is ultimately involved. Economists can, however, identify cases in which the pursuit of one equity goal or another will have consequences for economic efficiency or in which fairness for one group implies unfair treatment or inflicts a cost on another group. Such trade-offs between efficiency and equity, and among contending views and claims of equity, arise in evaluating spectrum fees.

Equity

Analysts encounter fundamental equity issues when evaluating current and prospective spectrum fees. An important issue is that of compensating the public either for a service provided to a specific beneficiary or, more controversially, in proportion to the gains enjoyed by a private entity that has the right to use a public resource.⁴

4. R.A. Musgrave, "A Brief History of the Fiscal Doctrine," in Alan Auerbach and Martin Feldstein, eds., *Handbook of Public Economics*, vol. 1 (New York: North-Holland, 1985), pp. 16-18.

The revenues generated by the current spectrum fees can be classified as user fees (or benefits taxes). Governments collect receipts of that type in exchange for providing a private party with a good or service, and in that sense those receipts are different from general tax revenues.⁵ Economists grant little weight to the distinction between a user fee and a tax.⁶ Policymakers and managers of public services, however, sometimes contend that user fees are fairer, less burdensome, and more cost-effective than more general forms of taxation. A 1997 document prepared by the Public Management Committee of the Organization of Economic Cooperation and Development, for example, lists the virtues of user fees, noting that they make the costs and benefits of government services more visible, relieve the general taxpayer of the cost of services that primarily benefit specific users, and impose discipline on both the governmental providers and private-sector purchasers of services.⁷

Two rationales for charging spectrum fees fit the user-fee mold. The first is associated with the value of a service the government provides to licensees. By regulating use of the radio spectrum, the government establishes conditions that allow licensees the interference-free use of the spectrum. That regulation conveys benefits directly to the licensee or the governmental holder of spectrum assigned to it, thus providing a basis for charging a fee sufficient to cover the cost of regulation. The United States and other national governments justify collecting spectrum fees under that reasoning.

A second rationale for charging spectrum fees is to compensate the public for the private use of a public resource. Fees collected on that basis are associated with the value of the spectrum as an asset rather than with the value of a service that the government provides to licensees. Compensating the public for the private use of a public resource is offered as a rationale for spectrum fees by the governments of Canada and Australia.⁸ The theme of compensating the public also figures prominently in the justification for FCC auctions.⁹ A related doctrine of charging

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5. Congressional Budget Office, *The Growth of Federal User Charges* (August 1993), pp. 1-2, discusses the definition of user fees and user charges and their relation to taxes.
 6. Edwin S. Mills, "User Fees," in John Eatwell, Murray Milgate, and Peter Newmans, eds., *The New Palgrave Dictionary of Economics* (New York: Stockton Press, 1987), pp. 767-768.
 7. Organization for Economic Cooperation and Development, Public Management Committee, *Best Practice Guidelines for User Charging for Government Services* (18th Annual Meeting of Senior Budget Officials, Paris, June 10-11, 1997), p. 2.
 8. Treasury Board of Canada, "Cost Recovery and Charging Policy" (April 8, 1997), p. 2; and Australian Communications Authority, "Fee Schedule, Part 1: Apparatus Licence Fee Framework" (available at <http://www.austel.gov.au/spectrum/licence/fees/part1.htm>).
 9. *Budget of the United States Government, Fiscal Year 1999*, p. 256, for example, describes the role of auctioning the right to use the radio spectrum as "... helping to balance the budget, while compensating the public for the use of this valuable resource."

fees to avoid “unjust enrichment” dates from antiquity but appears in U.S. law as a justification for spectrum fees. That doctrine has been used to justify taxation of above-normal profits that occur as a consequence of government regulation, a theme that also emerges in evaluating spectrum fees against the efficiency criterion.¹⁰

A central question in constructing fees that may be justifiable under one equity argument or another is, How much? How much is a specific piece of the radio spectrum worth? How much of a licensee's return is above-normal profit? The policy of auctioning licenses for the radio spectrum uses the marketplace to answer questions about the value of spectrum. Spectrum fees that are collected under the rationale of compensating the public for the value of the resource inherently rely on estimates of value and the judgment of governments about how to apply them.

Another general equity issue concerns how the burden of a fee is distributed. The idea of horizontal equity is simply stated: people in similar positions should be treated equally. Devising any fee or tax in general, and spectrum fees in particular, that meet that standard is difficult.¹¹ Issues of vertical equity concern the degree of difference in the burden carried by different payers in different circumstances. For example, how much more should AM radio licensees in large markets pay than licensees in small markets?

Economic Efficiency

Economists define economic efficiency as a state of affairs in which available resources are used to produce the bundle of goods and services most desired by consumers at the lowest possible cost. An economy characterized by competitive markets will generate an economically efficient outcome. Applying the efficiency criterion to real-world circumstances involves first analyzing how a fee or tax would affect economic efficiency in a competitive market and then taking account of how preexisting deviations from the competitive model would cause those conclusions to be modified.¹²

10. Musgrave, “A Brief History of the Fiscal Doctrine,” p. 24.

11. Harvey S. Rosen, *Public Finance* (Homewood, Ill.: Richard D. Irwin, Inc., 1985), pp. 316-319.

12. Formal statements of economic theory support the proposition that a competitive market will lead to an economically efficient allocation of resources only if numerous restrictive assumptions hold. Such assumptions include those about the behavior of economic actors, the assumption that producers maximize profits and consumers maximize their satisfaction, and assumptions about the conditions of markets (for example, that all actors are fully and accurately informed and that producers can freely enter and exit markets). Invariably, real-world markets will fail to conform with one assumption or another. Economists nevertheless use as a baseline the competitive model and its implication that competitive markets lead to an efficient allocation of resources. Typically, economists analyzing a specific market

The private, for-profit holders of spectrum rights can be divided into two groups: those who use the radio spectrum to provide telecommunications services and those who use it to produce other types of goods and services. Telecommunications providers generally use large parts of the radio spectrum to produce the services that they sell. Television and radio broadcasters and providers of cellular and personal communications services account for most of the revenues generated by that group (see Table 3). Users in the other group—those who provide a product other than telecommunications services—generally use less of the radio spectrum, and their use rights therefore account for a relatively small amount of the value of the goods and services they produce. Both groups need the radio spectrum to produce the goods and services they sell. The spectrum, therefore, is only as valuable as the price consumers are willing to pay for those goods and services; or, as economists describe it, the demand for spectrum is derived from the demand for final goods and services.

In perfectly competitive markets, the value of final goods and services (or output) is equal to the total value of the inputs necessary to produce them. Spectrum fees that vary with output can disrupt that relationship by artificially increasing costs and causing what economists call an efficiency loss, an excess burden, or a dead-weight loss. A fee imposed on the production of each unit of service will increase the additional cost of providing that unit. In a competitive market, profit-maximizing producers decide how much to produce by equating the cost of providing the last unit of service produced (the marginal cost) with the price that the unit will bring on the market.¹³ When a fee increases the marginal cost, each producer offers less of its goods and services at the prevailing market price. As less service is offered, consumers bid up its price, but total consumption falls as some consumers respond to higher prices by buying less. The efficiency loss associated with the fee is the value to consumers of the additional output that would have been produced without the fee, minus the cost of production.

A fee that does not affect producers' decisions about how much service to offer, however, will not inflict an efficiency cost. Such a fee, which economists

will accept that a market largely functions as if it was competitive, even if certain assumptions are rarely fully realized in any market. As in this analysis, the focus of many economists is on how obvious and large deviations from the competitive model present in a market or likely to occur as a consequence of a policy change or some other external event will affect economic efficiency. For further discussion, see F.M. Sherer and David Ross, *Industrial Market Structure and Economic Performance*, 3rd ed. (Boston: Houghton Mifflin, 1990), Chapter 2.

