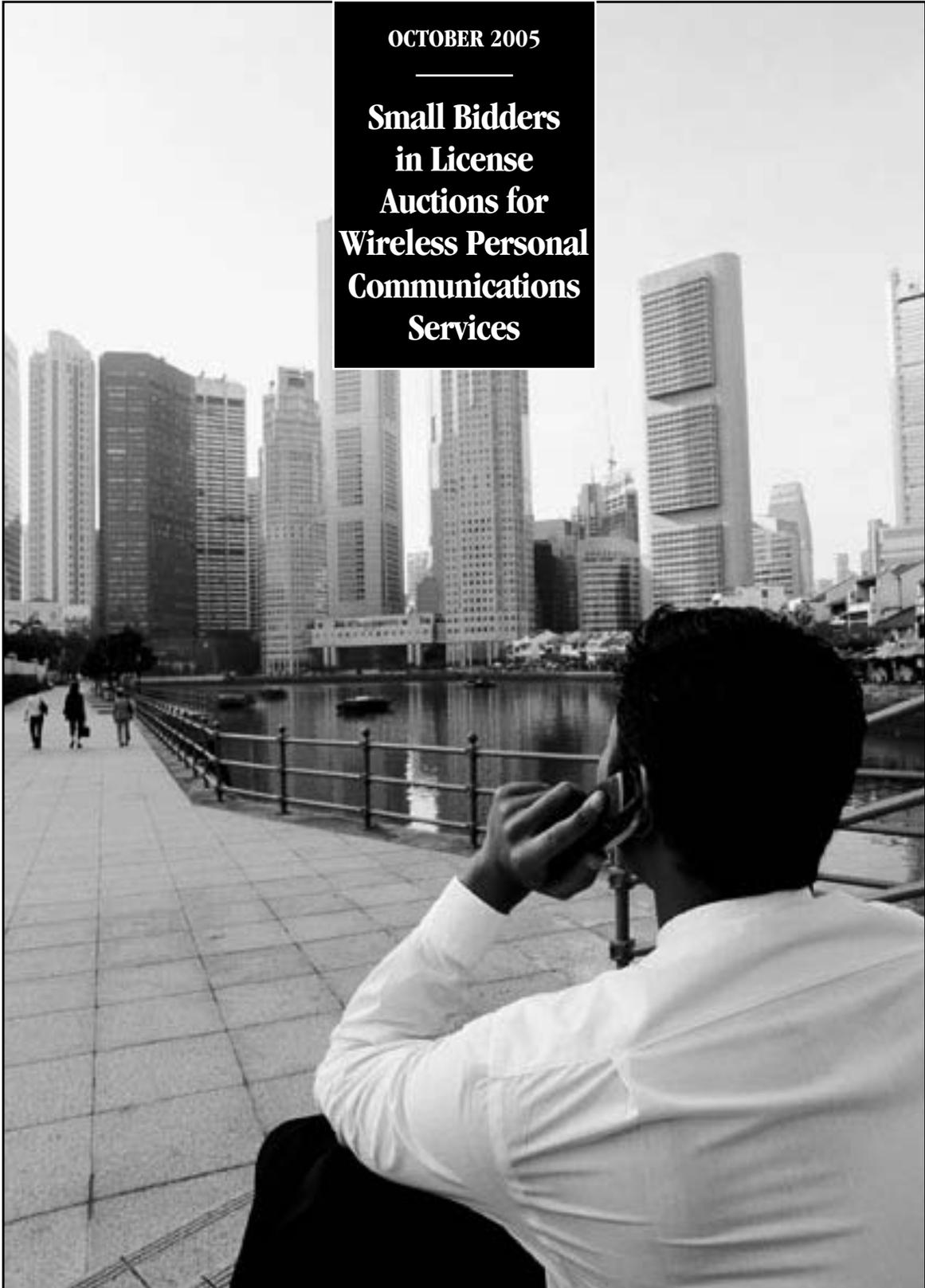


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CBO
PAPER

OCTOBER 2005

**Small Bidders
in License
Auctions for
Wireless Personal
Communications
Services**





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Note

Numbers in the text and tables may not add up to totals because of rounding.



Preface

Since the mid-1990s, the Federal Communications Commission (FCC) has assigned licenses for providing wireless communications services through competitive auctions. In carrying out the auctions, the FCC has a statutory obligation to ensure that small businesses are able to participate in the provision of those services. The FCC complies with that obligation in part by offering auction preferences to small bidders on licenses that account for one-third of the radio spectrum allocated to broadband personal communications services (PCS), which include both mobile telephony and wireless data exchange.

This Congressional Budget Office (CBO) paper, prepared at the request of the Senate Budget Committee, examines whether the FCC's small-bidder preferences imposed costs on PCS users and whether those preferences reduced federal revenues. First, because small firms may not establish and operate wireless networks as quickly or as successfully as larger firms, businesses and individuals may have less access to wireless communications and may pay more for them. In some cases, lengthy delays have occurred between the cancellation of a license for failure to satisfy financial and operational requirements and the reauction of that license. Second, partly because of their potentially less favorable commercial prospects, small bidders may not pay as much at auction for their licenses as larger bidders pay. As a result, by offering preferences at auction, the government may forgo auction receipts otherwise available to it. Consistent with CBO's mandate to provide objective, impartial analysis, this paper makes no recommendations.

Nathan Musick prepared the paper under the supervision of Roger Hitchner, Joseph Kile, and David Moore. (Roger Hitchner has since left CBO.) The paper benefited from the comments of Carla Tighe Murray of CBO; Peter Cramton of the University of Maryland; Coleman Bazelon of Analysis Group, Inc.; and Evan Kwerel of the FCC. (The assistance of external reviewers implies no responsibility for the final product, which rests solely with CBO.)

Janey Cohen edited the manuscript, and Leah Mazade proofread it. Maureen Costantino prepared the paper for publication and designed the cover, Lenny Skutnik produced the printed copies, and Annette Kalicki and Simone Thomas produced the electronic version for CBO's Web site (www.cbo.gov).

Douglas Holtz-Eakin
Director

October 2005

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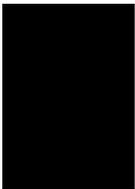
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Small Bidders in License Auctions for Wireless Personal Communications Services

Summary and Introduction

This paper examines the costs of the specific mechanisms the Federal Communications Commission (FCC) has used to meet its statutory obligation to ensure that small businesses have the opportunity to participate in the market for personal communications services (PCS), the most economically significant allocation of spectrum made since that for television in the 1950s. The FCC is responsible for allocating and regulating the use of the radio spectrum. That responsibility includes allocating parts of the spectrum for specific uses (such as television broadcasting) and assigning licenses to particular parties (for example, the owner of a local television station) authorizing them to use that allocation to provide service in specific geographic areas. Traditionally, licenses were assigned through a process in which competing applicants could argue why they deserved a particular license, and later by lottery. But as the value of the radio spectrum became more and more apparent—for example, as the market for mobile telephone service grew rapidly—policy-makers turned to competitive bidding to assign licenses. Auctioning licenses can be more efficient than the alternatives—because licenses are thereby placed in the hands of those businesses that value them most—and also provide federal revenues. The Omnibus Budget Reconciliation Act of 1993 permitted the FCC to auction licenses in certain circumstances. The law, however, set limits on market-based licensing by requiring the commission to devise methods that would allow small businesses to participate in markets for emerging telecommunications services.

The costs of ensuring that small businesses can participate in the provision of personal communications services are properly viewed in the context of the benefits that also may result. In proceedings on the auctions it would use to assign PCS licenses, the FCC discussed the benefits that might accrue from ensuring that small businesses won li-

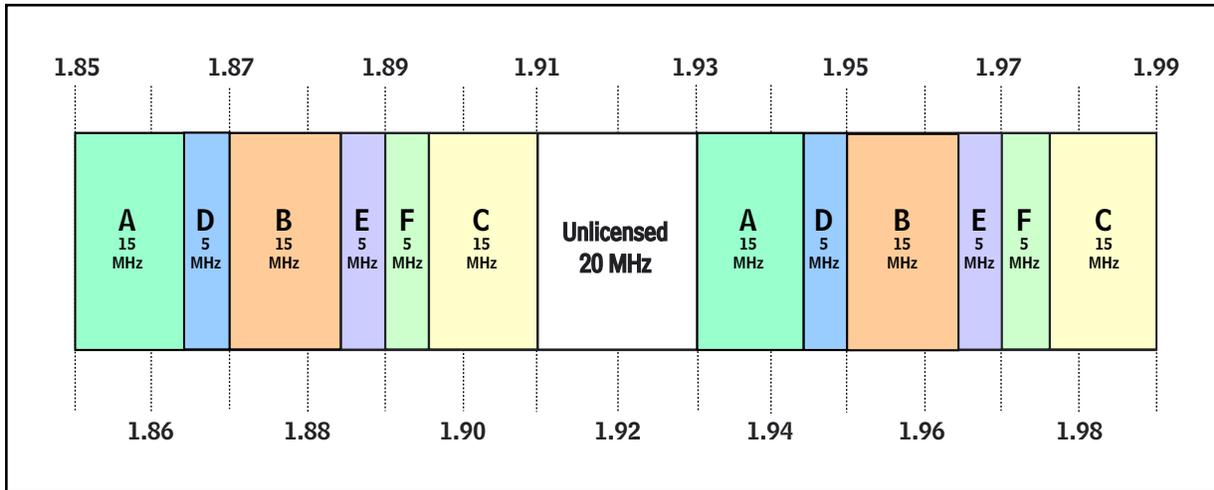
censes.¹ Those benefits included both equity and efficiency gains. On equity grounds, the FCC indicated that preferences might be necessary to compensate for unequal access to capital markets and other potential obstacles confronting small businesses.² Concerning efficiency, the commission noted that, according to some observers, small businesses could be an independent competitive factor forcing all providers to offer better service at lower prices and that small businesses also could be more innovative than their larger counterparts. Analysis of either type of benefit is beyond the scope of this paper.

This analysis shows that the preferences adopted by the FCC in the PCS auctions, particularly those used in the auction for the first large block of spectrum set aside for small businesses, the C block, did not ultimately result in widespread or long-term participation by small businesses in the PCS market. As of 2005, it was a common occurrence that control of a large portion of the PCS spectrum authorized by licenses set aside for small businesses had been sold to large providers; thus, many of the expected benefits of small-business participation were not realized. Nevertheless, the preferences had economic and budgetary impacts. First, a part of the economically valuable radio spectrum that could have been in service lay fallow for almost a decade in some geographic markets.

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1. Federal Communications Commission, *Fifth Report and Order*, PP Docket No. 93-253, FCC 94-178 (July 15, 1994), pp. 40-49.
 2. Federal Communications Commission, “FCC Seeks Comment on Changes in the C Block Auction Rules for Broadband PCS: Auction Date Set for August 29” (FCC 95-263, news release, June 23, 1995). The original plan for assigning broadband PCS licenses featured set-aside licenses for minority- and women-owned businesses as well as small businesses. The FCC dropped the special incentives for minority- and women-owned businesses in the C-block auction because of the Supreme Court’s decision in *Adarand Constructors, Inc. v. Peña*, 515 U.S. 200 (1995).

Figure 1.

The Federal Communications Commission’s Broadband PCS Band Plan



Source: Congressional Budget Office.

Notes: PCS = personal communications services; MHz = megahertz.

The numbers in bold (for example, 1.85 and 1.86) represent frequency bands in gigahertz.

Second, as the spectrum was put into use, the ownership of the licenses set aside in the PCS auctions migrated from small-business ownership to large-business ownership, revealing that personal communications services may be more efficiently provided by large network providers. Third, the federal government probably lost receipts as a consequence of the preferences policy.

The PCS Allocation, Auctions, and Preferences for Small Businesses

Since the mid-1990s, the FCC has run seven auctions to assign licenses to use the radio spectrum for providing broadband personal communications services. Those auctions comprised the four initial PCS auctions (FCC Auctions 4, 5, 10, and 11) and three PCS reauctions (FCC Auctions 22, 35, and 58). The personal communications services authorized by licenses assigned in those auctions include a wide range of digital voice and data applications, most prominently mobile telephony, and are allocated six radio frequency blocks (A through F) that occupy 120 megahertz of radio spectrum in the 1.9 gigahertz area, a particularly desirable part of the radio spectrum (see Figure 1).³ PCS licenses are granted for renewable 10-year terms, but as with other FCC licenses, licensees have a high expectation of renewal.⁴

Licenses in two-thirds of the radio spectrum allocated to personal communications services were initially assigned through competitive bidding in which auction preferences played little role (an exception being for favored bidders on the basis of technological innovativeness). Licenses in frequency blocks C and F made up the remaining portion and were initially assigned through auctions that were closed to all but small bidders (see Table 1). The initial C-block auctions (FCC Auctions 5 and 10) made available a single license of 30 megahertz of frequency in each of 493 geographically defined markets (called basic trading areas, or BTAs) of the United States and its territories. In the initial F-block auction (FCC Auction 11), F-block licenses covered 10 megahertz of

3. In contrast, narrowband personal communications services are confined to more limited types of information exchange, such as voice-message paging. Although the auctions that awarded licenses for those services (FCC Auctions 1 and 3) offered small-bidder preferences, the performance of those license winners is not considered by this paper. Thus, the term “personal communications services” and its abbreviation “PCS” will henceforth refer only to broadband personal communications services.
4. Renewal simply requires that licensees meet basic performance criteria; see 47 C.F.R. §§24.15, 24.16.

