



Spectrum Auctions for Mobile Broadband : A multifaceted Approach

Joaquin RESTREPO
Head, OPS Division
ITU, Radiocommunication Bureau

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Agenda

1. Main Drivers
2. Diverse Facets
3. Trade-offs
4. Scenarios for Developing Economies
5. Conclusions



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- 1. Main Drivers**
2. Diverse Facets
3. Trade-offs
4. Scenarios for Developing Economies
5. ITU Studies
6. Conclusions



1. MAIN DRIVERS

TELCO REGULATOR

Ultimate Mission:

Guaranteeing the provision of service universally:

- With high performances (Quality)
- At affordable prices (Affordability)
- in a non-discriminatory basis (Accessibility)

Main Strategic Functions:

- Promotion of Universal Service
- Fostering fair play competition
- Protecting users rights
- Efficient managing of scarce resources (e.g., **Spectrum**, Numbering)

Directive 2002/22/EC: States must ensure that the electronic communications services detailed in the Directive are made available to all users in their territory, regardless of their geographical location, at a specified quality level and an affordable price.



1. MAIN DRIVERS

SPECTRUM LICENSING

Premises

- Spectrum is: scarce resource; necessary to provide service
- Spectrum hoard deters competition (includes non licensing it)
- Spectrum licensing process should:
 - Be efficient and transparent (timelines, procedures)
 - Foster Services goals: Quality, Affordability, Accessibility
 - Promote fair Competition (equally-opportunity basis)

Favorable Regulatory environment for licensing (*ex-ante*)

- Legal Framework to attract Investments
- Incentives for Technologic Improvements
- Sharing Infrastructure
- Spectrum Hoarding Prevention (Spectrum Caps)
- Spectrum Sharing/ Trading

* Report ITU-R SM.2012-3: Economic aspects of spectrum management



1. MAIN DRIVERS

CLASSIC AUCTION GOAL:

Raising Money: “Scarce resources are allocated efficiently if they flow to those willing to pay the **highest amount**”*

SPECTRUM AUCTION

Spectrum is an scarce resource, but

- Belong to states (i.e., to all citizens)
- An essential asset for provision of a public service
- Its property can not be transferred

When performing spectrum auctions, how to balance:

- Auctions goals: Highest value
- Regulator duties: Quality, Affordability, Accessibility

*Cave, Doyle Webb: “Essentials of Modern Spectrum Management”



1. MAIN DRIVERS

WINNER CURSE:

*“A tendency for the winning bid in an auction to exceed the intrinsic value of the item purchased. Because of incomplete information, emotions or any other number of factors regarding the item being auctioned, bidders can have a difficult time determining the item's intrinsic value. As a result, the largest overestimation of an item's value ends up winning the auction”**

Private Assets: Winner curse affects only the buyer

Public and Scare Assets: Winner curse affects the whole ecosystem, as it jeopardizes the service provision in the aimed conditions of: Quality, Affordability, Accessibility

On the other hand, spectrum auction raising low money does not guarantee that bidder will transfer their savings on benefit of the service (and users)

Auction Design must consider all these facets, and it results should be measured accordingly

**from: investopedia.com*



1. MAIN DRIVERS

	PROVISION OF SERVICE			Auctions
	Quality	Affordability	Accessibility	
<i>Goal</i>	Newer and better service	Cheaper cost/service unit	Provision of service for all citizens	Increasing the revenues from the sell/leasing of the Assets
<i>Indicators</i>	Data Speed Diversity of Applications Service Availability and Quality Client Support	Diversity of Service Portfolio Service Penetration (pre and post paid) ARPU (ARPU vs. GDP per capita)	Bridging Digital Divides for : Rural and Remote Low incoming Gender Age Disability Minority communities	Raised Funds
<i>How to provide it?</i>	Network updating service improvement QoS/QoE licensing rules (ex-ante) Monitoring and Enforcement of the QoS, QoE (see ITU-T Rec)	Fostering ICT Investments Increasing Competition Incentivating Network Deployment and Enhancing	National Broadband Plan, NBBP Strategy for Infrastructure of NBBP National Treasury Investments Coverage Obligations to Licenses Feeding Universal Service Funds	Implement Auctions Mechanism best matching to the assets nature
<i>Challenges</i>	More complex (and expensive) AOM Planns	Reducing Renewues (lower ARPU)	Increasing CAPEX and OPEX Targeted Population usually with low ARPU	Low Money
<i>Spectrum Auction</i>	Define QoS/QoE requirements	Avoid Winner Curse Payment differed in time Incentives to penetration of service	Include Coverage Obligations Re invest Raised Money for Universal Service Projects?	Optimize Auction Revenues

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2. DIVERSE FACETS

SPECTRUM LICENSES: STAKEHOLDERS INTEREST

STATE STRATEGY

Increase the social benefit (economic and social growing)

NATIONAL TREASURY

Collecting the highest amount, to cover its cash needs

REGULATOR

Improving the service provision

Contributing to the universal service goals

BIDDERS

New business opportunities by accessing to a scarce resource

USERS

Newer, better, cheaper services
ubiquitous and rapid availability



2. DIVERSE FACETS

FOSTERING INTEREST ON THE ICT SECTOR

- Attract new Operators?;
 - Favorable environment for Investors from abroad/ internal (beyond the reach of regulator instruments)
 - Is there still room for a newcomer?
 - New Networks or MVNO?
 - National or foreign?
- Improve competition between current operators?: Favorable Competition environment: infrastructure sharing, interconnection, spectrum trading.
- Rule (Cap) Operators with Significant Market Power, SMP: Spectrum, Club effect, Tariff Models, etc.
- Prevent (and punish) collusion practices



2. DIVERSE FACETS

REGULATOR INTEREST IN SPECTRUM AUCTIONS

Improving the service provision

Contributing to the universal service goals

How to achieve?:

Improving ex-ante sector conditions

Fostering Competition

Fixing coverage obligations

But:

Coverage obligations might burden some bidders?

