



EVROPSKÁ UNIE  
Evropské strukturální a investiční fondy  
Operační program Výzkum, vývoj a vzdělávání

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# Spectrum auctions: applications

## Introduction to spectrum auctions

- Prior to late 1990s, most countries assigned spectrum through beauty contests or direct award
- Use of auctions: Initially, most auctions used the SMRA format (simultaneous multiple round ascending auction)

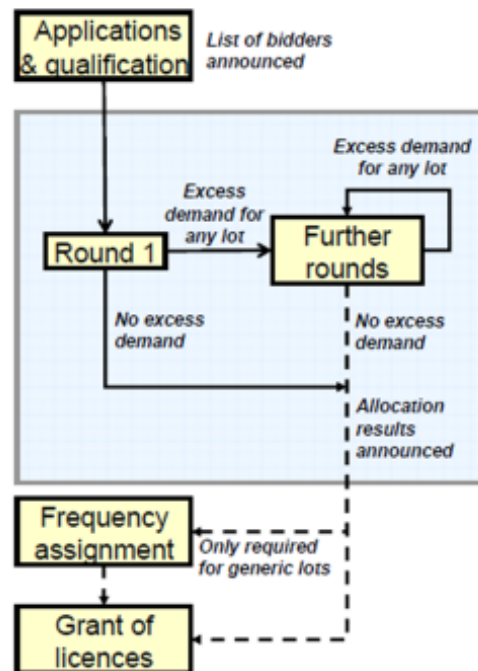
## Some Recent Auction Formats

- Multiple Round Auctions
  - 1: Simultaneous Multiple Round Auction (SMRA)  
(Canada, Germany, Spain, United States)
  - 2: Simultaneous Multiple Round Auction with Switching  
(Norway, Sweden, Finland)
  - 3: Combinatorial Clock Auction (CCA)  
(Denmark, Ireland, Netherlands, Austria, UK, Switzerland)
- Sealed Bid Auctions
  - 4: Combinatorial Second Price Auction  
(Portugal, Ireland)
  - 5: Combinatorial First Price Auction  
(France, Hungary)



## Simultaneous Multiple Round Auction (SMRA)

- Key rules:
  - ascending prices for each spectrum block
  - standing high bidders
  - auction continues until no more bids are placed
- Workhorse of the spectrum auction world
- Can be implemented with:
  - Specific lots; or
  - Generic lots



### SMRA – some observations

- The basic SMRA is a format that is simple for bidders to understand
  - It is best implemented using software for online bidding
  - Works best for substitutes; bidders may face aggregation risk if lots are complements
- Implementation has raised concerns in more complex spectrum packaging environments:
  - Can be vulnerable to gaming (e.g. demand reduction, signalling etc..)
  - Bid strategy can be rather complex if there are many lots
- Concerns can at least partially be addressed by changes to detailed rules, such as:
  - Changing activity rules to manage aggregation risk (e.g. staged activity rules or 'switching' rules)
  - Restricting transparency, to make coordination amongst bidders difficult
  - Spectrum caps and set asides to prevent/promote particular allocation outcomes
- These changes to detailed rules may themselves introduce other concerns, such as increased complexity and loss of market autonomy



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## Practical applications...

This collage features three news articles related to mobile phone auctions. On the left, a CNN Money article titled "German phone auction ends" reports that the UMTS mobile phone license auction raised \$46 billion and awarded six licenses. In the center, a BBC News article from January 2011 titled "US wireless auction raises \$17bn" shows a cityscape. On the right, a FierceWireless article titled "3G licence battles" lists key stories such as spiralling costs, Europe-wide debt woes, and a race to be first.

## And failures...

This collage features three news articles about failed spectrum auctions. On the left, a "MOBILE" article from August 2016 titled "Mexico postpones spectrum auction to 2017" shows a cityscape. In the center, a "live mint" article from August 2016 titled "2G spectrum auction fails before it begins" reports that only one telecom firm applied to participate. On the right, a "THE TIMES OF INDIA" article from August 2016 titled "Upcoming spectrum auction will be the most one-sided: Suresh Mahadevan, UBS" features a portrait of Suresh Mahadevan.



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## Are regulators getting it wrong?