Table 1.**Schedule of PCS Auctions by the Federal Communications Commission**

	Date	Frequency Block	Number of Licenses ^a	MHz	Small-Bidder Preferences? ^b
Initial Auctions					
Auction 4	December 1994 through March 1995	A	51	30	No ^c
		B	51	30	No
Auction 5	December 1995 through May 1996	C	493	30	Yes
Auction 10	July 1996	C	18	30	Yes
Auction 11	August 1996 through January 1997	D	493	10	No
		E	493	10	No
		F	493	10	Yes
Reauctions					
Auction 22	March 1999 through April 1999	C	133	15	Yes
			206	30	Yes
		E	6	10	No
		F	2	10	Yes
Auction 35	December 2000 through January 2001	C	312	10	Yes
			43	15	Yes
		F	67	10	Yes
Auction 58	January 2005 through February 2005	A	2	30	No
		C	168	10	Yes
			20	15	Yes
		D	11	10 ^d	No
		E	20	10 ^d	No
		F	21	10	Yes

Source: Congressional Budget Office based on Federal Communications Commission Auction Factsheets, available for each auction at wireless.fcc.gov/auctions.

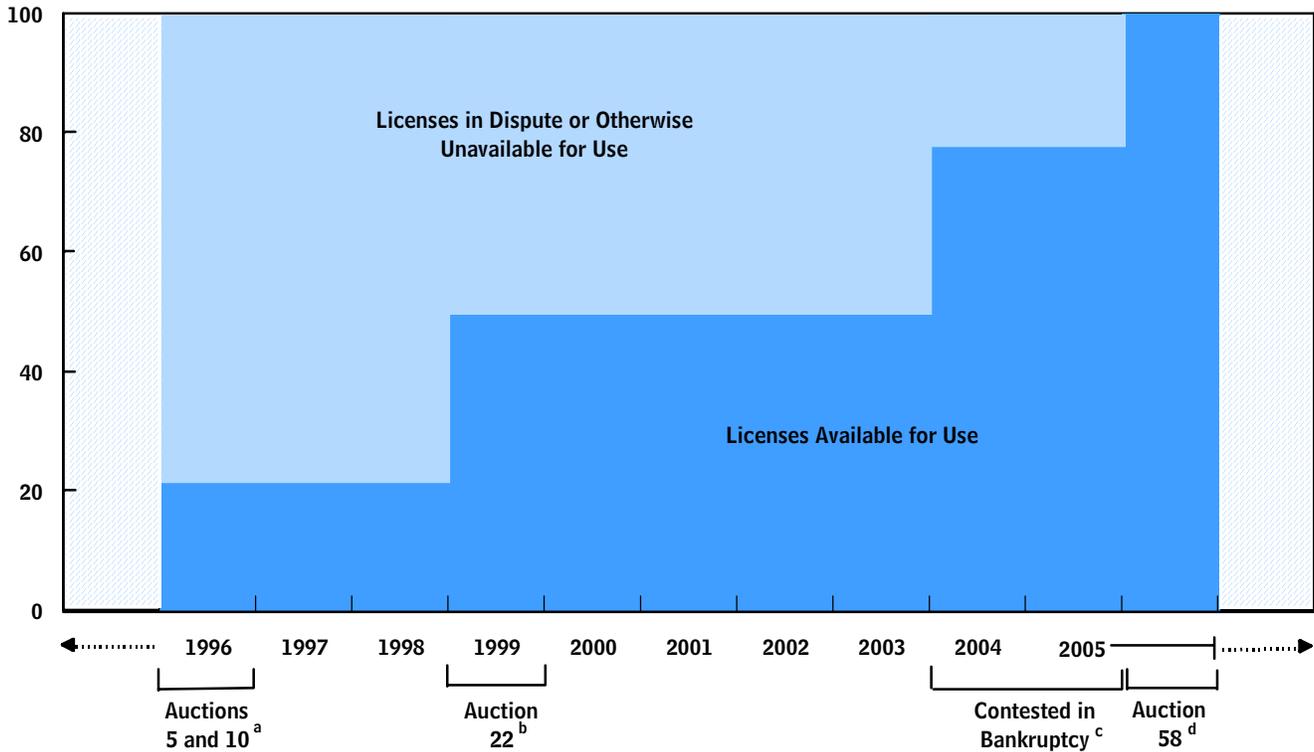
Note: PCS = personal communications services; MHz = megahertz.

- In each of the initial PCS auctions (FCC Auctions 4, 5, 10, and 11), licenses were offered for geographically defined markets that together covered the entire United States and its territories. In Auction 4, there were 51 such markets corresponding to major trading areas (MTAs); in Auctions 5, 10, and 11, there were 493 such markets corresponding to basic trading areas (BTAs). The number of licenses offered in the reauctions that followed (Auctions 22, 35, and 58) may vary because of availability and license disaggregation—that is, splitting a license's original spectrum bandwidth into smaller parts.
- Preferences offered to eligible small bidders include license set-asides, bidding credits, and installment payment plans. All of those preferences were applicable to bids on C- and F-block licenses in Auctions 5, 10, 11, and 22. In Auctions 35 and 58, only a portion of licenses in those frequency blocks could be won through small-bidder preferences, which were also limited to license set-asides and bidding credits.
- Three licenses in frequency block A were awarded outside of the auction through the FCC's Pioneer Preference Program, which distributed PCS licenses to businesses applying innovative technologies to those wireless services. That preference program was eliminated in 1997.
- Includes a handful of licenses of fewer than 10 megahertz.

Figure 2.

Reauction History of Available and Disputed PCS Licenses in the Federal Communications Commission’s C Block

(Percentage of cumulative potential PCS coverage from activated, available licenses)



Source: Congressional Budget Office.

Note: PCS = personal communications services.

- a. Licenses still activated after Auctions 5 and 10 closed.
- b. Licenses reclaimed by or returned to the Federal Communications Commission for reauction in Auction 22.
- c. Licenses retained or sold by auction winners contesting them in bankruptcy.
- d. Licenses returned to the FCC by NextWave and reaucted in Auction 58.

spectrum in each of the same geographically defined markets, were available only to small bidders, and were auctioned off simultaneously with the D- and E-block licenses, which were also 10 megahertz licenses available in each BTA but available to all bidders. The smallest bidders in the C- and F-block auctions could also take advantage of bidding credits (government subsidies of a fixed percentage of small bidders’ winning bids), and winners of licenses set aside for closed bidding (the C and F licenses) could pay for those licenses through installment payment plans at subsidized rates of interest.

Many of the small businesses that were winning bidders in the initial PCS license auctions, particularly in the ini-

tial C-block auctions (FCC Auctions 5 and 10), were unable to make payments on the licenses they had won and returned—in whole or in part—their licenses to the FCC for reauction.⁵ (See Figure 2 for a timeline of the PCS auctions.) Among successful bidders in Auctions 5 and 10 that subsequently defaulted, however, a handful (most prominently NextWave Personal Communications) were able to retain a large number of licenses in bankruptcy through a lengthy process of litigation with the Federal Communications Commission. As a result, several reauc-

5. Auctions 5 and 10 are considered together, since Auction 10 followed very quickly after Auction 5 as a reauction of 18 licenses on which the winning bidders defaulted.

tions were required to assign licenses for all of the PCS spectrum initially set aside for smaller concerns.

As recently as the third PCS reauction (FCC Auction 58, which took place from January to February 2005), several small-bidder preferences, such as license set-asides and bidding credits, have been available for reaucted licenses. However, the extent of license set-asides has been narrowed, particularly for licenses in markets with large populations (that is, of at least 2.5 million people).⁶

Additionally, in part to make PCS licenses more accessible to smaller bidders, reaucted licenses have regularly been divided into smaller frequency bands. For example, a 30 megahertz C-block license that was initially assigned through Auctions 5 and 10 and that was subsequently returned to or reclaimed by the FCC might be reaucted as two 15 megahertz licenses or three 10 megahertz licenses in the first, second, and third PCS reauctions.

Measuring the Cost of PCS Preferences

The Congressional Budget Office (CBO) used the FCC's Universal Licensing System (ULS) to track the performance of small bidders that won PCS licenses through preferences. ULS data have also been used to ascertain the extent to which control over the personal communications services authorized by those licenses has been transferred to larger firms. Both are novel ways of applying the ULS database. Although this study cannot be directly compared with previous studies, its findings are consistent with those of other sources using less detailed data on licensee performance.

Delays and Their Cost. The preferences for small businesses that the FCC used in the PCS auctions proved costly in two ways: a sizable portion of the radio spectrum was underutilized, and receipts to the government from PCS auctions were reduced. First, a valuable resource was allowed to lie fallow as a series of financial problems and legal disputes prevented the allocated airwaves from being used to provide telecommunications services. Potential PCS coverage is a measure of spectrum

usage that puts on the same footing licenses that provide for different amounts of spectrum or that authorize service to different numbers of people. For any given allocation of spectrum, 100 percent potential PCS coverage means that all of the bandwidth allocated and assigned is available to serve all of the covered population. For the PCS license auctions covering frequency blocks A and B—in which preferences for small businesses were not a factor—potential PCS coverage registered 100 percent within months after the auction closed, as winning bidders paid what they bid and began to build out their networks and provide service.

The availability to users of spectrum auctioned in frequency block C and, to a lesser extent, frequency block F was substantially delayed. Winning bidders in the initial C-block auctions (FCC Auctions 5 and 10) returned to the FCC for reauction licenses that—in whole or in part—accounted for one-third of the potential PCS coverage available at those two auctions. Additionally, many other licenses assigned through those two auctions as well as through the initial D-, E-, and F-block auction (FCC Auction 11) have, until very recently, been contested in court between the FCC and the small bidders—most prominently, NextWave Personal Communications—that went into bankruptcy soon after winning them. The contested licenses cover some of the most densely populated PCS markets and account for more than one-third of the total potential PCS coverage available from licenses initially set aside for small bidders and 12.5 percent of all potential PCS coverage (see Figure 2, which tracks potential PCS coverage available for use under the original C-block licenses for several auctions and over 10 years). Those delays in deploying wireless networks resulted in reduced access to—and probably higher prices for—personal communications services for a sizable share of the U.S. population.

The performance of small winning bidders on PCS licenses in the first PCS reauction (FCC Auction 22)—which was a reauction of PCS licenses won in FCC Auctions 5 and 10 and subsequently returned to the FCC by successful bidders that could not make payments on them—has changed dramatically compared with their performance following prior auctions. No license winner benefiting from preferences at that auction has failed to meet its operational or financial obligations. That probably was the result, at least in part, of the FCC's reconfiguration of licenses, which reduced the wireless spectrum being offered on average per license and made PCS li-

6. In such markets, "the demand for spectrum by existing carriers (was considered to be) the greatest and the prospects of a spectrum shortage for these carriers... the most acute." See Federal Communications Commission, "In the Matter of Amendment of the Commission's Rules Regarding Installment Payment Financing for Personal Communication Services," WT-Docket No. 97-82, *Sixth Report and Order on Reconsideration* (August 29, 2000), pp. 10-17.

censes more affordable to small bidders. For Auction 22, the FCC also restructured preferences by eliminating the availability of installment payments for small bidders that won licenses. That may have reduced the riskiness of some bids by reducing bidders' incentive to make high bids and then hope for eventually favorable circumstances that would enable them to meet their financial obligations. Nonetheless, economic efficiency in the provision of personal communications services may have continued to be compromised by making it easier for small firms to obtain PCS licenses even when economies of scale in operating such wireless networks often favored their larger competitors.

The value of the spectrum that was not put into use cannot be precisely estimated. Using prices and quantities observed from actual transactions for wireless services, some analysts have estimated that consumer surplus losses due to license dormancy in the C block are quite large, approaching \$40 billion. Essentially, that is the value to society from the spectrum set aside for small bidders had it reached the market in a timely way, fostering lower service prices and a larger amount of consumer purchases.

Loss of Revenue for the Federal Government. A second way in which small-bidder preferences at auction can be costly is by depriving the federal government of revenues it otherwise would have received. CBO explored that possibility for the PCS auctions by comparing, where possible, the winning bids on licenses to which bidder preferences could be applied with the winning bids on other, comparable licenses. Both small and large bidders could take part in the initial D-, E-, and F-block auction (FCC Auction 11) and in the second and third PCS reactions (FCC Auctions 35 and 58), with open and closed bidding taking place simultaneously on distinct—but comparable—licenses in the same market. (In open bidding, all auction participants may bid; in closed bidding, only entrepreneurs may bid on licenses set aside for them.) Qualified small bidders (designated entities) could also avail themselves of bidding credits at those auctions.

With the exception of license set-asides in Auction 58, small bidders appear to have used auction preferences to pay less than they otherwise would have in competition with larger bidders. For example, in Auction 11, small bidders paid—net of bidding credits and after incorporating a range of estimates of the value of government-financed installment payment plans—on average between 31 percent and 61 percent less for licenses set aside for them than bidders that won comparable licenses in open bidding. The corresponding figure for Auction 35 (which

did not offer installment payments to small bidders and in which the number of set-aside licenses varied largely according to the population of the market for which a license authorized service) was between 14 percent and 15 percent, depending upon the market population. Where the impact of bidding credits can be measured separately from the impact of license set-asides (FCC Auctions 35 and 58), small bidders eligible for bidding credits placed winning bids that were on average 20 percent and 19 percent less, respectively, than the next-highest bid of bidders that did not qualify for bidding credits. However, an outcome where small bidders used bidding credits to outbid larger competitors that did not qualify for those credits was infrequent, and the overall impact of bidding credits was small. In terms of total net auction receipts, bidding credits reduced revenues by a bit over 2 percent, on average, in affected auctions.

The diversity of estimates across Auctions 11, 35, and 58 and the different circumstances surrounding each auction make it difficult to reach a general conclusion about the extent to which preferences reduced auction receipts. The relative demand for and supply of licenses, the degree to which entrepreneurs and designated entities that benefit from preferences also receive financing from larger concerns, the extent of cooperation or rivalry between particular bidders, and other factors probably determine whether auction preferences reduce government revenues, and if they do, by how much.