13. Profit maximization is among the most fundamental, but questioned, assumptions necessary for competitive markets to allocate resources efficiently. A large theoretical and empirical literature focuses on the question of whether businesses maximize profits. A prominent alternative to the assumption of profit maximization is that businesses maximize sales or market share. This analysis reflects the consensus view that profit maximization generally ". . . provides a good first approximation of business behavior." For supporting discussion, see Sherer and Ross, *Industrial Market Structure and Economic Performance*, pp. 38-52.

TABLE 3. REVENUES OF SELECTED TELECOMMUNICATIONS SERVICE INDUSTRIES FOR 1997 (In millions of dollars)

Industry	Revenues
Television Broadcasting	32,950
Radio Broadcasting	13,650
Wireless Cable	600
Satellite Telecommunications Services	
Fixed	3,050
Mobile	950
Direct broadcast	950
Commercial Mobile Radio Services	
Cellular and personal communications	27,500
Paging	5,100
Specialized mobile radio	950

SOURCE: Congressional Budget Office based on Department of Commerce and the McGraw Hill Companies, *U.S. Industry and Trade Outlook '98* (New York: McGraw Hill, 1998), Chapters 25, 30, and 32. For data on commercial mobile radio services, see Federal Communications Commission, *Third Annual CMRS Competition Report* (June 1998), pp. B-2, C-2, and D-2.

refer to as a lump-sum fee, will not affect the producer's decision about how much to produce unless the fee is set so high that it causes the producer to shut down. Producers will treat increased payments required by a lump sum as fixed costs rather than as an increase in marginal costs; it is the higher marginal costs that trigger the sequence of events leading to an efficiency loss.

The system of spectrum management itself creates another circumstance in which a fee will not affect producers' decisions about how much service to provide. Perhaps by necessity, that system creates a fixed supply of licenses for many important services. For example, the supply of analog TV stations available in any one geographic area is on average 13. A prospective television broadcaster can offer to pay the owner of the 13th station enough so that the owner will sell, but no offer, no matter how generous, can call forth a 14th station. In some markets, the fixed supply of licenses joins with strong demand for the service requiring the license, allowing licensees to capture above-normal profits. Those profits grant the license a scarcity value.

Spectrum rights holders can capture above-normal profits even in markets in which they have many competitors. For that to happen, however, consumers would

have to demand more of the service being offered, assuming that additional quantities of the factor in fixed supply—the license—permitted those quantities to be brought to the market. Because consumers are willing to pay more than the economic cost of producing the amount of service that the fixed supply of licenses permits producers to provide, the price paid for those services rises above their economic cost. A fee that merely reduces that premium will not affect producers' decisions about how much service to provide, as long as the fee is not so high as to cause producers to shut down. The presence of above-normal profits is also evident in the market for licenses. In that market, producers bid against one another for the licenses necessary to secure the premium that consumers are willing to pay for the service that is restricted in supply because the number of licenses available is fixed.

The system of spectrum management can create a different type of imperfect market, an oligopoly, in which licenses are available for only a few competitors. In a competitive market, producers decide how much to produce by observing their own costs and market prices, but when only a small number of producers offer a service, each one is aware of how the amount it produces will affect market prices. In many such cases, licensees can charge prices that exceed the value of the resources necessary to produce the services. When the markup of price above cost is persistent, economists refer to the value captured by producers as above-normal profits. In rare cases, the few competitors in an oligopoly will behave as a virtual monopolist—a single producer that supplies an entire market. The monopolist will choose to produce less output than would be supplied by many producers—a decision that forces prices up to a level that extracts the largest profit the market will permit. In most cases, however, economists have found that the output and pricing decisions of oligopolies produce a result somewhere between the competitive and monopolistic outcome. Economic theory does not provide a definitive answer as to how much output oligopolists will offer and at what price.

The efficiency effects of imposing an output-based spectrum fee in oligopolistic markets are also not definitive. For a given fee, the reduction in the quantity of a service offered will be greater in the competitive case than in the monopoly case; the result in the oligopoly case, in which the few producers serving a market do not operate as a virtual monopolist, is likely to lie between the two. The relative size of the efficiency loss in each circumstance cannot be known in the abstract and must be measured for each case.¹⁴

The failure of some licensees to face the opportunity cost of the spectrum that they use is another feature of the system of spectrum management that may distort the relation between the prices of goods and services and the value of the resources necessary to produce them. In market economies, the price paid for a resource in

14. Michael L. Katz and Harvey S. Rosen, "Tax Analysis in an Oligopoly Model," *Public Finance Quarterly*, vol. 13 (January 1985), pp. 3-20.

any particular use—for example, the hourly wage for a worker—reflects its value in the next best alternative use, or its opportunity cost. When a government policy makes a resource available to producers at less than its opportunity cost, those producers are receiving a subsidy.

Subsidies may or may not improve overall economic efficiency, depending on the conditions under which they are imposed. For example, allowing the public sector nearly costless use of the radio spectrum for public safety purposes could arguably provide a means, although probably not the most cost-effective means, of increasing the production of public goods. Public goods are those that any number of people can simultaneously use or benefit from without increasing the total cost of providing the good or interfering with others' consumption of it. Since market economies tend to underproduce those goods, lowering their production costs could increase output and the overall efficiency of the economy.

Subsidizing the production of private goods is likely to lead to an inefficient outcome. Many users of private radio services, for example, pay less than the value of the spectrum they use. Consequently, allocations for private wireless services appear to be too small, as indicated by a waiting list of would-be users who seek the use of the spectrum at its near-zero price. Frequencies allocated and assigned without the benefit of prices that reflect opportunity costs are not likely either to be used to provide the highest-value services or to be allocated to the users who value them most. The former condition may hold with all allocated spectrum. Active private markets for licenses for major telecommunications services, however, are likely to distribute licenses to the users who value them most within the confines of the allocated use of the spectrum.¹⁵ Spectrum allocated to for-profit users for private rather than commercial use may be transferred from one owner to another as a consequence of general sales of corporate assets—for example, if a railroad holding an FCC license is sold. In such sales, however, maximizing the value of the radio spectrum is rarely a major concern.

Administrative Costs

Administrative costs are less important than equity or efficiency in choosing among different types of fees, but they are sometimes as important in the policy decisions made about what type of fee is put into effect. Administrative costs include not only the government's cost of setting, administering, and collecting a fee but also

15. For example, the owners of AM radio licenses have the option to offer programming or sell their spectrum rights. If an owner puts spectrum to its most profitable permitted use, prospective buyers will have nothing to gain by buying the right from the incumbent owner because they will be forced to offer a price equal to the opportunity cost—the present value of the stream of profits—that the incumbent owner will lose by selling the license. The fact that licenses do change hands reflects the different expectations that incumbent and prospective owners have about future profits.

the payer's cost of participating in rule-making and, subsequently, in gathering and presenting to the collecting authority information required to support the fee payment.

DESCRIPTION AND EVALUATION OF CURRENT SPECTRUM FEES

The three FCC spectrum fees in current law raise a relatively small amount of receipts. Although they do not span the full range of fee concepts, they illustrate how fees might be distributed among services and licensees. They also provide a heritage that would most likely influence the setting of new fees. For example, the classification system used to set the regulatory fees paid by television and radio licensees would represent a benchmark that would probably play a role in distributing the burden of any new fees among those licensees.

