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Allocating Publicly Owned Assets: The Case of Personal Communications Services

by Ian Gale

In late July 1994, the Federal Communications Commission (FCC) began an unprecedented sale of the airwaves. Large segments of radio spectrum (frequencies) were sold in a series of auctions, enabling firms to provide new telecommunications services. First to be sold were 4,900 radio licenses for two-way paging services, voice messaging, and data services, allowing receipt of faxes by hand-held devices, for example.¹ Next to be sold are about 2,000 licenses for wireless telephone services known as personal communications services (PCS). PCS systems will transmit calls via radio waves using digital technology. As with current cellular telephone systems, there will be many "base stations," and calls will be relayed from station to station as the caller moves around.

The use of auctions to allocate radio spectrum was mandated by Congress when it amended the Communications Act in 1993. In designing the auctions, the FCC has built on the experience of previous spectrum auctions in Australia, New Zealand, and the United Kingdom.

This action marks the first time that the airwaves have been sold by the federal government. Until last July, licenses had been allocated through comparative hearings or lotteries, both of which consumed substantial resources but failed to raise any revenue. The mounting federal debt was a major impetus for the auctions, and the initial series of auctions in fact raised far more than initial government estimates had predicted.

In addition to their favorable impact on the federal debt, the auctions will increase competition and lower rates for the approximately 17 million current cellular telephone users, while also providing higher-quality service. This *Economic Commentary* examines the rationale for using auctions to allocate radio spectrum. A secondary focus is on the impact of firms' capitalization on their bidding. In the past, concern that small firms did not have sufficient capital to compete with larger firms led to many government giveaways. Moreover, preferential treatment for small firms has had undesirable side effects. In particular, set-asides, which reserve certain licenses for bidding by small firms only, reduce bidding competition and lower revenue.

The formats chosen for the spectrum auctions avoid many of the problems associated with the earlier allocation schemes. Although some set-asides have been used, allowing small firms to pay in installments mitigates their capital constraints and permits them to be more aggressive bidders.

■ Allocation of Publicly Owned Assets

The federal government has frequently used auctions to allocate publicly owned assets. The best-known examples are Treasury bill and Treasury bond auctions. Others include auctions of timber harvesting rights and mineral extraction rights, as well as real estate (by the Resolution Trust Corporation). None of these auctions is controversial, and their

For the first time in U.S. history, the federal government has begun a sale of the airwaves. Sales of radio spectrum, conducted in a series of auctions last summer, will promote new telecommunications services, and upcoming auctions will sell licenses for wireless telephone systems known as personal communications services. These activities represent an appealing way to allocate scarce resources, will help put a dent in the federal debt, and will be fair to small firms facing capital constraints.

longevity suggests that auctions may be an appropriate method for allocating such assets. Yet in many other cases, bidding is not used.

Political considerations have limited the use of auctions, resulting in the awarding of assets with little or no payment. Radio and television licenses and cellular telephone licenses provide cases in point. (No fee was charged in the cellular telephone lotteries, other than for nominal processing.) In the airline industry, takeoff and landing slots were simply given to incumbent carriers after the Airline Deregulation Act was passed. Such giveaways represent transfers from the federal government (and thus from taxpayers) to small groups of firms or individuals. They also generate substantial lobbying aimed at maintaining the status quo.

In many other settings, assets have been allocated without bidding because of a belief that auctions are somehow inequitable. For instance, bidding is not typically used to allocate office space for university faculty or study carrels for graduate students, presumably to avoid having the spoils go only to the wealthy. There are notable exceptions, however. At the University of California at Los Angeles, graduate students in economics bid for study carrels, and the Economics Department at Arizona State University has allocated offices through an auction.² These examples suggest that economists give relatively more weight to efficiency—the idea that an asset should be deployed where it is valued most highly—than to equity.

When office space or a study carrel is allocated by a non-auction mechanism, the winner is typically unable to convey the office or carrel to someone else. In other settings, however, resale is common. For example, the Bureau of Land Management estimated that fewer than 5 percent of the winners of onshore oil and gas lease lotteries actually engaged in exploration.³ The FCC now estimates that of all the cellular telephone licenses awarded to firms other than local telephone companies, 85 percent had been resold by 1992. The value of those latter licenses could be as high as \$10 billion, but the federal government received no money for them.⁴

Resale tends to put the license in the hands of the firm that is willing to pay the most, which is what an auction would accomplish in the first place. In addition, spectrum currently used for a television station could be employed for cellular telephone service or PCS, thereby providing much greater benefits. Allowing resale of spectrum or changes in its utilization (subject to controls on issues such as interference with existing users) will tend to put spectrum to the use that benefits society the most. Resale can also make the initial bidding more competitive, because bidders foresee the possibility of selling to another firm in the future. Thus, permitting resale tends to be beneficial.