Current Ownership of the Set-Aside Licenses

Small bidders that have won PCS licenses through preferences are constrained in how they may subsequently dispose of them. In particular, within the first five years after such licenses have been granted, their sale or transfer to an entity that would not also qualify for preferences obligates the small license winner to pay a penalty. At the time the ULS data for this study were obtained (in fall 2004), the sale or transfer of most licenses assigned through Auctions 5, 10, 11, and 22 was exempt from penalty. And it appears that many bidders that won PCS licenses through preferences have sold or transferred those licenses to larger entities. Well over one-half of the total potential PCS coverage from licenses set aside for small bidders at Auction 11, and more than 40 percent of the corresponding figure for Auction 22, have been transferred from small bidders to larger entities. Although the corresponding figure for licenses won by small bidders in Auctions 5 and 10 is relatively low—approximately 25 percent—many licenses assigned through that auction were reacquired in Auction 22.

Small-Bidder Preferences

To comply with its statutory obligation to ensure that small concerns have the opportunity to participate in the provision of spectrum-based services, the FCC has given small bidders in PCS auctions a number of preferences, including license set-asides, bidding credits (government subsidization of a fixed percentage of small bidders' winning bids), and installment payment plans at subsidized rates of interest. Over time, however, the FCC has narrowed the extent of preferences offered to small bidders. Additionally, to be eligible for preferences at auction, small bidders have been constrained with respect to both the amount of equity that large firms may hold in them and how they dispose of the licenses won through the use of the preferences.

Background

In establishing competitive bidding procedures for FCC licenses, the Omnibus Budget Reconciliation Act of 1993 required the FCC to consider a variety of measures, including preferential bidder treatment at auction and financial assistance to winning bidders, to “ensure that small businesses, rural telephone companies, and businesses owned by members of minority groups and women are given the opportunity to participate in the provision of spectrum-based services.”⁷ In response to the Supreme Court's ruling in *Adarand Constructors, Inc. v. Peña* that “strict scrutiny”—that is, a new, higher standard of the evidence of discrimination, based on a showing of past discrimination—be satisfied to justify gender- or race-based preferences in federal programs, the FCC has offered preferences in PCS spectrum auctions to small businesses irrespective of gender or race.⁸

Eligibility Rules and Types of Preferences

Title 47 of the Code of Federal Regulations (CFR) contains the rules that govern the Federal Communications

Commission. Preferential treatment of small businesses is considered both in a general context in Part 1 (“Practice and Procedure”) and with respect to small businesses' provision of personal communications services in particular in Part 24.

The FCC uses a variety of terms to designate the small concerns targeted by its preference schemes in PCS auctions. Generally, designated entities are “small businesses, businesses owned by members of minority groups and/or women, and rural telephone companies,” with “small” defined in terms of revenues or assets (or both).⁹ However, the FCC also uses the terms “very small business” and “entrepreneur.” Both the precise definition of those terms and the provisions made to support bidders that qualify in any of those categories are made on a service-specific basis.

In PCS auctions, the FCC typically refers to the small concerns that qualify for closed bidding—that is, for license set-asides at auction—as entrepreneurs (see, for example, the factsheets for each PCS auction, available at wireless.fcc.gov/auctions/). However, not all entities that qualify for closed bidding are also eligible for bidding credits. The FCC reserves bidding credits for small and very small businesses, with the smallest bidders typically receiving the most generous credits. This paper will follow FCC convention by referring to small concerns that qualify for license set-asides as entrepreneurs and will refer to bidders that receive bidding credits of any amount as designated entities. By definition, then, all designated entities are also entrepreneurs, but not all entrepreneurs qualify as designated entities.

The criteria for qualifying as an entrepreneur or a designated entity have not changed throughout the PCS auctions. A small concern has been eligible to participate as an entrepreneur in a broadband PCS license auction if, “together with its affiliates and persons or entities that hold interests in the [concern] and their affiliates,” it has earned less than \$125 million in gross revenues during each of the two years prior to the auction and has assets of less than \$500 million when filing its application to participate.¹⁰ Similarly, designated entities have been small or very small businesses whose average annual gross reve-

7. 47 U.S.C. §309(j)(4).

8. 515 U.S. 200 (1995). In the first PCS auctions in which preferences were offered (FCC Auctions 5 and 10), three tiers of bidding credits were initially planned: 10 percent for small businesses, 15 percent for businesses owned by women or minorities, and 25 percent for small businesses owned by women and minorities. As a result of the Supreme Court's ruling in *Adarand Constructors, Inc. v. Peña*, the FCC collapsed the three bidding credit tiers to one of 25 percent that applied to virtually all small businesses. See Federal Communications Commission, *Sixth Report and Order*, PP Docket No. 93-253, FCC 95-301 (July 18, 1995), pp. 109-111.

9. 47 C.F.R. §1.2110(a)-(b).

10. 47 C.F.R. §24.709(a).

nues during the three-year period preceding the auction do not exceed \$40 million or \$15 million, respectively.¹¹

Although the FCC has offered preferences in almost all of its PCS auctions, the particular preferences available in any auction have varied. At the PCS auctions in which small-bidder preferences were first offered (FCC Auctions 5, 10, and 11), the Federal Communications Commission auctioned all C- and F-block licenses to entrepreneurs in closed bidding. Installment payment plans at subsidized rates of interest were also available to winners of those set-aside licenses.¹² At the ensuing reauctions of returned and canceled licenses (Auctions 22, 35, and 58), the FCC maintained license set-asides but discontinued installment payment plans. C- and F-block license set-asides for entrepreneur bidders have also become less generous. For example, starting with Auction 35, some C-block licenses have been offered in open bidding, and F-block license set-asides have been discontinued.¹³

Designated entities have benefited from bidding credits on C- and F-block licenses in all PCS auctions, although certain aspects of that preference have also evolved over time. In Auctions 5 and 10, for example, a 25 percent bidding credit was available to all bidders that qualified as small businesses. Beginning with Auction 11, small businesses have received a 15 percent bidding credit, and very small businesses have received a 25 percent bidding credit.¹⁴ Through Auction 22, bidding credits were applicable only to C- and F-block licenses, which were offered entirely in closed bidding. In subsequent PCS auctions, in which bidding on some C-block and all F-block licenses has been opened to all auction participants, bidding credits have been applicable only to C- and F-block licenses won in open bidding.¹⁵

Constraints

Several constraints are placed on small concerns that wish to qualify and retain their status as entrepreneurs or designated entities. First, the amount of equity contributed

from larger firms or investors is capped. There are, however, doubts about how effectively that cap insulates competition among small bidders from the influence of larger concerns. Second, there is an obligatory holding period before a license that has been won through a set-aside or bidding credit may be sold or transferred to a larger entity without incurring a penalty.

To qualify as an entrepreneur and be eligible for closed bidding on a PCS license, a bidder's revenues must not have exceeded \$125 million in each of the two years before the auction, and the bidder must have total assets of less than \$500 million at the time it applies to participate. To avoid hindering winning entrepreneurs in their efforts to obtain external financing for establishing wireless PCS networks, however, the FCC has allowed entrepreneurs to enter into several types of equity agreements with larger firms. In particular, small concerns can create a "control group" for the entity bidding as an entrepreneur (that is, the eventual PCS license applicant); as long as a sufficient amount of that entity's total assets is held by members of the control group that qualify as entrepreneurs (this can be as little as 15 percent), then additional equity can come from larger firms.¹⁶ As a result, an entrepreneur may obtain as much as 85 percent of its equity from larger concerns, including larger PCS providers. For several reasons, the equity participation rules have been controversial. First, as noted in footnote 15, they may be very difficult to enforce. Second, they may have permitted larger PCS providers to have undue influence.¹⁷

15. See Federal Communications Commission, "In the Matter of Amendment of the Commission's Rules Regarding Installment Payment Financing for Personal Communication Services," p. 23. The FCC endorsed the argument of a petitioner who claimed that retaining bidding credits in closed bidding would "simply skew these auctions in favor of well-capitalized applicants" who nonetheless would qualify for set-aside licenses because they "are carefully structured to shield deep-pocketed investors from attribution."

16. 47 C.F.R. §24.709(b).

17. FCC equity participation rules are in particular criticized for allowing some entrepreneur bidders to serve as "fronts" for larger companies, which as a result can benefit from preferences intended for smaller firms. The presence of fronts in closed bidding for set-aside licenses raises the price that small bidders must pay. See, for example, Peter Cramton, Allan T. Ingraham, and Hal J. Singer, "The Impact of Incumbent Bidding in Set-Aside Auctions: An Analysis of Prices in the Closed and Open Segments of FCC Auction 35" (mimeo, May 2002).

11. 47 C.F.R. §24.720(b)(1)-(2).

12. 47 C.F.R. §§24.711, 24.716.

13. 47 C.F.R. §24.709(a)(3)-(4).

14. 47 C.F.R. §§24.712(a)-(b), 24.717(a)-(b). Beginning with Auction 35, bidding credits have also been available to winning bidders for PCS licenses that have received authorization to provide those wireless services on qualifying Indian tribal lands. See 47 C.F.R. §1.2110(f)(3).

A second constraint placed on bidders that benefit from auction preferences is the five-year holding period during which they may not—without incurring a penalty—sell or transfer their license, in whole or in part, unless the purchaser would also qualify for the same preference(s) at auction.¹⁸ Known as an “unjust enrichment” payment, that penalty varies depending upon the type of preference through which the license was won at auction and, for bidding credits, upon the amount of time that the winning small bidder has held the license. For example, the unjust enrichment payment for licenses won in closed bidding should reflect “the estimated value of the set-aside benefit,” calculated as the difference in the free-market price between a set-aside license and a comparable license won in open bidding.¹⁹ For PCS licenses won through bidding credits, the unjust enrichment penalty equals the value of the bidding credit multiplied by a fraction that decreases from 1.0 to 0.25 during the five-year holding period.²⁰

Provision of Personal Communications Services by Small License Winners

How successfully FCC auctions have enabled small concerns to provide personal communications services may be judged by the failure of those bidders to use their licenses at all. That is, one can examine the frequency of license cancellation or termination and the degree to which PCS licenses won at auction by small bidders have been sold or transferred to larger entities. On that basis, the performance of small bidders that have won PCS licenses through license set-asides and bidding credits has been

mixed. The initial PCS auctions (FCC Auctions 5, 10, and 11) were marred by the inability of many small license winners to make good on their winning bids. As a consequence, many of the licenses assigned through those auctions were returned—in whole or in part—to the FCC for reauction, whereas a large number of the others have, until very recently, been contested in court between the FCC and the small concerns that went into bankruptcy soon after winning them. The contested licenses cover some of the most densely populated PCS markets. As a result, during the delay before they were put into the hands of viable wireless providers, a sizable share of the U.S. population had access to fewer personal communications services—most likely at higher prices—than they would have had if the spectrum had been in use.

The performance of small winning bidders in subsequent PCS license auctions has changed dramatically, owing, perhaps, to smaller license sizes and a restructuring of small-bidder preferences. For example, before reaucting many of the 30 megahertz licenses returned to it from defaulted auction winners, the FCC split them into several licenses of 15 megahertz and 10 megahertz each, in an attempt to make the new licenses better suited to the financial and operational capabilities of small concerns. Beginning with Auction 22, small license winners have no longer been able to pay off their winning bids through installment payments at subsidized rates of interest. That preference has been associated with encouraging inflated bidding, particularly in the initial C-block auctions (FCC Auctions 5 and 10) and the initial D-, E-, and F-block auction (FCC Auction 11).

The difficulties encountered in the early auctions have continued to affect the provision of personal communications services by small concerns. In particular, an agreement reached in 2004 between the FCC and NextWave Personal Communications, Inc., in the wake of the Supreme Court’s ruling against the government has allowed larger wireless providers to obtain PCS licenses in significant markets.²¹ In addition to that reallocation of PCS market share from small to large entities, rules have allowed small bidders benefiting from auction preferences to sell their licenses to larger concerns after five years without incurring a penalty.

18. More specifically, the new licensee must either already be in possession of licenses that it won through preferences, or be of a size that would qualify it for preferences were an auction to be held at the time of the license transfer or sale. The FCC does not, however, require a small bidder that wins a license through preferences to remain that size for five years. See 47 C.F.R. §24.709(c).

19. 47 C.F.R. §1.2111(b). Note that additional considerations for unjust enrichment penalties assessed on the sale or transfer of PCS licenses won through closed bidding are also found in 47 C.F.R. §24.839 and, in cases where the winning entrepreneur benefited from installment payments (Auctions 5, 10, and 11), in 47 C.F.R. §1.2211(c).

20. 47 C.F.R. §12111(d). Bidding-credit-based unjust enrichment penalties are not, however, assessed on the sale or transfer of licenses won in Auctions 5 or 10. See 47 C.F.R. §24.712(c).

21. 537 U.S. 293.

Cancellation and Termination of PCS Licenses Won by Small Bidders

The winner of a PCS license in an FCC auction must satisfy several requirements both to become a licensee and to retain the license over time. A winning bidder must submit on time the necessary down payment and thereafter make timely payments on the remaining amount of the winning auction bid. A wireless network must also be “built out” within an appropriate period. At regular intervals, licensees need to verify that sufficient network facilities exist to provide service to the population served by their license.²² Failure to satisfy financial or build-out requirements can bring about a license’s cancellation or termination, respectively.²³

Although a common set of requirements applies to PCS license winners, the licenses themselves are not identical. They differ in the amount of wireless spectrum that the operator can use to provide service (in practical terms, the amount of data or information that can be exchanged) and the geographic area in which the service can be offered and hence, the number of people that may be covered by that service. Those factors determine the likely net revenues from the auction of a license. All other things being equal, a license that conveys the right to provide personal communications services within a narrow frequency range and over a geographic area with a small number of individuals or households, for example, represents much less potential PCS coverage—and therefore fewer revenues—than does a license for wireless operations across a broad frequency range and over a geographic area with a large population.²⁴ A measure that is useful in putting licenses on a common footing is potential PCS coverage: license bandwidth measured in megahertz multiplied by the total population in the area covered by the license. Potential PCS coverage is useful for evaluating in quantitative terms the benefits lost to society from licensing delays and cancellations.