FCC License Application Fee

The FCC currently collects application fees from most of its licensees.¹⁶ The fees are collected under a benefits rationale—that licensing is a service for which the licensed party, rather than taxpayers as a whole, should pay. Fees are set to cover the cost of that activity rather than the value of the licenses. Collections were \$38 million in 1997 and have ranged between \$28 million and \$57 million since 1988 (see Table 4). Those amounts include application fees paid by wireline firms regulated by the FCC as well as fees paid by spectrum rights holders. Application fees for licenses granting the right to use the radio spectrum accounted for about \$10 million of the 1997 receipts.

Fees are paid at the time of application. The amount collected is determined by the demand for licensing activities—renewals and modifications—and a rate schedule charging different fees for those activities. Current regulations specify over 300 different fees. Those fees range from as little as \$5 for a filing necessary to modify the terms of a current license, to \$3,000 for a permit for a new television license, to over \$250,000 for the permit to launch and operate a global satellite system. Those charges correspond only loosely to the actual cost of each licensing activity. The current fees were set in 1996.¹⁷ Under current law, the FCC must adjust fees every two years to reflect changes in the consumer price index and notify the Congress of that adjustment.

16. Federal Communications Commission, *Fiscal Year 1999 Budget Estimates* (February 1998), pp. 38 and 55.

17. Federal Communications Commission, *Order*, GEN Docket No. 86-285, FCC 96-332 (August 7, 1996), lists the FCC application fees in effect for 1997.

TABLE 4. APPLICATION FEES COLLECTED BY THE FEDERAL COMMUNICATIONS COMMISSION (In millions of dollars)

Year	Collections
1988	41.2
1989	56.9
1990	27.6
1991	46.3
1992	50.6
1993	39.1
1994	42.8
1995	50.6
1996	42.8
1997	38.0
1998 ^a	38.0
1999 ^a	38.0

SOURCE: Congressional Budget Office based on data from Federal Communications Commission, *Fiscal Year 1999 Budget Estimates* (February 1998), p. 57.

a. Collections for 1998 and 1999 are estimates.

FCC Regulatory Cost Fee

The FCC has collected fees to cover regulatory costs since 1994. In 1997, collections totaled \$156 million.¹⁸ Spectrum rights holders paid about \$38.5 million, or 25 percent, of that amount.¹⁹ Total regulatory fees have covered an ever greater share of the commission's appropriated funding, rising from below 40 percent in 1994 to over 80 percent in 1997. (The President's budget for 1999 estimates that collections from fees for regulatory costs and for processing applications will be enough to offset 99 percent of the appropriation funds requested for the FCC in 1999.) Actual collections for 1994 through 1997 and estimated collections for 1998 and 1999 are shown in Table 5.

Regulatory fees are imposed to cover the cost of regulating use of the spectrum. Those fees are paid by major private, for-profit licensees, including television and radio broadcasters, CMRS providers (paging, enhanced specialized mobile radio, cellular, and personal communications services), and providers of microwave and private satellite services. The fee applies to all licensees in those

18. Federal Communications Commission, *Fiscal Year 1999 Budget Estimates*, p. 55.

19. Congressional Budget Office estimate based on data from the Federal Communications Commission.

TABLE 5. REGULATORY FEES COLLECTED BY THE FEDERAL COMMUNICATIONS COMMISSION (In millions of dollars)

Year	Collections
1994	58.7
1995	119.0
1996	126.5
1997	155.9
1998 ^a	162.5
1999 ^a	172.5

SOURCE: Congressional Budget Office based on data from Federal Communications Commission, *Fiscal Year 1999 Budget Estimates* (February 1998), p. 57.

a. Collections for 1998 and 1999 are estimates.

groups regardless of whether they obtained their license at auction. The fees do not apply to governmental, nonprofit, or amateur licensees.

The Omnibus Reconciliation Act of 1993 established regulatory fees for the FCC. In doing so, it directed the FCC to recover costs attributable only to regulatory activities—specifically policy and rulemaking, enforcement, and information dissemination. Collectible amounts are distributed among broadly defined categories of telecommunications services on the basis of cost. That cost is measured by an accounting system that allocates both direct and indirect costs among those categories.

The burden of fees has shifted among services since 1993, as shown in Table 6. Broadcasters' share of total regulatory cost has fallen from around 25 percent in 1994 to 15 percent in 1997. At the same time, the share of mobile telephone and paging services, labeled "wireless" in Table 6, has increased from 6 percent to 11 percent. For the paying licensee, however, the effect of those shifts has been obscured by the overall increase in regulatory fees, as a progressively larger share of the commission's annual appropriation has been covered by fees. The fees are charged on an annual basis, but some payments that are classified as small are collected in advance for the term of a license.

The fee charged to an individual licensee is determined in different ways in different service categories. Payments made by radio and television broadcasters are set in a fee schedule based on population and signal quality. That schedule charges higher fees to licensees with higher-quality signals in more populous markets. Fees for commercial mobile radio services are based on the number of

TABLE 6. REVENUE REQUIREMENTS BY SERVICE (By fiscal year, in percent)

	1994	1995	1996	1997 ^a
Cable TV	41	24	28	23
Broadcast	24	13	15	15
Satellite	3	4	4	4
Common Carriers	25	45	45	45
Wireless ^b	<u>6</u>	<u>14</u>	<u>7</u>	<u>11</u>
Total	100	100	100	100

SOURCE: Congressional Budget Office based on data from Federal Communications Commission, *Notice of Proposed Rule Making*, MD Docket No. 96-186, FCC 97-149 (February 14, 1997), p. 11.

a. Proposed.

b. Cellular telephone, personal communications, specialized mobile radio, and paging services.

subscribers served by a licensee. Payment per subscriber is set by the FCC to cover the services' total regulatory cost. Services with more bandwidth (cellular, personal communications, and specialized mobile radio services) pay more, and those with less bandwidth (paging) pay less. Other services, including microwave and satellite communications, pay fixed fees on a per-link or per-station basis.

The equity issues that arise in relation to the current regulatory fees are largely about the horizontal and vertical distribution of the burden of regulatory costs. The basic premise of the fee—that users should pay the cost of regulation—has not been challenged in recent regulatory proceedings. Some payers, however, have raised concerns about horizontal equity. Representatives of the CMRS providers, for example, contend that fee increases for 1998 do not reflect the cost of regulating them and thus do not provide fair treatment consistent with the avowed purpose of the fee.²⁰

Concerns about vertical equity, which are likely to arise with any new spectrum fees, are also evident in the proposals offered to distribute the burden of a service's regulatory costs among its licensees. The specific details of fee formulas matter in determining how the burden of a fee is shared among licensees in the

20. "PCIA Challenges Fee Increases," *RCR* (weekly newspaper for the wireless communications industry), April 27, 1998, p. 5.

same service and how much an individual licensee pays. A licensee could pay very different amounts under a fairly specific distribution rule—for example, licensees with the more valuable licenses should pay more—depending on the details of the formula used to assess value and payments. Ultimately, regulators have considerable discretion in setting the fees that individual licensees pay. The brief history of formulas used to distribute regulatory fees among commercial AM and FM radio licensees illustrates the point.²¹

In allocating regulatory costs among broadcast radio licensees, the rule has always been that licensees with more valuable licenses should pay more. That rule is reflected in the formulas as well as in two alternatives proposed in 1997. Table 7 shows the number of different fee levels that broadcast radio licensees are (or would be) charged and the ratio of the highest fee to the lowest fee.

