The Greatest Auction in History: Allocating Spectrum Efficiently (and Raising Billions)

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Congress passed a bill in 1993, authorizing the FCC to allocate spectrum licenses via auction (instead of using beauty contests or lotteries).

Spectrum licenses cover assorted geographic areas, there are typically multiple licenses for a given geographic area, and there are synergies.

Academic economists proposed the very idea of spectrum auctions, and devised the auction rules that worked successfully in 1994.

Auction theory has been an active area of NSF-funded research, 1980-2010.
A/B-Block Auction (two licenses per region)

Winning Bidders and Sample Footprints in MTA Broadband PCS Auction*

*Excluding Alaska, Guam, American Samoa
C-Block Auction (one license per region)

Footprints of Top-10 Bidders in C-Block Broadband PCS Auction

Top-10 Bidders (number of markets)
- NextWave (56)
- Pocket (41)
- Omnipoint (18)
- 21Century (17)
- BDPACS (17)
- PCS2000 (13)
- GWI (14)
- AerForce (12)
- ChaseTel (11)
- Carolina (9)
Prior Practice

- Department of the Interior (oil lease auctions)
  - Items are auctioned simultaneously in independent sealed-bid auctions

- Sotheby’s / Christie’s (art auctions)
  - Items are auctioned sequentially in open-outcry English auctions

- Fatal flaws in prior practice
  - Difficult or impossible to assemble rational packages that reflect the synergies and scale economies
  - Revenues are consequently low
The Simultaneous Ascending Auction

- All licenses are auctioned simultaneously
- In each round, any bidder can raise the high bid on any license (subject to eligibility and activity rules)
- Bidders have an eligibility based on their deposit
- Bidders must keep active to maintain their eligibility: 
  \[ \text{Activity} = \text{Standing High Bids} + \text{New Bids} \]
- Bid withdrawal penalties
- Minimum bid increments specified for each license
- Stopping Rule: Auction does not end on any license until bidding stops on all licenses
The Simultaneous Ascending Auction

- The “activity rule” is regarded to be the key feature:
  - Each license is assigned a number of points
  - Activity = Standing High Bids + New Bids (expressed in points)
  - Activity in a given round must be at least x% of the bidder’s eligibility (x is generally 80% early in the auction and 95% later in the auction)
  - A bidder whose activity is less than that required has its eligibility permanently reduced, commensurately
  - In short, in order for a bidder to be able to bid on licenses late in the auction, the bidder is required to bid early in the auction
An Area of Continuing Improvements

- Clock auctions
  - The next generation of auctions after the FCC simultaneous ascending auction
  - The India 3G Auction (scheduled to begin on April 9) is a clock auction

- Package bidding
  - Package bids are all-or-nothing bids on sets of licenses
  - Auctions with package bidding are theoretically superior but difficult to implement
  - The two most recent UK spectrum auctions were “package clock auctions”
Non-Ideological

- Initially proposed by Ronald Coase (1959)
- Enacted by a Democratic Congress and signed by President Clinton in 1993
- Championed by Reed Hundt and Al Gore
- Bob Dole: Let the free market work and stop the giveaway (digital TV spectrum, 1997)
Examples of Future Applications

- The US Treasury owns 27% of Citibank shares
  - Classic approach would be to hire investment banks
  - Better approach is to conduct a sealed-bid auction
  - The weight of academic economics (and the FCC experience) would suggest a dynamic auction

- Greenhouse gas emission reductions
  - Tendency of political process is to grandfather them
  - Most academic economists would favor 100% auction
  - The current proposed approach for Australia is a simultaneous clock auction (closely related in structure to the FCC auctions)