Licenses can differ in spectrum allocation and geographic coverage both initially, when they are auctioned, as well

as afterwards. For example, subject to FCC approval, a license can be modified after it is initially granted by splitting up either the associated spectrum or the geographic area serviced in order to lease or sell some or all of the resulting pieces of the license. License spectrum is “disaggregated” when the original bandwidth for which wireless operations are authorized by the license is divided into smaller segments, and the geographic service area of a license is “partitioned” when that area is divided into smaller sections that together make up the original geographically defined market. In principle, the potential PCS coverage of either disaggregated or partitioned licenses can be calculated as described above, as the product of spectrum bandwidth multiplied by population.²⁵ However, the limitations of the data available to this study make it difficult to determine the population served by partitioned licenses. As a result, partitioned licenses are treated separately in CBO’s results for the incidence of license cancellation and termination.

Of the six PCS auctions for which the FCC has made small-bidder preferences available, FCC Auctions 5, 10, 11, and 22—which took place between 1995 and 1999—represent a significant number of licenses and provide a sufficient time period for evaluating the ability of small license winners to meet financial and operational requirements. The remaining two PCS auctions do not allow for such assessments. About 80 percent of the 133 licenses won by entrepreneurs in Auction 35, which took place between 2000 and 2001, were invalidated as a result of a ruling by the Court of Appeals for the D.C. Circuit—subsequently upheld by the Supreme Court—that PCS licenses held by certain bankrupt bidders (in particular, NextWave Personal Communications) could not be reclaimed by the FCC for auction. Auction 58 just concluded in February 2005.

22. For PCS licenses of 30 megahertz and 10 megahertz, see, respectively, 47 C.F.R. §§24.203(a) and 24.203(b).

23. For FCC rules applying to cancellation resulting from nonpayment generally, see 47 C.F.R. §1.2109(a)-(c), and for installment payments on licenses won in Auctions 5, 10, and 11, 47 C.F.R. §1.2110(g)(4)(iii)-(iv). For rules governing termination resulting from failure to satisfy build-out requirements by all license winners, see 47 C.F.R. §1.946(c) and §1.955(a)(2).

24. Reflecting that, to determine the amount of money that bidders must pay “up front” to qualify to bid on a given license, the FCC typically begins by multiplying the amount of wireless spectrum available from the license by the population of the market covered by it. The FCC then applies a fixed monetary rate to that figure to obtain the dollar amount of the up-front payment. For a recent example, see Federal Communications Commission, “Revised Inventory for PCS Spectrum Auction—Comment Sought on Reserve Prices or Minimum Opening Bids and Other Auction Procedures,” Report No. AUC-04-58-C (Auction 58), Public Notice DA 04-2451 (August 3, 2004), pp. 2-3.

25. Following current FCC practice, population data come from the 1990 census (see the entry for “Pop” at wireless.fcc.gov/auctions/default.htm?job=glossary).

The Initial C-Block Auctions (FCC Auctions 5 and 10).

Auction 5 took place from December 18, 1995, to May 6, 1996. It offered 30 megahertz C-block licenses in 493 basic trading areas covering the United States and its territories. Eighty-nine bidders won licenses, with total bids (net of bidding credits) amounting to slightly more than \$10 billion at the close of the auction. However, two bidders (BDPCS, Inc., and National Telecom PCS, Inc.) failed to make timely down payments on the 18 licenses they won. Those licenses were reauctioned quickly thereafter in Auction 10, which ran from July 3 to July 16, 1996. At the close of Auction 10, seven bidders had placed more than \$900 million in winning bids. Because Auction 10 followed almost immediately after Auction 5 and took place under the same terms for entrepreneurs and designated entities, Auctions 5 and 10 are considered together.

The initial C-block auctions were open only to entrepreneurs. To pay off their winning bids, those small bidders could avail themselves of 10-year installment payment plans at government-subsidized borrowing rates. Bidding credits were also available to designated entities. Auctions 5 and 10 were only the second time that the FCC had put broadband PCS licenses on the market.²⁶ Bidders faced difficulties in projecting revenues from the new wireless services made possible by those licenses: inexperience with auctions of such complexity and generous financing from the federal government probably combined to inflate winning bids by entrepreneurs to untenable levels. As a result, the initial C-block auctions put relatively few licenses into the hands of bidders that could actually pay for them.²⁷

The C-block licenses won in Auctions 5 and 10 can be placed into two categories: those licenses that were retained by the winning bidders and activated (or put into operation) after Auction 10 and those licenses that remained dormant until their eventual reauction by the

FCC (see Table 2). Licenses in the second category are by far the most important in terms of both the number of licenses and their share of potential PCS coverage. They accounted for 423 (or 88 percent) of licenses available in Auctions 5 and 10 and 79 percent of the potential PCS coverage from the entire C block. Dormant licenses comprised licenses that remained unissued or that were reclaimed by the FCC; licenses that were returned to the FCC in whole or in part within a few years of the close of Auction 10 by winning bidders that could not pay for them and that responded to incentives offered by the FCC to return those licenses (those returns are also known as the “C-Block Settlement Elections”); and licenses that were contested between the FCC and the winning bidders that declared bankruptcy.²⁸ Among licenses in the latter group were ones that allowed the winning bidder to provide service in major metropolitan areas, including Boston, Los Angeles, and New York City. Because licenses remaining dormant after the close of Auction 10 account for such a large share of potential PCS coverage and while inactive represent considerable foregone benefits to society (as well as lost auction revenues to the government), the disposition over time of those licenses, as well as of licenses remaining dormant after the close of Auction 11, is considered in detail in a later section of this chapter.²⁹

Among PCS licenses that were retained by winning bidders and activated after Auction 10, 22 percent had been canceled by fall 2004. Those canceled licenses accounted for 15 percent of potential PCS coverage available from the C-block licenses activated after Auctions 5 and 10. More than two-thirds of those licenses were canceled because of nonpayment, while the remainder were canceled for reasons that have not been determined from available data. For example, the FCC’s Universal Licensing System database does not always note the reason for which a licensee voluntarily cancels its license. License terminations

26. Auction 5 followed soon after Auction 4, which took place between December 5, 1994, and March 13, 1994. Auction 4 was open to all bidders and was the first FCC auction of PCS licenses (for frequency blocks A and B). In contrast to the outcome of Auctions 5 and 10, only a few winning bidders in Auction 4 defaulted.

27. For an analysis of the difficulties encountered in Auctions 5 and 10, see Gwenell Bass, *Electromagnetic Spectrum Auction: An Economic Analysis of the C-Block Auctions*, CRS Report for Congress RL30119 (Congressional Research Service, February 9, 2000).

28. The options available to entrepreneurs for returning the licenses they won in Auctions 5 and 10 because they could not meet the financial obligations of the licenses are described in Federal Communications Commission, “Amendment of the Commission’s Rules Regarding Installment Payment Financing for Personal Communications Services (PCS) Licenses,” *Second Report and Order and Further Notice of Proposed Rule Making*, WT Docket 97-82 (released October 16, 1997).

29. Before declaring bankruptcy, winners of contested licenses in Auctions 5 and 10 (NextWave Personal Communications, Airadigm, and Urban Comm) also won licenses in Auction 11, which ended in mid-January 1997.

Table 2.

Disposition of PCS Licenses and Associated Wireless Spectrum Won in the Initial C-Block Auctions (FCC Auctions 5 and 10) as of Fall 2004

	Number of Licenses ^a	Share of Potential PCS Coverage ^b (Percent)	
		Licenses Activated After Auction 10	All Licenses
Licenses Activated After Auction 10			
Still Active (Including disaggregated licenses) ^c	178	81.3	17.6
Canceled			
Installment payments not made on a timely basis ^d	38	10.3	2.2
Undetermined from available data	17	4.4	1.0
Terminated			
Build-out requirements not met ^e	2	0.2	0
Undetermined from available data	1	0.1	0
Partitioned	11	3.7	0.8
Licenses Remaining Dormant After Auction 10			
Reclaimed or not granted by the FCC ^f	20	n.a.	1.9
Returned to the FCC as C-Block Settlement Elections	305	n.a.	32.9
Contested in Bankruptcy			
NextWave	63	n.a.	41.2
Airadigm and Urban Comm	23	n.a.	2.5
All Licenses After Auction 10			
Total Licenses	658	100.0	100.0

Source: Congressional Budget Office based on the Federal Communications Commission's Universal Licensing System database, available at wireless.fcc.gov/uls/, and Public Notices for FCC Auctions 5 and 10, available at wireless.fcc.gov/auctions/.

Note: PCS = personal communications services; n.a. = not applicable.

- a. Because of license disaggregation, for any geographically defined PCS market there may be multiple licenses occupying the 30 megahertz originally conveyed by the corresponding license offered in FCC Auctions 5 and 10. Hence, the sum of all licenses deriving from Auctions 5 and 10 may be greater than the 493 licenses originally offered.
- b. This paper defines the potential PCS coverage of a license as the product of a license's bandwidth multiplied by the population of the geographic area it covers (as measured by the 1990 census).
- c. Included in this group are licenses won by GWI (MetroPCS), which was able to retain those licenses in bankruptcy.
- d. See 47 C.F.R. 1.2110(g)(4)(iii)-(iv).
- e. See 47 C.F.R. 1.946(c) and 1.955(a)(2).
- f. The winning bidders for these licenses (CHPCS and Mountain Solutions) failed to make the required down payments for them.

for failure to meet build-out requirements or for other reasons not specified by the ULS data have been rare, amounting to less than one-half percent of potential PCS coverage from activated licenses.

The Initial D-, E-, and F-Block Auction (FCC Auction 11).

Auction 11 ran from August 26, 1996, to January 14, 1997. It put up for auction 10 megahertz PCS licenses in frequency blocks D, E, and F. In all blocks, one license was available for each of 493 geographic areas covering the United States and its territories. Some 125 bidders won 1,472 licenses; seven were held by the FCC. Total bids (net of bidding credits) exceeded \$2.5 billion.

All bidders that qualified for Auction 11 could bid on D- and E-block licenses; only entrepreneurs could bid on licenses in frequency block F. As in the initial C-block auctions (FCC Auctions 5 and 10), entrepreneur winners of licenses in block F could avail themselves of installment payment plans, and designated entities benefited from bidding credits on their bids for F-block licenses.

As with the initial C-block auctions, licenses won in Auction 11 can be categorized by those that were activated after the auction and those that remained dormant (see Table 3). In contrast to the earlier auctions, the FCC did not offer incentives for defaulted license winners to return licenses won in Auction 11. Hence, dormant licenses comprise licenses retained by the FCC (that is, not awarded to any bidder) and those contested between the FCC and their bankrupt winners (the same firms—NextWave, Airadigm, and Urban Comm—as in Auctions 5 and 10). Almost all dormant licenses come from the F block, where NextWave in particular captured more than 17 percent of potential PCS coverage from frequency block F. Licenses won in the F block by Airadigm and Urban Comm make up close to 2 percent, bringing to roughly 20 percent the potential PCS coverage from block F that remained dormant because of contested licenses.

At 3 percent of potential PCS coverage available from all of the F-block licenses activated after Auction 11, the incidence of license cancellation because of nonpayment is slightly higher among the entrepreneur license winners in block F than it is for all winning bidders in frequency blocks D and E (where it is zero). However, license cancellation for entrepreneurs because of nonpayment is much less important in Auction 11 than in Auctions 5

and 10, where it represented over 10 percent of potential PCS coverage among licenses activated at the end of Auction 10. That is also true for the incidence of license termination because of failure to meet build-out requirements, which does not occur at all among Auction 11 licenses in any frequency block. The greater success of winning bidders in meeting their financial commitments from the initial D, E, and F blocks may be the result of two factors: greater experience in license pricing and auction participation after the initial C-block auctions and a smaller amount of spectrum (10 megahertz)—hence more-accurate revenue expectations—from licenses in Auction 11. Finally, as with Auctions 5 and 10, a number of licenses from Auction 11 in all frequency blocks appear to have been either canceled or terminated for reasons not specified by the ULS data.

The First PCS Reauction (FCC Auction 22).

Auction 22 began on March 23, 1999, and ended on April 15 of that year. Some 347 licenses were offered, almost all of them C-block licenses from Auctions 5 and 10 that had been returned to the FCC by winning bidders that could not make payments on them. Six E-block licenses and two F-block licenses also were offered. At the close of the auction, 57 bidders had won 302 licenses—the remainder being held by the FCC—for \$412.8 million in total bids (net of bidding credits).

More than one-third of the C-block licenses in the first PCS reauction were for 15 megahertz of PCS spectrum, reflecting disaggregation of the wireless spectrum from many of the 30 megahertz licenses in the C block that were returned after Auctions 5 and 10. C- and F-block licenses were set aside for entrepreneurs in Auction 22, and designated entities also benefited from bidding credits on licenses in those frequency blocks. In contrast to the previous PCS auctions, installment payment plans were not available to entrepreneurs who won licenses in Auction 22.