All four approaches attempt to lay the heaviest burden on the licensees with the most valuable spectrum, but they define that concept differently. The formula used in 1994 relied on classes of stations that were defined by the strength of the licensee's property right (hours of operation and degree of protection from interference from adjacent channels). The 1997 system adopted a fee structure based on a newly created set of categories called “groups” (distinct from the traditional “classes”) that accounted for signal strength, area of reception, and population served; it also expanded the number of fee levels from six to 10. The ratio of highest to lowest fee was about 10 to 1. The alternatives proposed by the National Association of Broadcasters and the Montana Broadcasters Association would more than double the number of fee levels, and the Montana proposal would increase the fee ratio to more than 50 to 1. Both proposals would maintain the higher-value, higher-fee distribution principle but would shift the relative burden of the fees from smaller stations in rural markets to larger stations in urban markets.

Because regulatory fees are collected from different services in different ways, they have different effects, at least in concept, on economic efficiency. The fixed or lump-sum fees that broadcasters and satellite service providers are charged inflict a relatively small efficiency cost. The per-subscriber fees that providers of mobile telephone and paging services are charged probably carry a relatively higher efficiency cost per dollar of receipts raised.

21. Federal Communications Commission, *Notice of Proposed Rule Making*, MD Docket No. 96-186, FCC 97-49 (February 14, 1997), pp. 11-16.

TABLE 7. ALLOCATING REGULATORY FEES AMONG RADIO STATIONS: NUMBER OF FEE LEVELS AND THE RATIO OF HIGHEST FEE TO LOWEST FEE IN PRACTICE AND PROPOSED

	Number of Fee Levels	Ratio of Highest Fee to Lowest Fee
1994 Formula	6	4.5
1997 Formula	10	10.0
Proposals Made in 1997		
National Association of Broadcasters	36	22.0
Montana Broadcasters Association ^a	24	51.0

SOURCE: Congressional Budget Office based on data from the Federal Communications Commission.

a. As modified in Federal Communications Commission, *Notice of Proposed Rule Making*, MD Docket No. 96-186, FCC 97-149 (February 14, 1997), pp. 13-14, to account for legislative and regulatory developments.

FCC Fee on Ancillary Services Provided by Digital Television Licensees

The Telecommunications Act of 1996 directed the FCC to establish a means to assess and collect a fee from the holders of digital television licenses who provide services that are ancillary or supplementary to advertiser-supported television and receive for those services a subscription fee or compensation from a third party. Now in the early stages of carrying out that directive, the FCC is soliciting comments on various types of fees.²²

The law establishing the digital television fee explicitly notes that a purpose of the fee is to compensate the public for private use of the public spectrum and, in doing so, deny DTV licensees "unjust enrichment." The fee would potentially apply to the almost 1,600 DTV licensees who will have the use of both their current channel assignment and a second channel to initiate the new digital television service.²³ Only licensees who use their DTV spectrum to generate revenues in addition to those generated by advertiser-supported television would pay the fee. Among the services that might generate revenues (referred to as "feeable" services)

22. Federal Communications Commission, *Notice of Proposed Rule Making*, MM Docket No. 97-247, FCC 97-414 (December 18, 1997), presents the commission's responsibilities under the law and seeks comments on various aspects of the fee.

23. Congressional Budget Office, *Where Do We Go From Here?* Chapter 4, examines the transition to digital television.

are subscription television, information services such as telephone directories and educational materials, and even voice communications. The FCC is considering exempting public broadcasters, who will hold about 20 percent of the DTV licenses, from the fee.

The final characteristics of the DTV fee are not known because the commission is still establishing the fee. In December 1997, the FCC issued a notice of proposed rulemaking that asked for comments on both auction- and revenue-based fees. An auction-based fee would attempt to use an estimated market value of what the spectrum employed in producing feeable services might have generated had licenses to use it been sold at an FCC auction. The Telecommunications Act of 1996 directs the commission to use the potential value of the DTV spectrum at auction as a fee basis "to the extent feasible." The notice contends that the extent of feasibility is not great. It argues that each auction is conducted under unique circumstances in terms of markets, technology, and regulation and that selecting any one of those sets of circumstances on which to base a fee is arbitrary.

The FCC is also considering several revenue-based fee options that have, to varying degrees, the strengths of being observable, calculable, and well grounded in economic theory. The 1997 notice points out that economic theory provides a road map to link the revenues generated by an ancillary service to the value of the DTV spectrum when that spectrum is viewed as an input needed to produce the ancillary service. The FCC notice suggests, subject to comment and reformulation, that a fee based on the gross revenues derived from feeable services is superior to one based on net revenues or incremental profits, since any approach based on a measure of revenues other than gross revenues requires a solution to the thorny problem of attributing a portion of jointly incurred costs to a specific service and revenue stream. The commission also asks for comments on the form of the fee, posing the alternatives of a fixed annual fee, a percentage fee, or a hybrid fee that includes both a fixed fee and a percentage of revenues.²⁴

The case for the DTV fee is based on equity. The essential argument is as follows: TV licensees have been given a second channel free of charge to make the conversion from analog to digital broadcasting. Other frequencies that could be used to provide the same ancillary services that a DTV licensee might choose to provide are being sold at auction. Thus, it would be unfair to licensees for other services who bought their spectrum at auction to compete with DTV licensees offering the same services who did not pay for the right to do so.

24. The FCC recently decided that DTV licensees should pay a fee of 5 percent of the gross revenues resulting from the sale of ancillary or supplementary services requiring the use of the DTV spectrum. See Federal Communications Commission, *Report and Order*, MM Docket No. 97-247, FCC 98-303 (November 19, 1998).

In creating the fee, the Congress intended to steer broadcasters toward using their second channels for advertiser-supported television by making that use relatively more profitable than alternatives. Many economists, however, would argue that imposing any fee at all on ancillary services provided with spectrum allocated to DTV would reduce the economic value that the radio spectrum could deliver to society. In their view, the fee is an obstacle that makes it difficult for producers to provide consumers with services that they want to buy. Producers would probably provide more of those services without the fee. Thus, the efficiency loss is the value to consumers of the services they would have purchased without the fee, minus the value of services they would have purchased with the fee and the cost of providing the additional services. The efficiency loss associated with the fee is unlikely to be large, however, because the market for the ancillary and supplementary services that DTV licensees might provide will probably not be very large. CBO estimates that the receipts a DTV fee would be likely to generate over the next 10 years would be small.

Until additional details are available, the administrative feasibility and cost of assessing and collecting a DTV fee cannot be known. Nevertheless, the points made by the FCC notice concerning the difficulties of developing an auction-based fee are well taken.

PROSPECTIVE BROAD-BASED SPECTRUM FEES

Increasing broad-based fees to cover a legislatively determined receipts target of \$2 billion over five years (\$400 million annually) was an option considered, but discarded, in formulating the Balanced Budget Act of 1997.²⁵ Among the issues that would have to be addressed if broad-based spectrum fees were used to collect a legislatively determined receipts target are the distribution of the burden of the fee among radio services and licensees, equity concerns raised by new charges on spectrum uses, and the effect of new fees on economic efficiency.

Distributing the Burden

Three alternative bases could be used to collect increased receipts from the users of the radio spectrum: scaling up the current regulatory fees, imposing new fees based on a measure of the value of goods and services produced by licensees, and imposing new fees based on the amount of spectrum used by different services and licensees. In the hypothetical exercise of collecting a legislatively mandated

25. Juliana Gruenwald, "Auction of Broadcast Spectrum Gets Senate Panel Approval," *Congressional Quarterly* (June 21, 1997), p. 1439, notes the consideration and subsequent disposition of increased spectrum fees in the discussion of budget-reconciliation options in the legislative effort that concluded with the passage of the Balanced Budget Act of 1997.

receipts target from spectrum rights holders, choosing the basis on which to distribute the burden of that collection is a zero-sum game for the services that would be required to pay the fee—that is, a dollar in payments avoided by television broadcasters is not a dollar of lost receipts but a dollar paid by the licensees of other services.

