

FAQs about Ascending Auctions with Package Bidding

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What is “package bidding”?

Package bidding allows bidders to make a single bid for a whole group of licenses—a “package.” For example, if a bidder in the 700 MHz auction is interested in acquiring 20 MHz of spectrum that covers the entire United States, it can place a single bid for that particular package of licenses. While packages could also be assembled in the old auction format—through individual license bids—packages have much greater bite in the new format since they are now *all-or-nothing* bids.

Package auctions are also sometimes referred to as “combinatorial auctions.” The two terms are synonymous.

Why did the FCC change the rules to allow package bidding?

The FCC had been mandated by Congress to experiment with package bidding. It commissioned a series of reports studying the feasibility of package bidding, tested recommendations using laboratory experiments, and conducted an academic conference on the topic.

The main economic motivation for the change lies in its potential to eliminate the “exposure problem” faced by bidders in the *simultaneous multiple round* (SMR) auction. By permitting bidders to bid for precisely what they want, the package auction limits the bidders’ risk and encourages aggressive bidding.

What is the “exposure problem”?

The problem is best explained using an example. Suppose a company wants to become a new competitor in the mobile telephone market, but perceives that there are tremendous economies of scope in establishing a ubiquitous system in the United States. It decides to try to acquire 20 MHz of spectrum covering the entire United States and would be willing to pay a premium to acquire the whole package. In an SMR (simultaneous multiple round) auction, as prices rise to high levels, the company has a tough decision to make. If it continues to bid aggressively, hoping to justify its high bids by acquiring nationwide coverage, it is “exposed” to the risk that it may acquire just a few of the licenses it wants. Without complete nationwide coverage, those few licenses are not worth the high prices it has bid.

From an economic perspective, the exposure problem can lead to inefficient license assignments in two different ways. First, a bidder who decides to bid aggressively may acquire unwanted licenses. Second, a bidder who decides not to take the risk may fail to acquire licenses for which it actually has the highest valued use. In each case, the assignment is inefficient because licenses are not put to their best use.

Is there any evidence that the exposure problem is a serious one or that package bidding solves it?

The auction conducted in the Netherlands in February 1998 is a case study in how the exposure problem can affect outcomes. The band plan in that auction created two 15 MHz spectrum licenses and sixteen smaller licenses, involving about 2.5 MHz of bandwidth each. Compared to the larger licenses, the smaller ones sold for less than one-half the price per MHz. The last bidder for a large

license was eligible to try to assemble a collection of smaller licenses to support its entry, but declined to attempt that, despite the much lower prices per MHz of the smaller licenses.

The evidence that package bidding solves the problem comes entirely from laboratory experiments, mostly using student bidders. In the experiments commissioned by the FCC, focusing on the experimental treatment in which the exposure problem was most serious, a package auction achieved license assignments that were more than 95% efficient, while the simultaneous multiple round auction achieved efficiency of only about 80%. The extent to which these conclusions can be extrapolated from the laboratory to bidding for real spectrum licenses is a matter of continuing controversy.

Since the rules of the package auction continue to permit individual license bids, isn't this really just a minor refinement of the old simultaneous multiple round rules?

No, the differences between the auction rules are deep and fundamental.

Two of the most obvious changes are that the winning bid on an individual license may not be the highest bid on that license and that the provisionally winning bid on a license can go up and down during the course of the auction. These changes affect even bidders who plan not to exercise the new options of making package bids or making bids across rounds mutually exclusive.

The next most obvious change is for bidders who would otherwise face an exposure problem. Those bidders can now bid aggressively without the fear that they may be stuck with an unwanted collection of licenses at high prices.

Also important are the strategic changes. The concept of “straightforward bidding” takes on a different meaning than it had in the simultaneous multiple round auction. The strategies of *demand reduction* and *budget stretching* are likely to be much less effective in the new rules than in the simultaneous multiple round auction. Finally, certain other strategies are likely to become more effective.

How is the notion of straightforward bidding changed by these new auction rules?

“*Straightforward bidding*” means bidding as if one’s current bids in the auction are going to set the final prices. In the simultaneous multiple round auction, that means bidding for precisely the licenses one would want at the current minimum bids but refraining from bidding on licenses for which one already owns the standing high bids.

If we ignore the limit on packages, *straightforward bidding* in the new auction design would mean bidding for the package(s) one would most want to buy at the current minimum bids (and refraining from bidding if one has a tentative winning bid on a more profitable package).

Part of the theoretical appeal of the simultaneous multiple round auction is that if all bidders bid straightforwardly and if the licenses are mutual substitutes, then the allocation that emerges from the auction will be nearly efficient. The new auction has a similar appeal. Ignoring the package limitation and certain details of the minimum bid calculation, the package auction has the property that if all bidders bid straightforwardly, then the allocation that emerges from the auction will be nearly efficient.

Is straightforward bidding a viable strategy?