As in previous auctions, some licenses won in Auction 22 remained dormant afterwards; however, none was returned or contested (see Table 4 on page 16). Moreover, compared with previous auctions, those licenses represent a smaller share of potential PCS coverage from all licenses at auction (less than 6 percent). Among licenses activated after Auction 22 and won by any bidder, none had been canceled or terminated as of fall 2004.

Table 3.**Disposition of PCS Licenses and Associated Wireless Spectrum Won in the Initial D-, E-, and F-Block Auction (FCC Auction 11) as of Fall 2004**

	Number of Licences ^a	Share of Potential PCS Coverage ^b (Percent)	
		Licenses Activated After Auction 11	Block Total
Block D			
Licenses Activated After Auction 11			
Currently active	437	88.1	86.4
Canceled			
Installment payments not made on timely basis ^c	0	0	0
Undetermined from available data	1	0	0
Terminated			
Build-out requirements not met ^d	0	0	0
Undetermined from available data	3	0.1	0.1
Partitioned	51	11.8	11.6
Licenses Remaining Dormant After Auction 11			
Held by the FCC	0	n.a.	0
Contested in bankruptcy			
NextWave	3	n.a.	2.0
Airadigm and Urban Comm	<u>0</u>	<u>n.a.</u>	<u>0</u>
Total	495	100.0	100.0
Block E			
Licenses Activated After Auction 11			
Currently active	417	75.4	74.4
Canceled			
Installment payments not made on timely basis ^c	0	0	0
Undetermined from available data	2	0.2	0.2
Terminated			
Build-out requirements not met ^d	0	0	0
Undetermined from available data	9	0.2	0.2
Partitioned	59	24.1	23.8
Licenses Remaining Dormant After Auction 11			
Held by the FCC	5	n.a.	0.9
Contested in bankruptcy			
NextWave	2	n.a.	0.5
Airadigm and Urban Comm	<u>0</u>	<u>n.a.</u>	<u>0</u>
Total	494	100.0	100.0

Continued

Table 3.**Continued**

	Number of Licenses ^a	Share of Potential PCS Coverage ^b (Percent)	
		Licenses Activated After Auction 11	Block Total
Block F			
Licenses Activated After Auction 11			
Currently active	369	90.8	73.6
Canceled			
Installment payments not made on timely basis ^c	19	3.0	2.4
Undetermined from available data	15	0.9	0.8
Terminated			
Build-out requirements not met ^d	0	0	0
Undetermined from available data	8	0.6	0.5
Partitioned	34	4.7	3.8
Licenses Remaining Dormant After Auction 11			
Held by the FCC	2	n.a.	0.1
Contested in bankruptcy			
NextWave	27	n.a.	17.1
Airadigm and Urban Comm	<u>15</u>	<u>n.a.</u>	<u>1.7</u>
Total	489	100.0	100.0

Sources: Congressional Budget Office based on the Federal Communications Commission's Universal Licensing System database, available at wireless.fcc.gov/uls/, and Public Notices for FCC Auction 11, available at wireless.fcc.gov/auctions/.

Note: PCS = personal communications services; n.a. = not applicable.

- a. Several factors can cause the number of licenses in each frequency block to differ from the 493 originally offered at auction. First, because of license disaggregation, for any geographically defined PCS market there may be multiple licenses currently occupying the 10 megahertz initially conveyed by licenses from FCC Auction 11, and as a result, there may be more than 493 licenses in each frequency block. That does not, however, appear to be very common among Auction 11 licenses, perhaps because of their relatively narrow frequency range. Second, four licenses with apparently erroneous data records in frequency block F (that is, active or terminated licenses canceled for nonpayment) have been dropped, leaving the total below the original number of auctioned licenses.
- b. This paper defines the potential PCS coverage of a license as the product of a license's bandwidth multiplied by the population of the geographic area it covers (as measured by the 1990 census).
- c. See 47 C.F.R. 1.2110(g)(4)(iii)-(iv).
- d. See 47 C.F.R. 1.946(c) and 1.955(a)(2).

Table 4.**Disposition of PCS Licenses and Associated Wireless Spectrum Won in the First PCS Reauction (FCC Auction 22) as of Fall 2004**

	Number of Licenses ^a	Share of Potential PCS Coverage ^b (Percent)	
		Licenses Activated After Auction 22	All Licenses
Licenses Activated After Auction 22			
Currently Active	335	90.1	85.3
Canceled			
Installment payments not made on timely basis ^c	0	0	0
Undetermined from available data	0	0	0
Terminated			
Build-out requirements not met ^d	0	0	0
Undetermined from available data	0	0	0
Partitioned	19	9.9	9.4
Licenses Remaining Dormant After Auction 22			
Held by the FCC	45	n.a.	5.3
All Licenses After Auction 22			
Total Licenses	399	100.0	100.0

Source: Congressional Budget Office based on the Federal Communications Commission's Universal Licensing System database, available at wireless.fcc.gov/uls/, and Public Notices for FCC Auction 22, available at wireless.fcc.gov/auctions/.

Note: PCS = personal communications services; n.a. = not applicable.

- a. Because of license disaggregation, for any geographically defined PCS market there may be multiple licenses currently occupying the frequency range originally conveyed by the corresponding license reauctioned in FCC Auction 22. Hence, the sum of all licenses deriving from Auction 22 may be greater than the 341 licenses reauctioned in it in blocks C and F.
- b. This paper defines the potential PCS coverage of a license as the product of a license's bandwidth multiplied by the population of the geographic area it covers (as measured by the 1990 census).
- c. See 47 C.F.R. 1.2110(g)(4)(iii)-(iv).
- d. See 47 C.F.R. 1.946(c) and 1.955(a)(2).

Despite improvements over time by small firms in meeting the financial and operational requirements for retaining the licenses they won at auction, earlier difficulties—especially leading to dormancy of many licenses from Auctions 5, 10, and 11—delayed the use of a sizable amount of PCS spectrum for a number of years. The next section of this paper investigates the length of time during which those returned and contested licenses lay fallow and how that affected the economic efficiency and equity of those auction outcomes.

Reauction of Returned and Contested PCS Licenses from Auctions 5, 10, and 11

The amount of time required to reauction the dormant licenses from Auctions 5, 10, and 11 varied among licenses.³⁰ In Auction 22, which took place from March 23 to April 19, 1999, the FCC successfully reauctioned almost all of the licenses in the C block that were re-

30. FCC rules currently allow for allocating licenses of defaulted license winners to "the other highest bidders (in descending order)." See 47 C.F.R. 1.2209(b)-(c).

turned after Auction 10, which concluded on July 19, 1996. In contrast, PCS licenses from Auctions 5, 10, and 11 that were contested between the FCC and their winners in bankruptcy were finally put into the hands of new wireless providers more than eight years after those auctions. The extended dormancy of many of the licenses and much of the associated potential PCS coverage available in Auctions 5 and 10, and, to a lesser extent, in Auction 11 constitute a loss to society from having to forgo the benefits of the wireless services authorized by those licenses.

For example, all of the licenses—many of them disaggregated—that were returned to the FCC after Auction 10 were offered again in Auction 22 (see the second column of Table 5). Almost all of those licenses were successfully reaucted in Auction 22; only a few, representing 3 percent of potential PCS coverage in the C block, were held over by the FCC to Auction 35.

For contested licenses in frequency blocks C and F, however, the story is quite different. In January 2000, after several years of litigation, the FCC announced the reauction of contested licenses. Auction 35 was begun on December 12, 2000, and concluded on January 26, 2001. That reauction of contested licenses in Auction 35 was nullified, however, after the Supreme Court held that the FCC had violated section 525 of the Bankruptcy Code in canceling licenses held in bankruptcy by winning bidders in Auctions 5, 10, and 11. Finally, in 2004, the FCC reached an agreement with the most important owner of the contested licenses—NextWave Personal Communications—whereby NextWave would return 60 of its C-block licenses and two F-block licenses (out of 95 total) to the FCC to retire the company's outstanding debt obligations. Those licenses that the FCC was able to reclaim under that agreement were reaucted in Auction 58, which ran between January 26 and February 15, 2005. The potential PCS coverage that those licenses represent in the C and F frequency blocks amounts to 22.5 percent and 1.8 percent, respectively (see the fourth column of Table 5). NextWave was able to retain the remainder of the licenses that it won in Auctions 5, 10, and 11. It obtained the FCC's consent to sell some of those licenses to subsidiaries of Cingular Wireless for \$1.4 billion in spring 2004 (the FCC received \$714 million of those proceeds) and began the sale of the remaining licenses to Verizon Wireless for \$3 billion in fall 2004.³¹ The potential PCS coverage available from those Next-

Wave licenses accounts for 18.6 percent and 15.3 percent of the total available in frequency blocks C and F, respectively (see the last column of Table 5). The disposition of contested licenses returned to other bidders as a result of the Supreme Court's decision is unclear as of this writing.

Even after the Supreme Court's ruling returned the PCS licenses to NextWave in late January 2003, NextWave apparently maintained its networks only to the extent necessary to satisfy FCC requirements and did not provide phone or text messages or other types of data transfer.³² The lengthy delay before many PCS licenses (especially in frequency block C) were finally put into use severely compromised the efficiency of the early PCS auctions. Efficiency requires that society make the most of its endowments (such as natural resources and technology), given the demands for various goods and services that require the use of such capacity. Auctions 5, 10, and 11 together left dormant PCS licenses that, as a weighted average across frequency blocks C and F, accounted for more than 63 percent of potential PCS coverage from those two frequency blocks. That situation thereby imposed a large efficiency loss to society throughout the period prior to those licenses' reauction. Mobile wireless customers in markets where C- and F-block licenses were contested could obtain those new services from wireless providers that had previously won 30 megahertz licenses in frequency blocks A and B in Auction 4 or that won uncontested licenses at other PCS auctions. However, in any market where a license was contested, the supply of personal communications services was reduced and prices for those services probably higher than would have been the case if that spectrum had been in use.³³

31. See Federal Communications Commission, "In the Matter of Applications for Consent to the Assignment of Licenses Pursuant to Section 310(d) of the Communications Act from NextWave Personal Communications, Inc., Debtor-in-Possession, and NextWave Power Partners, Debtor-in-Possession, to subsidiaries of Cingular Wireless L.L.C.," *Memorandum Opinion and Order*, WT Docket No. 03-217, FCC 04-26 (released February 12, 2004); and Lousia Hearn, "Verizon Pays \$3bn for NextWave Spectrum," *Financial Times*, November 5, 2004.

32. See Christopher Stern, "There's Gold in That There Dead Air," *Washington Post*, September 2, 2004.

33. Forgone as well are tax revenues to the government from the wireless business that would have taken place under a contested license.

Table 5.

Share of Potential PCS Coverage in Frequency Blocks C and F from Returned or Contested Licenses Reauctioned in the First, Second, and Third PCS Reactions (FCC Auctions 22, 35, and 58)

	Share of Potential PCS Coverage ^a (Percent)				
	Original Auction ^b (1995–1996)	Auction 22 (1999)	Auction 35 ^c (2000–2001)	Auction 58 (2005)	Non-Auction Allocation ^d (2004–2005)
Block C					
Reclaimed by or Returned to the FCC	34.8	34.8	3.0	0.7	0
Contested in Bankruptcy					
NextWave	41.2	0	41.2	22.5	18.6
Airadigm and Urban Comm	<u>2.5</u>	<u>0</u>	<u>1.2</u>	<u>0</u>	<u>2.5</u>
Block Total	78.5	34.8	45.4	23.2	21.1
Block F					
Contested in Bankruptcy					
NextWave	17.1	0	17.1	1.8	15.3
Airadigm and Urban Comm	<u>1.7</u>	<u>0</u>	<u>1.7</u>	<u>0.0</u>	<u>1.7</u>
Block Total	18.8	0	18.8	1.8	17.0
Blocks C and F Combined^e					
Reclaimed by or Returned to the FCC	24.6	26.1	2.3	0.5	0
Contested in Bankruptcy					
NextWave	35.2	0	35.2	17.4	17.8
Airadigm and Urban Comm	<u>2.3</u>	<u>0</u>	<u>1.3</u>	<u>0</u>	<u>2.3</u>
Combined Total	62.1	26.1	38.8	17.9	20.1

Source: Congressional Budget Office based on the Federal Communications Commission's Universal Licensing System database, available at wireless.fcc.gov/uls/.

Note: PCS = personal communications services.

- This paper defines the potential PCS coverage of a license as the product of a license's bandwidth multiplied by the population of the geographic area it covers (as measured by the 1990 census).
- Auction 5 took place from December 18, 1995, to May 6, 1996; Auction 10 followed shortly thereafter (July 3 to July 16) as a reauction of 18 PCS licenses won by BDPCS, Inc., and National Telecom PCS, Inc.
- Auction 35 results for contested licenses were invalidated by the Supreme Court's holding in favor of NextWave Personal Communications.
- Licenses retained, sold, or transferred by their winners in bankruptcy. Includes, for example, NextWave Personal Communications' license sales to Cingular and Verizon.
- A weighted average of C-block and F-block shares of potential PCS coverage. There were 493 licenses (one for each geographic area of the United States and its territories) put up for auction in each block. C-block licenses originally conveyed 30 megahertz of wireless spectrum, while F-block licenses conveyed 10 megahertz. Hence, shares of potential PCS coverage from C-block licenses receive a weight of 0.75, while F-block licenses receive a weight of 0.25.