The FCC regulatory fees raised about \$38.5 million in 1997. Scaling up those fees by roughly a factor of 10 would generate \$400 million in receipts annually. Table 8 shows the level of payments that four major services would pay if such fees were enacted. Basing new fees on current regulatory fees offers the advantage of using a collection structure that is in place, but little else. The current fees are intended to cover the cost of services the government provides to the users of the radio spectrum and, as mentioned above, have laid a heavier burden on one service or another according to the relative cost of regulating those services in a specific year. Higher fees based on regulatory cost would reflect neither the value of the spectrum to rights holders nor its value to society.

A second base that could be used to allocate a legislatively mandated receipts target among services and licensees is the value of the goods and services that require the use of the radio spectrum. The revenues or profits of rights holders could be starting points from which to develop such a base. A broad-based fee distributed among services according to the value of output produced by rights holders inevitably raises the question of how much of the value of final sales or profits from a particular use of the airwaves can be attributed to spectrum. For example, cellular telephone services could not exist without using spectrum as an input. That does not necessarily mean, however, that all of the economic value created by cellular telephony is attributable to spectrum. Building cellular towers, marketing, and operating a telephone system are all activities that add value. Basing a fee on the total value created by cellular services could be considered unfair if spectrum contributed only a fraction of that total value. Administratively, measuring that fraction could be costly.

The bandwidth allocated to a service or licensee is a third base that could be used to distribute the burden of a fixed receipts target among services and licensees. Because all megahertz do not have the same technical properties and thus do not have equal economic potential, most proposals to base fees on bandwidth include correction factors that are generally recognized as influencing the value of a license.²⁶ Since the physical characteristics of different frequencies limit their uses, a bandwidth-based fee might be adjusted for the general location of a service's or

26. C.E. Agnew and others, *Economic Techniques for Spectrum Management: Final Report* (prepared by Mathtech, Inc., and Telecommunications Systems for the Department of Commerce, National Telecommunications and Information Administration, 1979), pp. IV-16 to IV-25.

TABLE 8. DISTRIBUTION AMONG SERVICES OF THE BURDEN OF \$400 MILLION IN SPECTRUM COLLECTIONS BASED ON SCALED-UP REGULATORY COSTS (In millions of dollars)

Service	Payment
Commercial Mobile Radio Services	118
Broadcast Television	98
AM and FM Radio	96
Satellite Services	67
Other	<u>21</u>
Total	400

SOURCE: Congressional Budget Office based on data from the Federal Communications Commission.

licensee’s bandwidth on the radio spectrum.²⁷ A bandwidth-based fee might also take account of the population or geographic area that a licensee can serve. Those measures can act as a proxy for the opportunity cost of the radio spectrum because spectrum is generally in higher demand in urban areas, where more people live, and therefore has more valuable alternative uses.²⁸ Finally, the most widely known radio services—television and radio broadcasting, for example—are licensed on an exclusive basis. Many users of the radio spectrum, however, share their spectrum with other users. Fee plans that include both licensees who have exclusive use rights and those who share the spectrum could charge lower rates to the latter group.

27. The technical characteristics of the lower frequencies permit both mobile and fixed services, thus increasing the value of those frequencies. Moreover, communication at higher frequencies requires more spectrum, more power, and more expensive equipment than at lower frequencies. Thus, frequencies under 3 GHz are typically more valuable than those above 3 GHz. Accordingly, a fee based on bandwidth alone might charge a lower per-megahertz rate on higher frequencies than on lower ones. The size of that difference in value is illustrated by comparing (1) the roughly 50 cents per person (in the license area), per megahertz paid at the FCC auction of the A and B block personal communications service licenses granting the use of 30 MHz of frequencies under 3 GHz with (2) the per-person, per-megahertz value of 0.002 cent paid at an FCC auction of the rights to use 1.3 GHz of spectrum at 28 GHz.

28. For example, Canada is considering a fee that would account for population density by charging more per megahertz licensed in more populous areas. See Industry Canada, *Consultation on Radio License Fees—Phase 1* (February 1996), pp. 5-10.

Who Pays?

The burden of scaled-up, broad-based spectrum fees that would fall on major radio services is easily calculated if the increase is collected by simply scaling up the regulatory fees paid in 1997, but making similar estimates for fees based on the value of the spectrum to rights holders or on bandwidth is not as straightforward. The reason is that designing an actual collection system on either base would require the resolution of the issues noted above—for example, rules to attribute a part of revenues to the spectrum input (for revenue-based fees) or rules to account for the different properties of frequencies located in different parts of the spectrum (for bandwidth-based fees). Rough estimates of the relative size of the determining characteristic for each alternative, however, can be made and compared.

When such a comparison is made for three major telecommunications services—broadcast television, AM and FM radio, and CMRS—two differences stand out (see Figure 1). First, television broadcasting would most likely shoulder a relatively heavier burden if broad-based fees were allocated on the basis of bandwidth than if either of the other two bases were used.²⁹ Second, AM and FM radio would fare relatively better under a bandwidth-based fee than under either of the other two bases.

Equity

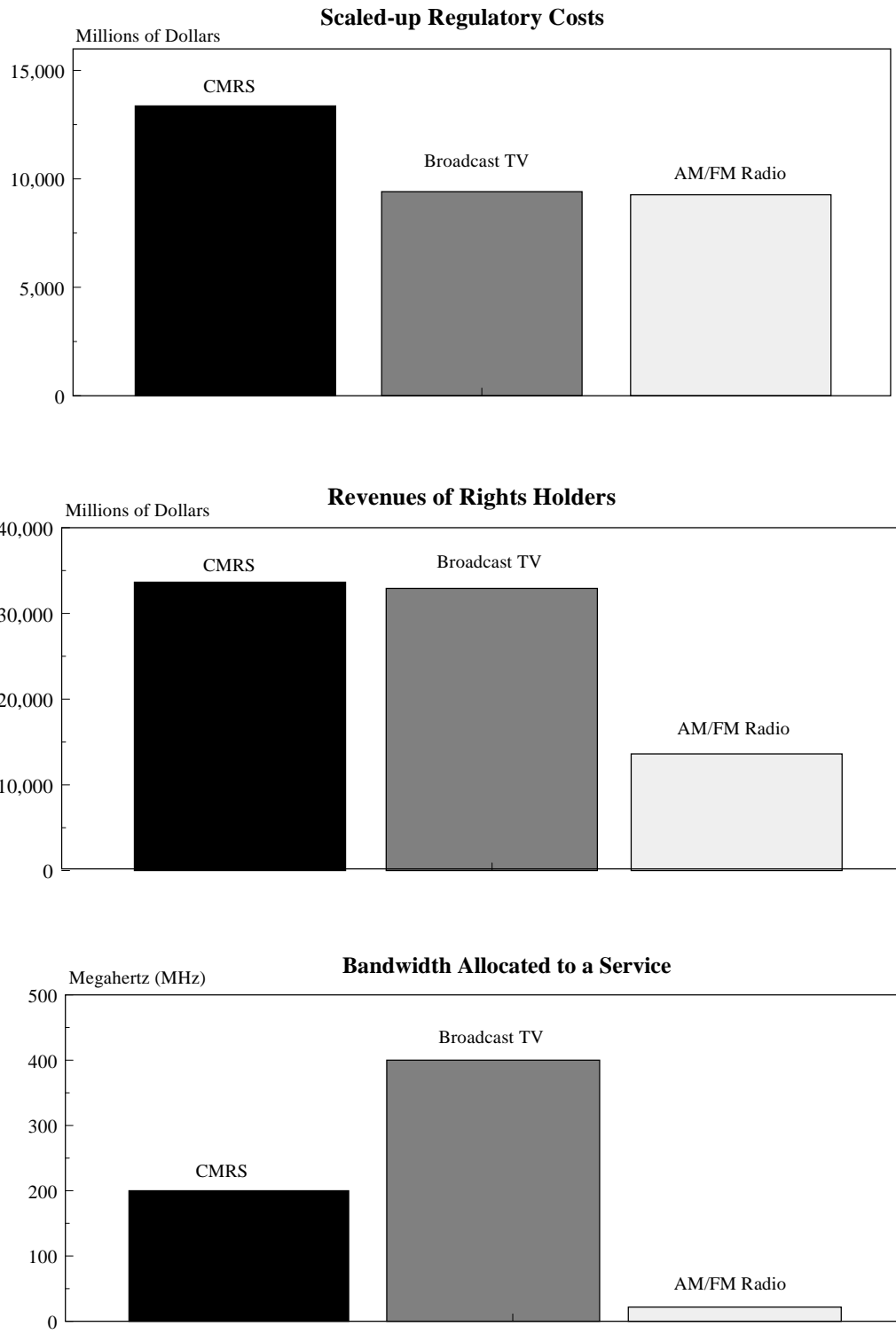
Increasing spectrum fees above the level of regulatory costs would represent a new direction in policy. The rationale for higher fees is that the public should be compensated when private parties benefit from the use of a public resource. Even if that rationale is accepted, however, no easy answer emerges as to how much the radio spectrum is worth in specific uses and how much of that value should flow to the public.