Just as for the simultaneous multiple round auction, the answer varies for different bidders. The best strategy for a bidder in any spectrum auction depends on (i) what it wants to acquire, (ii) its assessment of its competitors, and (iii) the strategies that the auction rules make possible.

In the simultaneous multiple round auctions, the competitive environment has often been one with some small bidders seeking to acquire a few licenses and some larger bidders who sought large collections of licenses. Smaller bidders often did pretty well with a straightforward bidding strategy, while bidders who wanted larger amounts of spectrum sometimes preferred to engage in various more complicated strategies, such as those described below.

If the package auction rules were applied in these same environments, the incentives to adopt complicated strategies would be largely reversed. The largest bidders would find it a viable strategy to bid aggressively for precisely the packages they wish to acquire, while smaller bidders might find it profitable to adopt more complex strategies.

There are various other possible competitive environments, some of which are more favorable to straightforward bidding. Because the nature of the actual environment for the 700 MHz auction is still unsettled at the time we prepare this, it is premature to make any pronouncements about the viability of straightforward bidding for that auction.

What is the strategy of demand reduction in the SMR auction, and why won't it be generally useful in the package auction?

Demand reduction is reducing the quantity of licenses one demands in the SMR to accommodate the demands of other bidders and thereby reduce competition for the remaining licenses. In the typical case, large bidders engage in demand reduction, sacrificing a few licenses to reduce competition and prices on what they hope will be many other licenses.

The logic of demand reduction is rooted in the two ideas (1) that there is competition for each license separately as in the SMR auction and (2) that the several licenses are mutual substitutes. In the package auction, it is possible that most of the bids will be made for large packages, in which case condition (1) of the logic of demand reduction is not satisfied. Also, the very premise of the package auction design is that licenses are sometimes complements. Our own studies have identified examples in which demand reduction is counter-productive for these reasons, but we have also identified other examples in which demand reduction can still be effective in package auctions.

What is the strategy of budget stretching in the SMR auction, and why won't it still be useful under the new rules?

Budget stretching is a technique to exploit a competitor that is known to be bidding with a limited budget. The idea is to bid in a way that forces the competitor to spend more on the licenses it finds most important in order to leave it with less to spend on other licenses.

This strategy is only effective when the two groups of licenses—those of primary interest to the competitor and those in contention—are priced separately. The budget stretching strategy can be defeated in the package auction by a competitor that simply bids straightforwardly for a package consisting of both groups of licenses.

What is the strategy of retaliation in the SMR auction, and how does it change in the package auction?

Retaliation is a strategy to facilitate coordinated demand reduction. It is a means of negotiating a split of the licenses with a competitor. When a competitor bumps a bidder from its preferred license, the bidder can retaliate by bumping the competitor on one or more of the competitor's preferred licenses. This is telling the competitor to go away—continuing to bid against the retaliating bidder will be very expensive.

In a package auction, the incentives for retaliation are changed in three ways. First, the incentive for retaliation between two small bidders may be strengthened. A small bidder that retaliates against a competitor on “its” license and forces that competitor to raise its bid also raises the combined sum, which may help it to become part of the winning bid set. Second, a bidder can sometimes protect itself from retaliation from a small bidder just by refusing to bid separately on the parts of the package. Third, the scope for retaliation by a large bidder is reduced. The large bidder only has an incentive to retaliate on licenses outside of its desired package. Retaliating on licenses within its desired package amounts to bidding against itself.

What are the new “cooperative” elements of the package auction design?

Perhaps the most fundamental change in the auction rules is that winning bids in the new package auction are determined by comparing sets of bids, rather than by comparing individual bids. This can force bidders into competing coalitions, which introduces a cooperative element into effective bidding strategy.

To illustrate, suppose one bidder bids on a package of all the 10MHz licenses and a second bids on a package of all the 20MHz licenses. Those two bidders can effectively become coalition partners in competition with any single bidder who has bid for a package of all the licenses or with a coalition of regional bidders who have bid for 30MHz packages in the various regions. We call these “*coalitions*” because it is only the sum of their bids that determines the winning set. The coalition partners' bids determine how they divide that sum between them.

Who loses and who gains from the change to package bidding?

If the strategic situation proves to be similar to that found in, say, the PCS broadband auction with some large bidders and some small ones, then the small bidders will be the losers from this change and large bidders will be the winners.

One reason that small bidders lose is that, in the package auction, large bidders will be less inclined to engage in demand reduction to accommodate smaller bidders. Another reason is that, in the package auction, smaller bidders have the burden of coordinating with their “coalition partners.” This must be accomplished without the benefit of explicit communication. Bidders for the largest packages, in contrast, don't have to coordinate with anyone.

Large bidders in a package auction can use package bids to protect themselves from the exposure problem, as well as from retaliation and budget stretching strategies. They can also use package bids instead of demand reduction, which our analyses have shown is sometimes more profitable.

What new kinds of competitive strategies do the package bidding rules enable?

Package bidding introduces a variety of new competitive strategies. You should consult an auction expert.

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