The efficiency loss brought about by dormant PCS licenses can be divided into demand and supply components, designated as consumer and producer surplus. Roughly defined, those reflect the consumption benefits (net of purchase price) and the revenues (net of cost) that could have been obtained by consumers and producers, respectively, had those licenses been put into operation after the auction. Quantifying either of those components with precision is very difficult, and such calculations are best treated as indicative rather than precise measures. However, using prices and quantities observed from actual transactions for wireless services, some estimates for consumer surplus losses as a result of license dormancy in the C block are quite large, approaching \$40 billion.³⁴

Additionally, many of the contested PCS licenses ended up in the hands of large wireless providers, especially when in 2004 and 2005, NextWave sold to Cingular and Verizon the licenses that it kept as part of its agreement with the FCC. So to the extent that “disseminating licenses among a wide variety of applicants” was the goal of the license set-asides, bidding credits, and installment payment plans that NextWave benefited from as a small bidder, those preferences did not, in the case of a sizable portion of contested licenses from Auctions 5, 10, and 11, serve their purpose.³⁵ The next section investigates the degree to which small bidders have transferred to larger entities the PCS licenses that they won through preferences.

Transfer of PCS Licenses from Small Bidders to Larger Entities

Bidders that win a PCS license through preferences—for example, set-asides or bidding credits—cannot sell or

transfer any part of that license for five years after it has been granted without paying a penalty, unless they do so to an entity that would also qualify for preferences at auction. By fall 2004, when the data for this study were obtained, most PCS licenses that had been put into operation after the close of their auction had been granted for at least five years. As a result, many small bidders that had won PCS licenses through preferences in the initial PCS auctions or the first PCS reauction were in a position to sell or transfer those licenses without penalty. And many appear to have done so. For licenses from the initial C-block auctions (FCC Auctions 5 and 10), 38.2 percent of potential PCS coverage from currently active, unpartitioned licenses assigned through those auctions has been sold or transferred from entrepreneurs to nonentrepreneurs. Over half of the total potential PCS coverage from licenses set aside for small bidders at the initial D-, E-, and F-block auction (FCC Auction 11) and well over 40 percent of the corresponding amount from the first PCS reauction have also been transferred from small bidders to larger entities.

The sale or transfer of a PCS license can take several forms and typically requires the FCC’s approval. When a license is acquired from an existing licensee by another entity, an application for “Assignment of Authorization” is submitted. When control of the entity holding a license changes hands, an application for “Transfer of Control” is submitted. In the latter case, for example, the name of a licensee need not change in the ULS database, even though control of the licensee and hence of the license it holds has changed hands. Assignments of authorization and transfers of control may also be pro forma, in the sense that actual control over the license or licensee, respectively, does not change.

This study identifies instances in which control (or ownership) of a license has moved from an entrepreneur to a nonentrepreneur by inspecting the application history of active, nonpartitioned licenses that were assigned through Auctions 5, 10, 11, and 22 and that are held by entities whose total holdings from the respective auction account for at least 1 percent of potential PCS coverage from such licenses. Those licensees account for most po-

34. See Thomas W. Athlete and Robert E Muñoz, *A Welfare Analysis of Spectrum Allocation Policies*, AEI-Brookings Joint Center for Regulatory Studies (Washington, D.C.: August 2004), p. 21. Those authors estimate that the loss in consumer surplus brought about by the dormancy of the 30 megahertz of spectrum nationwide from all C-block licenses between 1996 and 2003 is equal to \$39.2 billion (in 2004 dollars). That figure most likely overstates the actual loss in consumer surplus because the first C-block reauction (FCC Auction 22), which concluded in April 1999, put roughly one-third of the potential PCS coverage from licenses in the C block into the hands of viable PCS providers several years before the end point of the authors’ loss calculations (2003).

35. See 47 U.S.C. 309(j)(3)(B).

Table 6.

Concentration in Ownership of Currently Active, Unpartitioned PCS Licenses from the Initial C-Block Auctions (FCC Auctions 5 and 10)

	Number of Licenses	Share of Potential PCS Coverage ^a (Percent)	Entrepreneur Control?
At Auction Close			
GWI (MetroPCS)	15	40.6	Yes
Omnipoint	4	7.7	Yes
Carolina	27	6.8	Yes
DCR	11	6.7	Yes
PCS2000	7	5.6	Yes
ChaseTel	7	5.5	Yes
Indus	1	4.0	Yes
TriState	7	3.5	Yes
MercuryP	6	2.7	Yes
CookWest	10	2.2	Yes
RLV	2	1.3	Yes
Wire2000	4	1.3	Yes
BRK	9	1.2	Yes
PokaLam	5	1.1	Yes
Polycell	7	1.1	Yes
Total	122	91.2	

Continued

tential PCS coverage from currently active, nonpartitioned licenses.³⁶ By examining the entrepreneur status of the last entity that has obtained control of the licenses—groups of licenses won in a given auction are typically sold or transferred together—it is possible to determine whether an entrepreneur has retained ownership of them.³⁷

As of fall 2004, 38.2 percent of potential PCS coverage from currently active, unpartitioned licenses assigned through the initial C-block auctions (FCC Auctions 5

and 10) had been sold or transferred from entrepreneurs to non-entrepreneurs (see Table 6). Because currently active, unpartitioned licenses account for 17.6 percent of potential PCS coverage from all licenses assigned through Auctions 5 and 10 (see Table 2 on page 12), the extent of small-to-large-entity license transfers in terms of total potential PCS coverage is 6.7 percent (38.2 percent times 17.6 percent). However, that figure rises to 25.3 percent after adding the 18.6 percent of potential PCS coverage from the total available from C-block licenses that two large, non-entrepreneur wireless concerns—Cingular and Verizon—purchased from NextWave in 2004 and 2005 (see Table 5 on page 18).

36. Many currently active licenses have been disaggregated—that is, their initial spectrum bandwidth has been divided into segments. Hence, in the tables below, some PCS license winners appear to have won more licenses at auction than they actually did, only because the licenses they won have been disaggregated to create additional licenses. In the first PCS reaction (FCC Auction 22), for example, Leap Wireless International is credited with winning 60 licenses. It actually won 36, but those 36 have been disaggregated to create additional licenses of smaller spectrum bandwidth.

37. Some third-party corroboration of CBO's findings is available in Appendix B of Federal Communications Commission, "Comments of T-Mobile, Inc.," *In the Matter of Petition for Rulemaking or, Alternatively, a Waiver of the Closed Bidding Rules for C Block Licenses in the Broadband Personal Communications Services*, RM-11019, available at www.fcc.gov/DiversityFAC/auction58-proposal/comments/T-MobilePetitionReplyComments.pdf.

Table 6.

Continued

	Number of Licenses	Share of Potential PCS Coverage ^a (Percent)	Entrepreneur Control?
As of Fall 2004			
GWI (MetroPCS)	14	38.2	Yes
Cricket ^b	13	8.4	Yes
Omnipoint ^c	4	7.5	No
VoiceStream ^d	18	4.3	No
NewComm Wireless Services ^e	2	4.0	No
Wisconsin Acquisition Corporation ^f	1	4.0	No
CIVS IV License Sub 1, LLC ^g	4	3.8	No
Eliska Wireless Ventures ^h	7	3.5	No
Aircom PCS ⁱ	6	2.7	No
Triton PCS	11	2.5	No
Cascade Wireless	1	2.4	Yes
Cellco Partnership	9	2.3	No
TeleCorp Holding Corp. ⁱ	9	2.3	No
AT&T Wireless ⁱ	7	1.3	No
MetroPCS California/Florida	4	1.1	Yes
Total	110	88.2	

Source: Congressional Budget Office based on the Federal Communications Commission’s Universal Licensing System database, available at wireless.fcc.gov/uls/.

Note: PCS = personal communications services.

- a. This paper defines the potential PCS coverage of a license as the product of a license’s bandwidth multiplied by the population of the geographic area it covers (as measured by the 1990 census).
- b. Cricket is a wholly owned subsidiary of Leap Wireless International, which qualified as an entrepreneur bidder in Auction 22.
- c. Control of licenses transferred in 2002 to Deutsche Telecom.
- d. Merged with T-Mobile (owned by Deutsche Telecom) in 2001.
- e. Control of licenses transferred in 2002 to TEM PR, which is wholly owned by Telefónica Móviles, S.A., of Spain.
- f. Control of license transferred in 2002 to AT&T Wireless.
- g. Control of licenses transferred in 2002 to VoiceStream, which merged with T-Mobile (owned by Deutsche Telecom) in 2001.
- h. Licenses controlled by Deutsche Telecom.
- i. Control of licenses transferred from AT&T to Cingular in 2004.

Relative to all currently active unpartitioned licenses assigned through Auction 11 and Auction 22, the share of potential PCS coverage transferred from small to large entities is 59.8 percent and 49.7 percent. Multiplying each figure by the respective share of potential PCS coverage that currently active unpartitioned licenses account for relative to all licenses assigned in Auction 11 and Auc-

tion 22 (73.6 percent and 85.3 percent) results in total potential PCS transfer rates from small to large entities of 44.0 percent and 42.4 percent, respectively, for those two auctions. Again, however, the total for Auction 11 rises to 59.3 percent after adding the 15.3 percent of potential PCS coverage accounted for by NextWave’s sales of

Table 7.

Concentration in Ownership of Currently Active, Unpartitioned F-Block PCS Licenses from the Initial D-, E-, and F-Block Auction (FCC Auction 11)

	Number of Licenses	Share of Potential PCS Coverage ^a (Percent)	Entrepreneur Control?
At Auction Close			
NorthCoast	44	23.4	Yes
OPCSE	47	17.1	Yes
AerForce	5	10.8	Yes
Telecorp	7	5.7	Yes
Cook Inlet	7	4.5	Yes
Mercury	24	3.8	Yes
Devon	11	3.0	Yes
MercuryM	18	2.0	Yes
DCCPCS	6	2.0	Yes
AirGate	3	1.7	Yes
Oregon	1	1.3	Yes
PCSouth	12	1.3	Yes
Central	6	1.3	Yes
Radiofone	1	1.1	Yes
Alpine	8	1.1	Yes
Total	200	80.1	

Continued

F-block licenses to Cingular and Verizon in 2004 and 2005.³⁸

Entrepreneur license winners have frequently availed themselves of the option of selling or transferring their licenses to larger entities at the end of the obligatory five-year holding period (see Tables 6, 7, and 8)—and research to determine entrepreneur status indicates that some did so before then, paying unjust enrichment penalties as a result. Also, several licensees identified as entrepreneurs actually have sizable equity investments (as much as 85 percent, as allowed by FCC regulations) from larger wireless providers. That may be evidence of the importance of large-firm advantages in providing personal communications services because if larger firms were able

to operate most profitably in markets for mobile wireless communications, then putting control of PCS licenses in their hands could be financially advantageous both for themselves and for smaller licensees.³⁹ However, consumers and society in general would not be better off if such profitability came through a lack of competition among PCS providers. Additionally, there is also evidence that

38. Although the share of potential PCS coverage from licenses offered in Auctions 11 and 22 that has been transferred from small license winners to larger entities is relatively large compared with the corresponding share for Auctions 5 and 10 (6.7 percent), recall that many licenses assigned through Auctions 5 and 10 were reaucted in Auction 22.

39. For a discussion of large-firm advantages (or “scale economies”) in the provision of commercial mobile services, see Federal Communications Commission, *In the Matter of Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services*, WT Docket No. 04-111, FCC 04-216 (September 28, 2004), p. 46. Such scale economies are not, however, a new development: in drafting the legislation that requires the FCC to establish competitive bidding procedures that ensure that some small businesses win wireless licenses, the Congress nonetheless “recognize[d] that the characteristics of some services are inherently national in scope, and are therefore ill-suited for small business.” See House Committee on the Budget, *Report to Accompany H.R. 2264*, Report 103-111 (May 25, 1993), p. 103.

Table 7.**Continued**

	Number of Licenses	Share of Potential PCS Coverage ^a	Entrepreneur Control?
		(Percent)	
As of Fall 2004			
VoiceStream	62	29.4	No
Cellco Partnership	25	18.8	No
THC	5	5.6	Yes
Cricket ^b	12	4.9	Yes
Pacific Telesis Mobile ^c	1	2.5	No
Telecorp ^d	8	2.3	No
New Par ^e	15	2.3	No
CCPR Paging, Inc. ^f	2	1.9	No
Verizon	2	1.6	No
Cleveland Unlimited	1	1.6	Unknown
Cellular South	12	1.3	Yes
Buffalo-Lake Erie Wireless	6	1.3	Unknown
Royal Wireless	5	1.2	Yes
Alpine	8	1.1	Yes
AT&T Wireless	3	1.0	No
Cook Inlet	9	1.0	-- ^g
USCOS	<u>10</u>	<u>1.0</u>	Yes
Total	186	78.8	

Source: Congressional Budget Office based on the Federal Communications Commission's Universal Licensing System database, available at wireless.fcc.gov/uls/.

Note: PCS = personal communications services.

- a. This paper defines the potential PCS coverage of a license as the product of a license's bandwidth multiplied by the population of the geographic area it covers (as measured by the 1990 census).
- b. Cricket is a wholly owned subsidiary of Leap Wireless International, which qualified as an entrepreneur bidder in Auction 22.
- c. License controlled by Cingular.
- d. Control of licenses transferred from AT&T to Cingular in 2004.
- e. Licenses controlled by Cellco and Verizon.
- f. Licenses controlled by Cingular.
- g. Although Cook Inlet qualifies as an entrepreneur, in 2002 it transferred control of six of the nine licenses listed to VoiceStream, which merged with T-Mobile (owned by Deutsche Telecom) in 2001.