Opponents of increasing fees offer both general and specific counter-arguments to the equity claim that the public should be compensated on the basis of the value of the radio spectrum when the airwaves are put to private use. In general, the case against additional charges holds that the public already shares in the benefits granted to the private users of public resources through income and other general taxes that apply to the private sector.³⁰ Opponents will also contend that in the specific case of the radio spectrum, the activities of licensees—not the existence of the airwaves—underlie the value of the use rights. Moreover, they

29. When the transition to digital television is completed, only about 300 MHz of spectrum, compared with the current allocation of 400 MHz, will be devoted to television broadcasting. Accordingly, television broadcasters will pay a smaller share of a bandwidth-based fee.

30. Federal Communications Commission, *Third Annual CMRS Competition Report* (June 1998), pp. 34-35, notes that state and local governments have imposed additional taxes on providers of personal communications services since the auctions of 1994 and 1995.

FIGURE 1. THREE RADIO SERVICES COMPARED BY THE DEFINING CHARACTERISTICS OF THREE ALTERNATIVE BASES FOR SPECTRUM FEES, CALENDAR YEAR 1997



SOURCE: Congressional Budget Office.

NOTE: CMRS = commercial mobile radio services.

note that the public service obligations of specific licensees, most notably broadcasters, are also a form of compensation already paid to the public.

In the case of radio and television broadcasting, some perspective on that point is provided by a public benefits study undertaken by the National Association of Broadcasters (NAB).³¹ According to that study, the free airtime, charitable activity, and other public services produced by broadcasters in 1997 had a value of \$6.85 billion. That estimate also provides a context in which to measure a fee increase. For example, the roughly \$200 million that broadcasters would pay annually if collections were increased by scaling up 1997 regulatory fees would be 10 times those fees but only a 3 percent increase above the NAB's estimate of the market value of the nonmonetary forms of compensation that broadcasters currently provide to the public.

The increasing number of licensees who have paid for their licenses at auction is the basis for a second general equity concern that increased spectrum fees would raise. If the rationale for higher fees is to compensate the public for the private use of a public resource, then licensees who paid at auction may contend that they have already paid. Exempting those licensees, however, raises concerns about horizontal equity—specifically, the competitive advantage that exempted licensees would have if their competitors were charged a fee and they were not. Most of the current licensees in major telecommunications services who did not pay the government for their licenses bought them in secondary markets. Those licensees carry as great a burden as rights holders who paid the government at auction and could argue that they were being treated unfairly if licensees who obtained their licenses at auction were exempted.

Other issues of horizontal equity would emerge in connection with any specific base that could be used to levy new spectrum fees. A fee based on bandwidth, even if it was adjusted for major economic factors, would fail to recognize the difference in value of technically similar pieces of the spectrum that are allocated to different services. Licensees with relatively greater amounts of allocated bandwidth could claim unfair treatment compared with licensees with less bandwidth whose allocation service rules permit them to provide more profitable services. A fee base that recognized spectrum value—for example, one that sought to levy the heaviest burden on licensees earning economic rents—would charge different fees to holders of the rights to use similar bandwidth, again raising issues of fairness.

31. National Association of Broadcasters, *Broadcasters: Bringing Community Service Home, A National Report on the Broadcast Industry's Community Service* (Washington, D.C.: NAB, April 1998), p. 1.

Efficiency

The effect that an increase in collections from spectrum rights holders will have on economic efficiency depends on the form of the fee used to collect payments from licensees regardless of which base is used to distribute the burden among service categories. An efficiency loss would occur if a goal of \$400 million in receipts from spectrum fees was met by charging an output-based fee that affected the decisions of producers about how much service to offer. That loss would be minimized, however, if the additional receipts were collected using a lump-sum fee that would not affect such decisions.

Lump-Sum Fees. As indicated in the general review of the economics of spectrum fees, a lump-sum fee will not affect the profit-maximizing producer's decisions about how much to produce unless the fee is set so high as to cause the producer to shut down. For major telecommunications services, the fee increase considered would be unlikely to have that effect. Supporting that observation is the high scarcity value observed for FCC licenses for some major services, reflecting the ability of licensees to earn above-normal profits that could be tapped to pay fees without inflicting a substantial efficiency cost. For other services, producers also enjoy above-normal profits because they can charge prices in excess of economic costs. Profit-maximizing licensees who pay lump-sum fees that merely reduce those profits would not adjust their output in response to a lump-sum fee and would therefore not trigger an efficiency loss.³²

A recent analysis of the efficiency losses associated with the form used to collect receipts that will subsidize the use of the Internet by schools, libraries, and rural health care providers illustrates how the form of the fee can affect efficiency losses.³³ The FCC currently collects the receipts necessary to pay for the Internet subsidies through an output-based fee related to the amount of long-distance phone services purchased by individuals. That fee raises the price of long-distance calls and, by the study's estimate, generates an efficiency loss of just over one dollar for each dollar raised by the tax. The study estimates that financing the Internet subsidy with a lump-sum fee applied to all telephone users would have an efficiency cost of only 6 cents per dollar raised.

Two additional observations should be made concerning the efficiency effects of collecting an additional \$400 million annually through lump-sum fees. First, in many discussions of tax policy, analysts point out that lump-sum fees are usually

32. Above-normal profits are not a necessary condition for firms to pay a lump-sum fee without an efficiency loss. The presence of such profits, however, makes it less likely that a firm would choose to shut down rather than pay the fee.

33. Jerry Hausman, *Taxation by Telecommunications Regulation*, Working Paper No. 6260 (Cambridge, Mass.: National Bureau of Economic Research, November 1997).

not chosen because of equity concerns. Yet about 75 percent of the charges currently paid by wireless licensees are imposed on a lump-sum basis, suggesting that increased fees could also be levied in the same way. Second, the caveat to the proposition that a lump-sum charge will not cause an efficiency loss is that the fee not be set so high as to cause producers to shut down. The important empirical question, then, is whether fees that are 10 times the current level will cause producers to shut down.