■ Benefits of Auctions

When Congress instructed the FCC to allocate radio spectrum, it could have mandated any of several different methods, including lotteries, comparative hearings, first-come first-served, and auctions. A lottery can certainly raise revenue, but there is often a significant delay before service begins, since many of the licenses will be resold. When the FCC used open lotteries for cellular telephone licenses, it took more than a year for service to begin, on average. In addition, because the fees were so low and the values of the licenses were so high, nearly 400,000 applicants clamored for an opportunity. Processing these applications imposed a massive cost on the FCC.

Comparative hearings have been used extensively to award radio and television licenses. Drawbacks to their use again include the cost (to the FCC and the applicants) and the delay. In “streamlined hearings,” the FCC took an average of two years to award cellular telephone licenses in the top 30 markets. If the PCS licenses were allocated by hearings, the process would take several years, and millions of dollars would be spent attempting to influence the outcome. And if licenses were awarded on a first-come first-served basis, there is a danger that inferior technologies would be used in a rush to be first.⁵

Auctions avoid many of the drawbacks of these other schemes. In an auction, the object for sale is awarded to the bidder who offers to pay the most. Because this bidder is typically the one who values the object most highly, the outcome is efficient. Moreover, under plausible conditions, a simple auction yields the maximum possible revenue to the seller.⁶ Even though auctions have many appealing features, however, additional issues must be raised—chiefly, how to respond to the existence of capital constraints.

■ Capital Constraints

Whenever auctions are used to allocate government-owned assets, some small bidders claim to be at a disadvantage relative to their larger counterparts. The implication is that large firms, by virtue of greater financial clout, can outbid the smaller firms. If bidders face capital

constraints, there may be a divergence between how highly a bidder values the good and what he is able to pay.

For illustrative purposes, consider a bidder seeking to buy a small business. The business is worth \$250,000 to the bidder in the sense that this is the maximum he would pay in the absence of any capital constraint. The bidder may have at his disposal only \$10,000, however. He may be able to get a loan to purchase the business, but will have difficulty doing so and will face a high interest rate. In this sense, the bidder has a severe capital constraint. If many of the bidders confront such constraints, then the seller may find it optimal to offer below-market interest rates to increase competition.

Capital constraints are present in many other cases, although not as dramatically. The bidder could be a firm that faces a high cost of capital because its cash flow is low. Again, a divergence occurs between the value of the object to the bidder and what he is able to pay. These issues are of paramount importance because of the popular, but largely unfounded, belief that small firms create a disproportionate share of net new jobs, which creates pressure to give small firms preferential treatment.⁷

In government auctions, there is anecdotal evidence of concern about the limited financial resources of bidders. For example, the federal government has limited the length and size of mineral leases, thereby making small firms more competitive.⁸ In timber rights auctions, set-aside sales have been made available exclusively to small firms. Royalty payments, which are popular in mineral rights auctions, provide a method of spreading the winner's payments across periods, thereby mitigating the impact of the current capital constraint.⁹

Researchers Kenneth Hendricks and Robert Porter provide additional evidence of the importance of capital constraints.¹⁰ Since 1975, Outer Continental Shelf (OCS) regulations have permitted joint bidding by all but the eight largest firms. The authors study bidding behavior on OCS leases for the period 1954–1979, focusing on the impact of joint

bidding on bids and profit rates. Their findings on the profitability of joint ventures involving a large firm and small fringe firms are of particular interest. Formation of the joint ventures apparently leads to more competitive bidding. The authors suggest that these joint ventures are "motivated primarily by capital constraints."¹¹

Even if one accepts the argument that small firms are at a relative disadvantage, there remains the question of how to assist them. Bidders with low liquid assets will be able to compete effectively in auctions if 1) they can pay in installments, 2) they are given "bidding credits" so that their bids are treated as if they were larger than they in fact are, 3) the licenses are made sufficiently small (for example, covering narrow geographical areas) that their value is low relative to the liquid assets of the small bidders, or 4) some licenses are set aside for bidding by small firms only. The last of these possibilities is the least appealing, since it reduces competition for the licenses that are set aside, thereby lowering revenue. The other three options enhance competition, although making licenses small may forsake economies of scale.

The FCC ultimately decided to set aside a small number of licenses for companies with revenues below \$125 million. In addition, in many other auctions, small businesses received bidding credits (discounts) as high as 25 percent. The size of the bidding credits depends on the size of the firm as well as on the sex and race of the owner. The use of installment payments was also offered.

■ Bidder Capability

The FCC would like to be certain that service will begin in a timely fashion. As such, it may wish to seek assurance that bidders are capable of providing the service. An engineer's report was required in the FCC lotteries of cellular telephone licenses, spawning a cottage industry that produced such reports. By

the end of the lottery, an application cost approximately \$650 to prepare, including the application fee.¹² Thus, it did not represent much of a burden for the participants, nor did it indicate capability. In the PCS auctions, the FCC took a different tack: Winners risk losing their licenses if they have not installed networks serving one-third of the potential customers within five years.¹³

■ The Form of the Auction

Auctions can take many forms. For example, objects can be sold sequentially or simultaneously, and bidding can be open or by sealed bid. A simultaneous auction would allow firms to put together bids for packages of licenses covering adjacent geographical areas, but may necessitate withdrawal of bids if other bidders are awarded some parts of the package. A sequential auction would allow firms to make bids knowing which licenses they had already acquired, but it does not give firms the opportunity to express their valuations for packages of licenses. The FCC decided to use a form of simultaneous auction for the large markets and to use sequential auctions for the small markets. Ultimately, differences in formats are less important than the fact that auctions of some form were held.