Table 8.**Concentration in Ownership of Currently Active, Unpartitioned C-Block PCS Licenses from the First PCS Reauction (FCC Auction 22)**

	Number of Licenses	Share of Potential PCS Coverage ^a (Percent)	Entrepreneur Control?
At Auction Close			
OPCS Three	34	22.3	Yes
Cook Inlet	24	16.6	Yes
ABC Wireless	66	11.4	Yes
Leap Wireless International	60	11.3	Yes
BCN Communications	3	4.3	Yes
Beta Communications	6	3.8	Yes
American Wireless	10	3.2	Yes
Viper Wireless	5	2.9	Yes
Zuma PCS	7	1.8	Yes
OPM Auction Co.	6	1.7	Yes
ConnectBid	2	1.5	Yes
Telepak	2	1.3	Yes
Highland Cellular	4	1.3	Yes
Eliska Wireless	2	1.1	Yes
Conestoga Wireless	5	1.0	Yes
CFW Communications	6	1.0	Yes
Alpine PCS	1	1.0	Yes
Entertainment Unlimited	<u>2</u>	<u>1.0</u>	Yes
Total	245	88.7	

Continued

small PCS providers have been well suited to operate in some rural markets.⁴⁰

Estimating Revenues Forgone to the Government from Small-Bidder Preferences

The Federal Communications Commission has offered preferences to small bidders in all but one of its auctions of licenses for personal communications services (there were no such preferences offered in the first PCS auction, FCC Auction 4). Because the intent of those preferences is to enable small concerns to obtain licenses at auction when they otherwise could not, auction preferences may

have allowed some PCS licenses to be won at less than market prices. However, it is not clear that auction preferences necessarily produce revenue losses for the government. For example, offering preferences to small bidders may, in some instances, result in greater competition for licenses, pushing up winning bids beyond what larger bidders would otherwise have been required to pay.

Alternatively, if small bidders can eventually resell a license to a larger entity at a market-determined price—even after a delay, say, of five years—then competition among bidders that enjoy license set-asides or bidding credits can result in winning bids that exceed the bids of larger entities competing for the same license by roughly the value of those preferences. The small bidders would thereby “bid away” the value of their preferences, and those preferences would not have an impact on auction receipts to the government (that is, they would be “reve-

40. See Matt Richtel, “Where Only the Antelope Roam,” *New York Times*, November 6, 2004.

Table 8.

Continued

	Number of Licenses	Share of Potential PCS Coverage ^a (Percent)	Entrepreneur Control?
As of Fall 2004			
VoiceStream	49	36.7	No
Cricket ^b	49	12.5	Yes
BCN Communications ^c	3	4.3	No
ABC Wireless	22	3.5	Yes
Telecorp	7	3.1	Yes
Tritel ^d	11	2.3	No
AWS License Newco	2	2.3	No
Lone Star Wireless	2	2.3	Yes
D&E/Omnipoint Joint Venture ^e	3	2.0	No
Cellular South	2	1.3	Yes
Highland Cellular Holdings	4	1.3	Yes
Key Communications	4	1.3	Yes
Von Donop Inlet PCS	8	1.2	Yes
Coral Wireless	1	1.1	Yes
Powertel Knoxville ^f	2	1.1	No
Keystone Wireless	5	1.0	Unknown
Southwestern Bell	2	1.0	No
NTELOS	6	1.0	Yes
Alpine-Fresno	1	1.0	Yes
Entertainment Unlimited	<u>2</u>	<u>1.0</u>	Yes
Total	185	81.3	

Source: Congressional Budget Office based on the Federal Communications Commission’s Universal Licensing System database, available at wireless.fcc.gov/uls/.

Note: PCS = personal communications services.

- a. This paper defines the potential PCS coverage of a license as the product of a license’s bandwidth multiplied by the population of the geographic area it covers (as measured by the 1990 census).
- b. Cricket is a wholly owned subsidiary of Leap Wireless International, which qualified as an entrepreneur bidder in Auction 22.
- c. Control of licenses transferred in 2002 to VoiceStream, which merged with T-Mobile (owned by Deutsche Telecom) in 2001.
- d. Control of licenses transferred from AT&T to Cingular in 2004.
- e. Control of licenses transferred in 2002 to Deutsche Telecom.
- f. Licenses controlled by Deutsche Telecom.

nue neutral”). Indeed, if bidders that receive preferences rely mainly on larger entities for their financing—recall that the FCC allows up to 85 percent of a small bidder’s equity to be provided by other concerns, as long as that equity participation satisfies certain conditions—then bidding credits could basically be superfluous.

This analysis examines how much it costs the government to offer preferences to small bidders in its PCS spectrum auctions by comparing the winning bids of small bidders that benefit from preferences with the winning bids of larger entities for the same type of license.

In Auction 11, small bidders paid—net of bidding credits and after incorporating a range of estimates of the value of government-financed installment payment plans—on average between 31 percent and 61 percent less (per unit of potential PCS coverage) for licenses set aside for them than did bidders that won comparable licenses in open bidding. In subsequent auctions, installment payment plans were discontinued and the number of set-aside licenses varied, largely according to the population of the market for which a license authorized service. In Auction 35, winning bids on set-aside licenses were between 14 percent and 15 percent less, depending upon market population, than what was paid for comparable licenses won in open bidding. The estimated impact of license set-asides on the average level of winning bids in Auction 58 is very different: license set-asides appear to have had virtually no impact on average, and for some populous markets, winners of set-aside licenses actually paid more.

In both Auctions 35 and 58, small bidders eligible for bidding credits placed winning bids that were 20 percent and 19 percent less, respectively (per unit of potential PCS coverage) than the next-highest bid of bidders that did not qualify for bidding credits. However, among all C- and F-block licenses available in open bidding at those auctions, that outcome was not common. In terms of total net auction receipts, bidding credits reduced revenues by a bit over 2 percent, on average, in affected auctions.

With the exception of license set-asides in Auction 58, small bidders appear to have used auction preferences to pay less than they otherwise would have in competition with larger bidders. Those results do not support a hypothesis of revenue neutrality from auction preferences. However, the diversity of estimates across Auctions 11, 35, and 58 and the different circumstances surrounding each auction make it difficult to reach a general conclu-

sion about the extent to which preferences reduced auction receipts. The relative demand for and supply of licenses, the degree to which entrepreneurs and designated entities that benefit from preferences also receive financing from larger concerns, the extent of cooperation or rivalry between particular bidders, and other factors are likely to determine whether auction preferences reduce government revenues, and if they do, by how much.

Not all PCS auctions in which preferences have played a role allow for comparisons of winning bids between small bidders eligible for preferences at auction and other bidders. For example, the initial C-block auctions (FCC Auctions 5 and 10) and the first PCS reaction (FCC Auction 22) were basically restricted to entrepreneur bidders.⁴¹ By comparison, both small and large bidders could take part in the initial D-, E-, and F-block auction (FCC Auction 11) and the second and third PCS reactions (FCC Auctions 35 and 58), with open and closed bidding taking place simultaneously on distinct—but comparable—licenses for wireless personal communications services in the same market. Qualified small bidders (designated entities) could also avail themselves of bidding credits at those auctions.

In making such comparisons, several potential qualifications need to be kept in mind. First, using the difference in winning bids of small and large concerns to infer lost auction receipts is tantamount to concluding that the winning bids of large concerns are equal to the amount that the government would have received for the licenses won by small bidders without preferences. Typically,

41. In principle, one could compare the winning bids by small bidders for C-block licenses in Auctions 5 and 10 with the winning bids for comparable licenses in frequency blocks A and B in Auction 4, which directly preceded Auctions 5 and 10 and which was available to qualified bidders of any size. However, such comparisons are difficult to make because most of the winning bids in Auction 5 were not viable. As a result, auction receipts due to the government at the conclusion of Auctions 5 and 10 overstate actual receipts. Also, because of differences in how markets were defined geographically in those auctions, licenses are not directly comparable. In Auction 4, licenses were available for 51 major trading areas (MTAs); in Auctions 5 and 10, licenses were available for 493 basic trading areas. Hence, to compare licenses across auctions, the licenses available in Auctions 5 and 10 would have to be aggregated to the MTA level. And lack of comparability could be a problem even then because bidding strategies and the level of winning bids could vary depending upon whether a handful of MTA licenses or numerous BTA licenses needed to be won at auction to establish a wireless network of the same size.

however, analysts assume that when the supply of a good is increased—in this case, when bidding on set-aside licenses is opened up to large bidders—then the price of that good will decline (in other words, the average price that large bidders pay after purchasing the additional licenses newly available to them will fall). Consequently, an estimate of the lost revenues to the government based on bid differences between entrepreneurs and nonentrepreneurs would represent an upper-bound estimate of the actual losses.

In contrast, auction preferences may also have a revenue-boosting effect on government receipts. That would be especially true when there was little competition between bidders that valued the licenses most highly and when the government could distinguish between groups of high- and low-valuation bidders. For example, by reducing the number of licenses available to high-valuation bidders when competition among them was weak, set-asides could force higher bids from that group that would more than offset the loss in revenues to the government from lower bids on the set-aside licenses. Offering bidding credits to small bidders in open bidding may in some instances result in greater competition for licenses, pushing up winning bids beyond what larger bidders would otherwise have been required to pay.⁴² Using differences in the winning bids on set-aside versus other licenses to infer the lost receipts to the government from its small-bidder preference scheme would not capture the potential revenue-boosting effects just described because it would miss the counterfactual outcome without preferences.

Finally, estimates of the impact of preferences may not always be comparable across PCS auctions. For example, because bidding credits in Auction 11 were applicable only to licenses won in closed bidding, the impact of license set-asides and bidding credits are lumped together in comparisons of winning bids between small and other bidders.⁴³ Several other aspects of Auction 11 also distinguish it from Auctions 35 and 58 in ways that could in-

fluence comparisons of the average bids of small bidders and large license winners.

First, just over eight years separate the close of Auction 11 (January 1997) and the close of Auction 58 (February 2005). At the close of Auction 11, PCS markets were still emerging; at the close of Auction 58, they were well established. Hence, the willingness of bidders to pay, and the difference in the bids of small and large firms, might differ in comparisons of the two auctions.

Second, Auction 11 made available a sufficient number of PCS licenses in each of three frequency blocks (D, E, and F) to authorize wireless coverage across the entire United States and its territories. In contrast, in Auctions 35 and 58, licenses were available only on a scattered basis geographically (although Auction 35 offered licenses in major metropolitan areas). The prospect of offering personal communications services nationwide is considered to be an important competitive advantage for those wireless providers capable of building out and operating large networks. Because all licenses in block F were set aside for bidding by small bidders in Auction 11, larger bidders may have effectively faced limits on the number of licenses they could win at auction relative to the number they required to establish wireless networks of a size they desired. Hence, winning bids by larger firms in Auction 11 may understate the amount those bidders would have paid had there been no set-asides at that auction.⁴⁴

Third, and in contrast to the previous factor, is the possibility of collusion among larger bidders in Auction 11;

42. For the positive impact of preferences on government receipts from a narrowband auction that preceded the PCS auctions, see Ian Ayres and Peter Cramton, "Deficit Reduction Through Diversity: How Affirmative Action at the FCC Increased Auction Competition," *Stanford Law Review*, vol. 48 (1996), pp. 761-815. In particular, the authors attribute the rise in auction receipts, moving from the national to regional narrowband PCS auctions, to stronger competition for regional narrowband licenses brought about by the higher bidding credits offered to smaller bidders at that auction.

43. Further, entrepreneur bidders in Auction 11 were able to take advantage of installment payments at subsidized rates of interest to pay off their winning bids, so the impacts of license set-asides, bidding credits, and subsidized lines of credit are all intermingled in comparisons of winning bids between small and large bidders in that auction.

44. For example, as part of an exchange of spectrum with Nextel, the FCC increased from \$1.62 to \$1.70 (per unit of potential PCS) the value of spectrum at issue to reflect the benefits to a wireless mobile communications provider of having a sufficient number of licenses to be able to provide nationwide service. That estimate would have been larger if a large share of providers had not obtained a sufficient number of licenses to be able to provide service nationwide. See Federal Communications Commission, *In the Matter of Improving Public Safety Communications in the 80 MHz Band*, WT Docket No. 02-55, FCC 04-168 (August 6, 2004), p. 144.

Table 9.**Comparison of Winning Bids for Comparable Licenses in FCC Auction 11**

(Dollars)

	Average Winning Bid ^a
Without Adjustment for Financing Subsidy in Closed Bidding ^b	
Open bidding	0.36
Closed bidding	0.25
Difference	0.11
With 20 Percent Adjustment for Financing Subsidy in Closed Bidding ^b	
Open bidding	0.36
Closed bidding	0.20
Difference	0.17
With 40 Percent Adjustment for Financing Subsidy in Closed Bidding ^b	
Open bidding	0.36
Closed bidding	0.15
Difference	0.22

Source: Congressional Budget Office using data on winning bids in FCC Auction 11 from wireless.fcc.gov/auctions/11/charts/11market.xls and 1990 population data to weight winning bids from wireless.fcc.gov/auctions/data/maps/cntysv2000_census.xls, worksheet "BTA."

Notes: PCS = personal communications services.

In FCC Auction 11, open bidding (in which all auction participants could bid) was used to auction licenses in frequency blocks D and E, while closed bidding (in which only qualified small bidders could participate) was used to auction licenses in frequency block F. The difference between average winning bids for licenses in frequency blocks D and E was \$0.01.

Comparison of average winning bids is based on 449 markets, rather than the 493 markets for which licenses were available. Markets are omitted from calculations if licenses were won there by bidders that subsequently contested them in bankruptcy (that is, by either Airadigm, NextWave Personal Communications, or Urban Comm).