The likely answer is no, at least in the major services of broadcast television, broadcast radio, and commercial mobile radio services, which together accounted for almost 80 percent of the fees collected to cover regulatory costs in 1997. Scaling up 1997 regulatory fees by a factor of 10 would require collections of \$98 million annually from television broadcasters—the equivalent of about 1.2 percent of the industry's estimated cash flow and 1.6 percent of its estimated pretax profits for 1997.³⁴ Neither percentage suggests that additional lump-sum fees of the level considered would cause television broadcasters to cease operation. The story is probably the same for radio, although equivalent data are not available. Assuming that pretax profits and cash flow occur in the same proportion to revenues in radio as in television, the \$96 million that would be collected from radio broadcasters by scaling up current regulatory fees by a factor of 10 would account for 3 percent of cash flow and 4 percent of pretax profits.³⁵ However, television and radio broadcasters performing dramatically worse than the average could be forced to shut down. The loss in efficiency caused by those shutdowns would be small.

Trends in license values provide additional support for the proposition that both television and radio profits are sufficient to absorb lump-sum fees of the levels discussed without causing widespread shutdowns. License values for both television and radio stations grew substantially during the 1991-1997 period. According to one set of estimates, the total value of commercial television stations increased from about \$25 billion in 1991 to over \$80 billion in 1997.³⁶ The total value of radio stations increased at an even faster rate during the same period, rising from \$15 billion to almost \$60 billion. Increases in station values are only partly attributable to the scarcity value of licenses created by the system of spectrum management; the value of many different types of assets has increased during the

34. Congressional Budget Office estimates of industry cash flow and pretax profits are based on National Association of Broadcasters, *1996 Television Financial Report* (Washington, D.C.: NAB, 1996); Federal Communications Commission, *Television Channel Utilization* (March 1996); and Department of Commerce and the McGraw Hill Companies, *U.S. Industry and Trade Outlook '98* (New York: McGraw Hill, 1998).

35. Department of Commerce and the McGraw Hill Companies, *U.S. Industry and Trade Outlook '98*, pp. 25-22, indicates that television advertising receipts for 1997 (\$32.9 billion) were roughly 2.5 times greater than the \$13.6 billion in receipts captured by radio broadcasters.

36. John M. Higgins, "As Broadcasters Giveth, They Taketh in Billions," *Broadcast and Cable*, April 6, 1998, pp. 80-81.

expansion of the past eight years. Nevertheless, rising license prices provide corroborative evidence that higher lump-sum fees could be paid without a loss of efficiency.

Growth in some indicators of profitability suggests that the mobile telephone service industry would also be able to pay higher fees without shutting down. Since the 1994 entry of personal communications service providers, the markets for mobile telephone service have become more competitive. Yet only about 60 percent of the population is served by four or more producers, and producers probably still earn above-normal profits. For example, profit margins for the original two cellular providers has probably grown in recent years: the ratio of earnings before interest, taxes, depreciation, and amortization (EBIDTA) to total revenues for the those producers rose from just under 35 percent in 1994 to 39 percent in 1997.³⁷

Output-Based Fees. In contrast to a lump-sum mechanism, a fee form that pegged the payments of individual rights holders to their activities, whether measured in value or physical terms, would carry an efficiency cost. The size of that loss would depend on the demand and cost conditions in a diverse set of telecommunications service markets, including those for television and radio advertising, communications relay services (both ground- and space-based), and mobile telephone service. Estimating the size of those effects is beyond the scope of this memorandum. A simple policy rule and two types of imperfections—one in the markets for telecommunications services and another in the markets for FCC licenses—would affect efficiency under a fee form tied to the activities (or output) of spectrum rights holders.

The Ramsey rule holds that with a fee based on the activities of producers, allocating the largest burden of an increased receipts target to those services for which consumer demand is least responsive to price changes will minimize efficiency losses.³⁸ The size of the efficiency loss associated with a spectrum fee that varies with producers' activities will depend on the size of the fee, its effect on service prices, and how much consumers decrease their purchases in response to higher prices. The responsiveness of consumers to price changes, or the elasticity of demand, is a factor that could be used to allocate the burden of a fee among licensees of different services so as to minimize the effect of the fee on short-run efficiency.

Market imperfections would also affect the size of the efficiency losses caused by a fee based on producers' activities. The most significant imperfection is the

37. Federal Communications Commission, *Third Annual CMRS Competition Report*, p. 29.

38. Rosen, *Public Finance*, pp. 302-304.

oligopolistic character of most telecommunications service markets. If the small number of competitors providing services to a market behave as if they were a monopolist, they will restrict their output and be able to charge a price that extracts the largest excess profit the market will permit. (That was perhaps the case when only two competitors provided land-mobile telephone service before the 1994 entry of new personal communications service competitors.) In such a virtual monopoly, a given level of an output-based fee will have two effects: it will cause a smaller reduction in output than would a comparable charge applied to a competitive market; and it will also produce a smaller efficiency loss. If a small number of competitors fall short of approximating a monopolist's behavior, as is most likely the case in the current market for mobile telephone service, then an output-based spectrum charge will cause a decrease in production compared with that occurring in the competitive and the monopoly cases. But even with that general guidance, the relative efficiency loss in the oligopoly case compared with the competitive case cannot be known without analyzing specific market conditions.

A second imperfection is evident in markets for licenses in which many providers of nontelecommunications services obtain their spectrum rights. In those markets, some spectrum users pay very little for that valuable right and thus receive a subsidy. Subsidies that are not justified by some failure of prices to accurately reflect social costs or benefits are not characteristic of well-functioning markets because they promote overuse of the subsidized resource. A fee that eliminates a subsidy and provides an incentive for resources to be put to uses of higher value will create an efficiency gain rather than a loss. Although a broad-based spectrum fee might generate such gains, a fee more narrowly targeted toward subsidized licensees would do so with less prospect of collateral damage to users who face the opportunity cost of the spectrum that they use. (The effects of such a fee on efficiency are considered in more detail below in the discussion of a charge to private wireless spectrum rights holders.)

The Long Term. Although the loss of rents and diminished profits may not have substantial consequences for efficiency in the short run, the longer-term situation could be different. The introduction of new products, technologies, and services has greatly increased economic welfare. For example, by one recent estimate, the gain in consumer welfare from the introduction of cellular telephone service was almost \$50 billion from 1985 to 1996.³⁹ Although economists agree on the contribution of innovation to economic welfare, the role of higher-than-normal profits in encouraging innovation has long been the focus of debate.⁴⁰ Spectrum fees that decrease profits could hurt economic welfare to the extent that they delay innovations in telecommunications technologies and services. Another long-run

39. Jerry Hausman, *Cellular Telephone, New Products and the CPI*, Working Paper No. 5982 (Cambridge, Mass.: National Bureau of Economic Research, March 1997), p. 10.

40. Scherer and Ross, *Industrial Market Structure and Economic Performance*, p. 10.

concern is more specific and institutional—the possibility that charging fees to broadcast television licensees at the same time they are attempting to move from analog to digital broadcasting could slow that transition and thus delay the overall efficiency gains that are likely to accompany it.

Administrative Costs

The administrative burden of any broad-based fee will depend on the specific formulation of the fee. An annual fee that simply scales up the current licensing and regulatory fee regime is the simplest form of a revenue-raising fee. An efficiency-preserving solution requires identifying which spectrum uses and users will be able to bear a fee without significantly changing their use of spectrum. Determining the level of fees that a service or licensee can pay without being driven out of business is more difficult and, even more important, open to varying analysis and subject to political pressure.