- Auctions are theoretically efficient
  - Reveal preferences of buyers
  - Lead to efficient allocation of spectrum
  - Lead to benefits for consumers
- Problems
  - Regulators may have objectives other than efficiency
  - Obligations and restrictions on lots distort values
  - Sudden expansion of spectrum availability reduces criticality of any one band
  - Use of spectrum is changing over time
  - Operators are facing changes in technology and usage patterns

## The best auction format will depend on local conditions

- In any spectrum award, there are a broad range of objectives for an NRA/Government, including:
  - Promoting an efficient outcome
  - Encouraging downstream competition
  - Encouraging competition (i.e. participation) in an auction
  - Revenue generation
  - Other policy goals e.g. roll-out/coverage
  - Having a well run, reasonably quick and legally robust process
- There is no single 'best' auction format
  - there is no obvious correlation between auction formats and auction outcomes
  - each format has different attributes, making them more or less attractive to the government and particular bidders for each award
  - appropriate auction format may depend on existing market structure (and whether government aims to change it)



## Auctions that go right

US AWS-3	German multi-band	UK 800 and 2600 MHz
<ul style="list-style-type: none"><li>• Clearly defined need for spectrum</li><li>• Well-designed lots and process</li><li>• Well timed auction</li></ul>	<ul style="list-style-type: none"><li>• Simultaneous auctions enable operators to build optimum profile</li><li>• Obligations did not reduce value but encouraged competition</li><li>• Complicated auction process lead to signalling</li></ul>	<ul style="list-style-type: none"><li>• Lots designed to facilitate new entrant</li><li>• Clear differences between blocks</li><li>• Revenue lower than expected – but were expectations realistic?</li></ul>

## Auctions that go wrong

Thailand 900 MHz	Mexico AWS-1	Paraguay AWS-1
<ul style="list-style-type: none"><li>• Reserve prices set very high – one winner defaulted on payments</li><li>• Investment in networks suffering</li><li>• Reauction sold at (again very high) reserve price</li></ul>	<ul style="list-style-type: none"><li>• Spectrum sold at reserve price – set above benchmark levels</li><li>• One lot unsold despite industry need</li><li>• Operators investigating sharing and wholesale solutions</li></ul>	<ul style="list-style-type: none"><li>• Largest operator did not take part – instead refarming existing spectrum and building more network</li><li>• High costs of obligations</li></ul>

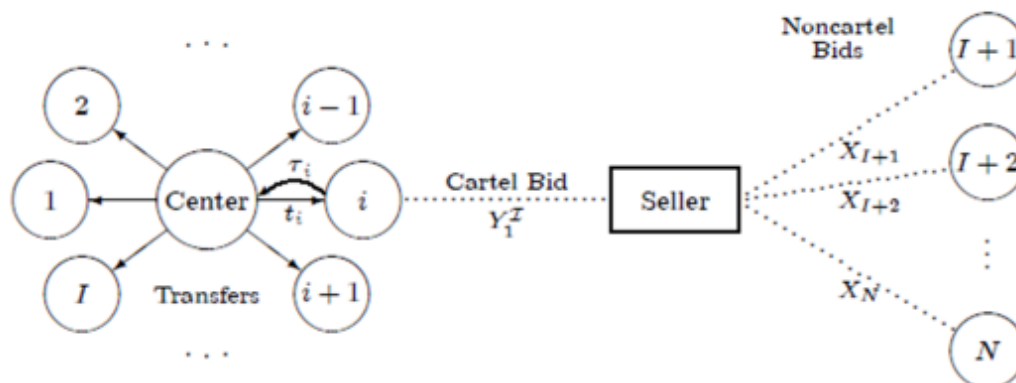


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# Auctions: collusions

## Collusions: Bidding ring



A bidding ring is a collection of bidders who collude in an auction in order to gain greater surplus by depressing competition

Source: Asker (2010)

- Goal is to artificially decrease the winning bid in order to increase the profit from auctions
- Requires subsequent transfers or change in position
- In general, illegal
- Sustainability of collusion?
  - Think about the previous classes on sustainability of repeated games



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## Example 1

Electrical Conspiracy' in the 1950's

- 29 suppliers of industrial electrical generators and equipment colluded in first price sealed bid procurement auctions
- This ring used a bid rotation scheme in which each ring member was allocated a phase of the Moon.
- The phase of the Moon at the time of the auction determined which of the ring members had the right to bid (without competition)

## Example 2

- Ring adopted by 81 book dealers in the auction of the library of Ruxley Lodge in 1919
- After buying up the contents of the library free from internal competition, the ring members met in a sequence of knockout auctions which reallocated the contents of the library to those ring members who valued them the most.
- The proceeds of each knockout were shared equally among participants, thus generating a system of sidepayments.



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### Example 3

- 2014: The state highway company has excluded four construction giants – Doprastav, Strabag, Skanska and Inžinierske Stavby – from the public tender process in the wake of a cartel scandal from 2005 that also involved two other firms.
- The heaviest fine was handed to Portuguese firm Mota–Engil (€13.88 million), followed by Strabag (€12.21 million), Skanska (€8.98 million), Doprastav (€6.57 million), Inžinierske Stavby (€3.02 million) and Betamont (€131,150).





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