- a. Winning bids are expressed per unit of potential PCS coverage (which is defined as the product of a license's bandwidth multiplied by the population of the geographic area it covers) and are net of bidding credits. In calculating average differences, each winning bid is weighted by the share of potential PCS coverage accounted for by the corresponding license, relative to the total available from all licenses used in calculations.
- b. To pay off their winning bids, license winners in closed bidding in FCC Auction 11 enjoyed a financing subsidy from the federal government in the form of loans at below-market rates of interest; that subsidy was in addition to the government-subsidized bidding that took the form of bidding credits. Because of the financing subsidy, small bidders were able to bid more for F-block licenses than they could have if they had been forced to obtain funds in private capital markets. However, in contrast to bidding credits, the amount of the financing subsidy could not be directly observed. Hence, to capture fully the impact of small-bidder preferences in FCC Auction 11, winning bids in closed bidding were reduced by a fraction that reflects a range of estimates (either 20 percent or 40 percent) of the value of the financing subsidy to small bidders (see Congressional Budget Office, *Where Do We Go from Here? The FCC Auctions and the Future of Radio Spectrum Management* (April 1997), Box 1.

any such anticompetitive behavior may have reduced the level of winning bids by larger firms.⁴⁵

45. Peter Cramton and Jesse A. Schwartz, "Collusive Bidding in the FCC Spectrum Auctions," *Contributions to Economic Analysis and Policy*, vol.1, no.1 (2002).

Auction 11

In the FCC's Auction 11, a 10 megahertz license was available in frequency blocks D, E, and F for each of 493 geographical areas. Hence, Auction 11 put on the market 1,479 PCS licenses of 10 megahertz, which were awarded simultaneously through a single, multiple-round auction. Licenses in frequency blocks D and E were offered in

open bidding, while licenses available in frequency block F were set aside for entrepreneurs in closed bidding. To pay for the licenses they won in frequency block F, entrepreneurs could take advantage of installment payments at a subsidized rate of interest.⁴⁶ That interest rate varied by size of entrepreneur and was basically the rate of interest at which the federal government was able to borrow plus in some cases a modest premium, which according to most observers fell considerably short of what private lenders would have charged such small bidders. Qualified small bidders (designated entities) also received bidding credits for F-block licenses.

Licenses in any of the three frequency blocks (D, E, and F) appear to be identical with respect to a given geographic area, in the sense that they convey the same amount of wireless spectrum bandwidth.⁴⁷ Consequently, a direct way of determining whether preferences allowed small bidders to pay less for the licenses they won than larger bidders paid would be to compare the difference between winning bids in open bidding (that is, for licenses in frequency blocks D and E) and winning bids in the closed bidding for F-block licenses.

Per unit of potential PCS coverage, the average winning bids on licenses in open bidding exceeded the average winning bid in closed bidding by \$0.11 (see Table 9). That estimated shortfall in the winning bids for set-aside F-block licenses represents roughly 31 percent of the average winning bid in open bidding for licenses in blocks D and E. However, in making that comparison, it should be kept in mind that in addition to the licenses set aside for them in block F, entrepreneur bidders won 155 licenses in open bidding. Thirteen entrepreneurs won 29 licenses in blocks D and E without winning an F-block license. Indeed, a higher portion of nonentrepreneur bidders came away from Auction 11 without a license (37 percent) than did entrepreneurs (11 percent).

To obtain a complete estimate of the revenue forgone to the government from its small-bidder preferences, winning-bid differences between small and large bidders must take into account the financing subsidy from the installment payment available to winners of set-aside li-

censes. That subsidy allowed bidders to place higher bids than they could otherwise have afforded. In particular, because the installment payment program offered to entrepreneurs spread winning-bid payments out over 10 years—five years longer than the holding date necessary for an entrepreneur to sell or transfer a license without penalty—small bidders for set-aside licenses may have had an incentive to “bid away” some of the value of that set-aside in anticipation of recouping that portion of the bid upon resale to a larger firm.

According to the Federal Credit Reform Act of 1990 (FCRA), the cost to the government of any financial subsidy should be limited to direct interest rate subsidies plus the expected loss in the event that winning bidders default on their loan obligations and the government must reacquire those licenses. Entrepreneurs in Auction 11 had to pay at least the government borrowing rate on their winning F-block license bids, so there was no direct interest subsidy. The U.S. government borrows at a risk-free rate, however, which does not reflect the cost of potential entrepreneur default.⁴⁸ The benefit to entrepreneurs of government-subsidized installment payments should be greater than estimates under FCRA of the government’s cost of providing that financing. If small bidders were to finance their winning bids on private financial markets, they would have to compensate the lender not just for the expected loss upon default but also for the cost that the lender incurs from holding capital (or securing additional lines of credit) to accommodate deviations of actual default losses from the value expected for them.

Assuming a 20 percent financing subsidy raises the amount by which winning bids on licenses in open bidding exceed those on F-block licenses to \$0.17 (per unit of potential PCS coverage). Assuming a 40 percent financing subsidy raises the corresponding excess winning-bid amount to \$0.22. Those figures represent 47 percent and 61 percent, respectively, of the value of the average winning bid on licenses available in open bidding.⁴⁹

46. See 47 C.F.R. 24.716.

47. The mean difference (per unit of potential PCS authorized by each license) in the value of winning bids by geographic area for the D- and E-block licenses available to all bidders is approximately zero.

48. Although some F-block license winners were charged an interest premium in addition to the risk-free government borrowing rate on their installment loans, it is still likely that their borrowing costs were less than those they would have paid in private financial markets.

49. See Congressional Budget Office, *Where Do We Go from Here? The FCC Auctions and the Future of Radio Spectrum Management* (April 1997), Box 1.

Table 10.**Comparison of Winning Bids for Comparable Licenses in FCC Auctions 35 and 58**

	All Market Pairs		Excluding New York City	
	Number of Markets	Average Winning Bid ^a (Dollars)	Number of Markets	Average Winning Bid ^a (Dollars)
Auction 35				
Tier 1 Markets				
Open bidding	9	6.25	8	3.81
Closed bidding	9	4.89	8	3.29
Difference		1.36		0.52
Tier 2 Markets				
Open bidding	75	2.75	n.a.	n.a.
Closed bidding	75	2.32	n.a.	n.a.
Difference		0.43		n.a.
Auction 58				
Tier 1 Markets				
Open bidding	4	1.14	n.a.	n.a.
Closed bidding	4	1.32	n.a.	n.a.
Difference		-0.18		n.a.
Tier 2 Markets				
Open bidding	52	0.72	n.a.	n.a.
Closed bidding	52	0.72	n.a.	n.a.
Difference		0	n.a.	n.a.

Source: Congressional Budget Office using data on winning bids in FCC Auctions 35 and 58 from wireless.fcc.gov/auctions/35/charts/35market.xls and wireless.fcc.gov/auctions/58/charts/58market.xls, respectively, and 1990 population data used to weight winning bids from wireless.fcc.gov/auctions/data/maps/cntysv2000_census.xls, worksheet "BTA."

Note: PCS = personal communications services; n.a. = not applicable.

- a. Winning bids are expressed per unit of potential PCS coverage (which is defined as the product of a license's bandwidth multiplied by the population of the geographic area it covers) and are net of bidding credits. In calculating average differences, each winning bid is weighted by the share of potential PCS coverage accounted for by the corresponding license, relative to the total available from all licenses used in winning-bid comparisons in each market tier.

Auctions 35 and 58

A smaller number of licenses were offered in FCC Auctions 35 and 58 than in Auction 11; however, those later auctions do allow the impact of license set-asides and bidding credits to be calculated separately. For example, Auction 35 put on the market a total of 422 licenses. However, only 355 of those licenses, in 140 markets, were in frequency block C and thus potentially set aside for small bidders. Further, there were only 84 markets in Auction 35 in which open and closed bidding took place simultaneously and where, as a consequence, winning-bid comparisons could be made—a much smaller number than in

Auction 11 (which, after excluding markets where won licenses were subsequently contested, had 449). For similar reasons, although Auction 58 put on the market 242 licenses, there were only 56 markets that allowed for a comparison of winning bids between open and closed bidding.

License Set-Asides. In Auctions 35 and 58, only licenses in frequency block C were potentially set aside for small bidders. The number of licenses available in open and closed bidding also depended upon the population of the market for which a license authorized service. For exam-

ple, where three licenses were available, markets with 2.5 million or more in population (Tier 1 markets) generally had two licenses available in open bidding and one license available in closed bidding. For markets with smaller populations (Tier 2 markets), the license allocation between open and closed bidding was reversed.⁵⁰

In Auction 35, the average winning bid on a PCS license available in closed bidding for a Tier 1 market was \$1.36 less (per unit of potential PCS conveyed by the license) than on a license available in open bidding (see Table 10). However, after excluding New York City from that calculation—winning bids in that market were exceptionally high at Auction 35 owing to unusually strong competition among a handful of bidders for PCS licenses there—that difference falls to \$0.52, representing approximately 14 percent of the value of the average winning bid in open bidding for a license in those markets. The corresponding differential for Tier 2 markets in Auction 35 is was \$0.42, or 15 percent of the average winning bid in open bidding.

In contrast, the estimated impact of license set-asides on the level of winning bids in Auction 58 was very different from that in Auction 35. The average winning bid on a license available in closed bidding for a Tier 1 market was actually \$0.18 higher (per unit of potential PCS coverage) than on a license available in open bidding for the same market. The corresponding winning-bid differential between open and closed bidding for licenses in Tier 2 markets in Auction 35 was approximately zero (\$0.01). Part of the surprising outcome for Tier 1 winning bids was probably the result of there being only four Tier 1 markets that allow for comparisons of winning bids between open and closed bidding. Such a small number of data points may allow idiosyncratic influences—such as the particular composition of the group competing in either open or closed bidding—that are peculiar to only a few markets to have a large influence on the average.

In the competition for licenses in the four Tier 1 markets at Auction 58 that featured both open and closed bid-

ding, one bidder—Cook Inlet, an entrepreneur affiliated with the large wireless provider VoiceStream—often exerted strong upward pressure on license prices in closed bidding in particular. Whether Cook Inlet was the highest or next-highest bidder in those cases and whether it actually ended up winning a license for the same market in open bidding, the winning bids on set-aside licenses that resulted far exceeded most of the corresponding winning bids in open bidding (and on several occasions worked to the detriment of one particular entrepreneur competitor, Vista PCS).

Bidding Credits. In Auctions 35 and 58, bidding credits were offered exclusively in open bidding on C- and F-block licenses. Hence, an estimate of the impact of bidding credits on receipts from those auctions can be obtained by comparing the winning bids—net of bidding credits—of small bidders in open bidding with the next-highest bids on the same licenses by bidders that were not eligible to receive bidding credits.

In Auction 35, small bidders eligible for bidding credits placed winning bids that were on average \$0.83 less (per unit of potential PCS coverage) than the bid of the next-highest bidder that was not eligible for bidding credits (see Table 11). In Auction 58, the corresponding figure was \$0.20. Those estimates account for 20 percent and 19 percent, respectively, of the average next-highest bid of bidders that did not qualify for bidding credits (\$4.12 and \$1.05, respectively).

Among all C- and F-block licenses available in open bidding at those auctions (there were 250 and 65 such licenses in Auctions 35 and 58), the outcome in which a small bidder used bidding credits to outbid a larger competitor was not common. When weighted by their share of potential PCS coverage from all C- and F-block licenses available in open bidding (approximately 18 percent and 24 percent, respectively), bidding credits in Auctions 35 and 58 resulted in winning bids that averaged \$0.15 and \$0.05 less, per unit of potential PCS coverage, than the average value of the next-highest bid by bidders not eligible for bidding credits. In terms of total net auction receipts, bidding credits reduced revenues by about 2 percent: \$345.8 million in Auction 35 (relative to total net auction receipts of \$16.9 billion) and \$47.7 million in Auction 58 (relative to total net auction receipts of \$2 billion).

50. Whether a particular license or set of licenses was offered in open or closed bidding within each tier depended upon a license's allocated frequency band within the C block. Also, all C-block licenses that had not been won by any bidder at earlier FCC auctions were offered in open bidding. As a result, licenses for some markets in Auctions 35 and 58 might be offered entirely in open or closed bidding.

Table 11.

Impact of Bidding Credits on Winning-Bid Differences in Open Bidding in FCC Auctions 35 and 58

	Number of Licenses	Share of Potential PCS Coverage ^a (Percent)	Average Winning Bid ^b (Dollars)	Average Next-Highest Bid ^b (Dollars)	Average Difference ^b (Dollars)
Auction 35	35	18	3.29	4.12	-0.83
Auction 58	19	24	0.85	1.05	-0.20

Source: Congressional Budget Office using data on winning bids in FCC Auctions 35 and 58 from wireless.fcc.gov/auctions/35/charts/35market.xls and wireless.fcc.gov/auctions/58/charts/58market.xls, respectively, and 1990 population data to weight winning bids from wireless.fcc.gov/auctions/data/maps/cntysv2000_census.xls, worksheet "BTA."

Notes: Bidding credits in FCC Auctions 35 and 58 were applicable to open bidding on licenses in frequency blocks C and F.

PCS = personal communications services.

- Share of total potential PCS coverage (which is defined as the product of a license's bandwidth multiplied by the population of the geographic area it covers) from all licenses offered in open bidding in frequency blocks C and F.
- Winning bids are expressed per unit of potential PCS coverage and are net of any bidding credits. In calculating average differences, each winning bid is weighted by the share of potential PCS coverage accounted for by the corresponding license, relative to the total available from all licenses used in calculations for each auction.

The data from Auction 35 also suggest that bidding credits might have contributed to more competitive bidding in Auction 35: 40 percent of licenses to which bidding credits could be applied were won by a bidder that did not qualify for bidding credits, with the next-highest bid being placed by a bidder that did qualify for bidding credits. However, many of those bidders that qualified for bidding credits also received substantial financial backing from larger wireless firms.⁵¹

With the exception of license set-asides in Auction 58, small bidders appear to have used auction preferences to pay less than they otherwise would have in competition with larger bidders.

51. See John Rockhold, "Auction Masquerade—Government Activity," *Wireless Review*, February 1, 2001.