A PROSPECTIVE NARROW-BASED SPECTRUM FEE

Narrow-based fees are designed to address issues relating to specific services, licensees, or spectrum bands. The fee on auxiliary services provided by digital television licensees is an example of a narrow-based fee. The 105th Congress considered legislation that would have similarly targeted licensees of private wireless bands. The proposed legislation would have addressed the problem of congestion in those bands by directing the FCC to allocate additional spectrum for private wireless services and to charge a spectrum lease fee (a narrow-based fee) to the for-profit parties who use those frequencies.

Private Wireless Services and the Problem of Overcrowding

Spectrum is allocated for private wireless services to meet the internal communications needs of private companies, state and local governments, and other organizations. More than 275,000 businesses use private wireless services.⁴¹ Those businesses include public utilities, petroleum producers, forest product producers, film and video producers, taxicab and limousine services, railroads, trucking companies, and a variety of manufacturing companies. Functionally, private wireless services play a role in business communications, production and process

41. Land Mobile Communications Council, *Petition for Rule Making in the Matter of an Allocation of Spectrum for the Private Mobile Radio Services* (April 22, 1998), p. 3.

control, and public safety.⁴² Private wireless frequencies are used for those purposes over wide areas (a forest), smaller defined areas (an airport), and areas as small as an industrial plant. Although those frequencies contribute proportionately less to the value of output than do commercial telecommunications services, the value of spectrum allocated to private wireless services is ultimately found in the value of the public and private goods and services that require the spectrum in their production.

Some spectrum allocated for private wireless service is licensed on an exclusive basis, and some can be shared with other private wireless licensees as well as with other services. The shared arrangement makes it difficult to estimate how much spectrum in total is allocated to the service. Hundreds of channels are spread over allocations of different sizes—some as small as 2 MHz, some larger than 30 MHz—located on spectrum at frequencies from 25 MHz to 940 MHz. When private wireless spectrum is shared, an entity called a frequency coordinator, which may constitute a group of users or a paid agent, is sometimes used to ensure interference-free communications.

Use of private wireless spectrum has grown about 10 percent annually in recent years, as measured by the number of licenses, and is expected to continue that growth over the next few years.⁴³ The increased demand has created overcrowding problems, and some of the frequencies previously available to private radio services are now under the regulatory umbrella of commercial services.⁴⁴ In response to their growing needs, private wireless users have adopted more efficient technologies that require narrower slices of the radio spectrum for voice communications. The process of migrating to narrower channels—referred to as "refarming"—will continue.

Many representatives of private wireless spectrum users claim that the only solution to the overcrowding problem is to allocate additional frequencies for private wireless uses. Those additional frequencies, however, would then be unavailable for other valuable uses. Consequently, the gains of allocating additional spectrum to private wireless services must be weighed against the losses—the opportunity cost—of using the same frequencies to satisfy competing demands. Imposing spectrum fees on private wireless use is an alternative policy

42. David Wye and others, *Private Land Mobile Radio Services: Background* (Federal Communications Commission, Wireless Telecommunications Bureau, December 1996), provides an overview of private wireless services.

43. Nathan Associates Inc., *Methods for Assigning Licenses of Newly Allocated Spectrum for Private Wireless Communications* (prepared for the Private Wireless Communications Coalition, Washington, D.C., July 1995), pp. 10-12.

44. Land Mobile Communications Council, *Petition for Rule Making*, p. 5.

that imposes the cost of overcrowding on private wireless spectrum users rather than on other users.

A Private Wireless Fee

The Congress could impose a fee on all users of the spectrum allocated for services, regardless of whether additional frequencies were allocated to those uses. The fee's purpose would be to reduce congestion in the affected bands. A private wireless fee would accomplish that objective by forcing all spectrum rights holders to confront the opportunity cost of the resource that they use. Some licensees would pay and continue to use the currently allocated bands. Other licensees, however, would choose to invest in technologies that made more efficient use of spectrum and used fewer channels or to buy commercial services and give up their private wireless rights altogether. In either case, congestion would be reduced. A fee capturing tens of millions of dollars annually might be sufficient to accomplish that purpose, although further analysis would be necessary to determine an appropriate level of aggregate collections and rate schedules for different classes of users.

Equity. Public safety spectrum users have a long-standing and widely supported expectation that they should not have to pay for the frequencies they use. Although those users pay for the other resources—automobiles and radio equipment, for example—necessary to produce the public goods they provide, the spectrum resource is a clear exception. Thus, a fee would most likely apply to private, for-profit users only and would be construed by some people as unfair. Partly in recognition of that concern, the Private Wireless Spectrum Availability Act, which was introduced in the first session of the 105th Congress and was also considered for inclusion in the Balanced Budget Act of 1997, would have allocated 12 MHz of additional frequencies to relieve congestion and would have imposed a fee on the non-public-safety users only if they chose to use the new frequencies.

Efficiency. The generalities concerning the efficiency effects of fees are usually demonstrated in the confines of a functioning market economy, in which the prices of goods and services are aligned with those of the resources necessary to produce them. In such an economy, the price paid for a resource in any particular use—for example, the hourly wage for a worker—reflects its value in the next best alternative use, or its opportunity cost. A fee or tax applied to a resource that is priced at its opportunity cost drives a wedge between the price of the resource and its opportunity cost that can ultimately lead to an efficiency loss. But if a resource is priced below its opportunity cost—in effect, is subsidized—then removing the wedge by imposing a fee can lead to an efficiency gain. Economists and market-oriented spectrum managers have long suggested that spectrum fees based on opportunity cost could create such gains because many users of the radio spectrum do not pay its opportunity cost.

A fee charged to producers of private wireless services has the potential to close the gap between prices and resource values in allocations of spectrum for private wireless services because property rights—in this case, establishing who is entitled to how much of the private wireless spectrum—are not well defined. As a result, spectrum users lack an incentive to conserve spectrum, a situation that leads to overuse and congestion.

In the near term, efficient use is promoted by setting a fee based on bandwidth—adjusted for factors such as geographic or spectrum location—that measures how much spectrum a licensee uses (or prevents other licensees from using). A fee that is properly set would present each user with the social costs of using spectrum in the band and would probably reduce the excess demand for spectrum that exists because users currently pay no fee. Even if the fee was imposed only on a newly allocated band—as the Private Wireless Spectrum Availability Act proposed—the efficient use of all bands could be marginally improved because private wireless users would face a cost when deciding whether to acquire additional spectrum in the newly allocated band or use their currently licensed spectrum more efficiently.

Users of private wireless spectrum would have several alternatives to mitigate or eliminate the higher costs from increased spectrum fees. One approach would be to use spectrum in a technically more efficient way, as the refarming initiatives are doing. For communications between fixed points—as might occur in some production control or monitoring uses—wireless communications could be replaced with wired communications. Finally, commercial services may be available—limousine dispatch services, for example. All of those changes in behavior induced by higher costs of spectrum can lead to the more efficient use of spectrum.

In the longer term, the private wireless fee also promotes efficiency by compensating the public for the private use of spectrum that is not auctioned. The revenue from the fee diminishes both consideration of budgetary incentives and a potential bias toward auctionable services in the overall decisions about spectrum allocation.

Administrative Costs. The additional administrative burden on the FCC of charging a private wireless fee is unlikely to be significant. The Private Wireless Spectrum Availability Act included one solution that would have the FCC use private frequency coordinators to administer the fees. Using such coordinators is probably the least expensive way to collect the fees because the coordinators already help to license private wireless users and therefore have the relevant information about bandwidth and other factors that would probably be used to calculate the fee.