■ The Initial Results

The FCC started the spectrum auctions with the sale of 10 nationwide narrowband licenses. The auction commenced on July 25, 1994, and took 46 rounds and five days to complete. When it was over, \$617 million had been raised—10 times what the Congressional Budget Office and the Office of Management and Budget had predicted.¹⁴ No small firms won nationwide licenses, however. (Bidding credits were offered on three of the 10 licenses.) The revenue raised in this initial offering bodes well for the auction of the more valuable broadband licenses.

■ Conclusion

The auction of PCS licenses represents a bold step forward, and the results from the nationwide narrowband auctions are promising. An auction is an appealing method of allocating scarce resources because it awards the object to the bidder who offers to pay the most, thus maximizing social welfare while raising revenue. If firms differ only in their cost structure, then the low-cost firms should win a large share of the auctions—the efficient outcome.

A caveat is that some firms may have low costs but be undercapitalized. The use of installment payments or bidding credits is a desirable response and is preferable to the use of set-asides, which arbitrarily limit the number of bidders and thereby reduce revenue. The ultimate test of the limited set-aside program offered in the spectrum auctions will be whether the successful small firms stay in the market and flourish or sell their licenses as soon as they are able.

■ Footnotes

1. These are known as "narrowband" licenses and are not well suited for voice communication. The others are "broadband" licenses.
2. The public relations problems associated with auctioning off faculty offices—even when the proceeds go to a fund to support graduate students—are documented in William J. Boyes and Stephen K. Happel, "Auctions as an Allocation Mechanism in Academia: The Case of Faculty Offices," *Journal of Economic Perspectives*, vol. 3, no. 3 (Summer 1989), pp. 37-40.
3. See C. Fred Bergsten, Kimberly Ann Elliott, Jeffrey J. Schott, and Wendy E. Takacs, *Auction Quotas and United States Trade Policy*, Washington, D.C.: Institute for International Economics, vol. 19, 1987.
4. See "The Sky's the Limit," *Washington Post*, June 5, 1994. The profits that accrue to resellers also raise public ire. The incumbent mayor of Charlotte, North Carolina, lost his bid for reelection in 1987 after it was learned that an investment group in which he participated sold a broadcast license four months after receiving it from the FCC. Documents indicated that the then-mayor stood to make more than \$400,000 on the transaction. See "Gantt Might Have to Live with TV Station Uproar All Over Again," *Charlotte Observer*, March 24, 1990.

5. For additional discussion, see Evan Kwerel and John Williams, "Moving toward a Market for Spectrum," *Regulation*, vol. 16, no. 2 (1993), pp. 53-62.

6. In the revenue-maximizing auction, the seller may set a minimum acceptable bid. See R. Preston McAfee and John McMillan, "Auctions and Bidding," *Journal of Economic Literature*, vol. 25, no. 2 (June 1987), pp. 699-738. Their analysis does not consider capital constraints explicitly.

7. This point is made convincingly by Steven J. Davis, John Haltiwanger, and Scott Schuh, "Small Business and Job Creation: Dissecting the Myth and Reassessing the Facts," *Business Economics*, vol. 29, no. 3 (July 1994), pp. 13-22.

8. The Mineral Leasing Act and the Outer Continental Shelf Land Act explicitly limit the size of leases, but allow consolidation of leases after bidding is complete. Leases are limited to five and 10 years for producing and nonproducing tracts, respectively. See C. Fred Bergsten, et al., *Auction Quotas and United States Trade Policy* (footnote 3).

9. Between 1953 and 1982, the revenue raised from royalty payments in Outer Continental Shelf auctions amounted to \$17.3 billion, or 41.9 percent of the revenue raised from up-front bids. See Kenneth Hendricks and Robert H. Porter, "Joint Bidding in Federal OCS Auctions," *American Economic Review, Papers and Proceedings*, vol. 82, no. 2 (May 1992), pp. 506-11.


10. Ibid.

11. Ibid., p. 510. Stephen McDonald reaches a similar conclusion in *The Leasing of Federal Lands for Fossil Fuel Production*, Baltimore: Johns Hopkins University Press, 1979, pp. 106-07.

12. See Thomas W. Hazlett and Robert J. Michaels, "The Cost of Rent-Seeking: Evidence from Cellular Telephone License Lotteries," *Southern Economic Journal*, vol. 59, no. 3 (January 1993), pp. 425-35.

13. See "U.S. Lays out Rules for Big Auction of Radio Airwaves," *New York Times*, September 23, 1993.

14. See Peter Cramton, "Money out of Thin Air: The Nationwide Narrowband PCS Auction," *Journal of Economics and Management Strategy*, forthcoming 1995.


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