Auction Competition vs. Sector Competition?

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3. TRADE-OFFS

Quality:

Poor QoS deters service penetration, hence its economic and social impact

Imposing very high QoS requirements leads to overdesigning Networks (and over cost), affecting penetration

Competition should motor QoS improvements (since a threshold value fixed by regulator?)

QoS becomes a Key consideration if spectrum auction deals with new services, e.g. 3G vs. 4G:

- According to national definitions
- Review the status (is 3G or 4G already commercially available?)

3. TRADE-OFFS

Affordability:

As being related to the tariffs, it depends of the Operators business case and degree of competition

Current mobile services markets: Regulators are called not to intervene over users fee, but to foster its lowering instead, by:

- Investment environment (to promote before government; usually beyond regulator powers)
- Appealing Telecom environment: infrastructure sharing, interconnection, competition promotion, etc.,
- Auctions: prevent “winner curse”, and its potential penalties over service fees

Affordable service prices are indispensable for the Universal service goals

3. TRADE-OFFS

Accessibility:

How to reach “non-profitable” niches? (high CAPEX-OPEX vs. Low revenues = negative margin)

- National Treasury Investments: In competition against other national priorities (health, education, etc.)
- Universal Service Obligations (fees as a % of Operators' revenues): Well intended strategy (and accepted by sector; re-invested on it); unfortunately, with some exemptions, they depict very low level of budget execution
- Associated Obligations in Licensing: seems to be a more expedite manner to reach targeted population; reduce the license's value, but avoid. Limited mechanism that might not be enough for achieving in time Universal Service Roadmaps

3. TRADE-OFFS

COMPETITION GOALS

Sector Competition

- Attract new Operators (National/Foreign; Network/MVNO)
- Favorable Competition environment
- Rule (and Cap) SMP
- Sharing (proportionally) Universal Services Obligations

Spectrum Auction Competition

- Rule (and Cap) participation of SMP: favor newcomers entrance, but deter (burden) SMP Operators, and vice versa
- Coverage Obligations: lower it might increase offer, but defers achievement of National BB Plans; high requirements may favor existing operators

Actions to Improve Competition conditions for: i) ICT Sector, ii) the Spectrum Auction, might oppose each other



3. TRADE-OFFS

Spectrum Auction: Key Questions

Where the collected resources are going to?

- National Treasuries
- ICT Authorities (resource to potentially be reinvested on the sector: Universal Service Projects)

Trend: the lower the amount kept by ICT authority, the larger the associated coverage obligations

How “clean” is the spectrum?

- Refarming duties for winners (extensive detailed conditions)
- Regulator’s duty: usually financed through a reserve of auction’s collected resources. Matching up roadmaps for Coverage duties and Refarming

Increasing Competition: effects of spectrum caps, license sharing/trading, etc. on:

- During the Auction
- For service provision

3. TRADE-OFFS

Indicators for Spectrum Auction Goals:

STATE (Social benefit):

Impact of service on: ICT Sector, GDP, Social wealthy. Long term observation (5 to 10 years)

NATIONAL TREASURY (Cash Flow):

\$ and derived: \$/MHz; \$/MHz/Pop (year, PPP, ARPU etc) ;
immediate observation

BIDDERS

Cash Flows, Risk; non-public information

USERS

\$/service unit; portfolio diversity, coverage, QoS; long term observation (5 to 10 years)

REGULATOR

ALL ABOVE!



3. TRADE-OFFS

WHICH APPROACH?

Any approach can be valid, as it reflects particular autonomous national strategies and priorities, in terms of:

- Funds destination
- Coverage Obligations and conditions
- Sector Environment (Investments, Competition)
- Refarming procedures

Pertinent indicators should be analyzed, fixing target values

This issues shall be duly explained to and discussed with sector and general public (ex-ante), to avoid:

- Over expectations
- Disappointments by results

Periodic follow-up information might be useful

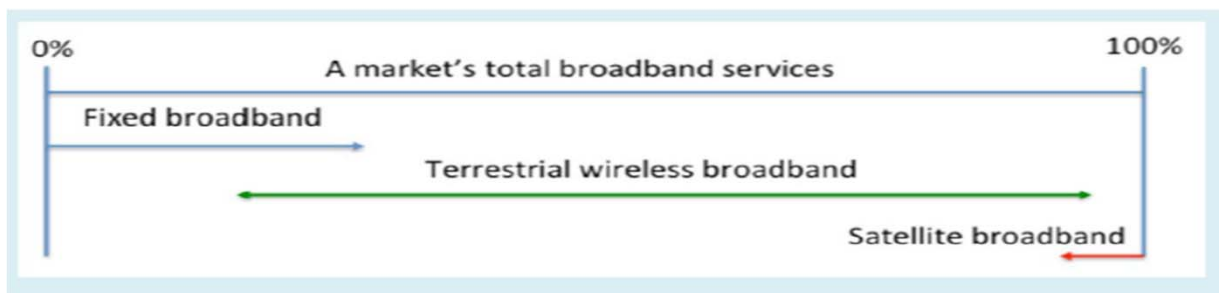
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4. SCENARIOS FOR DEVELOPING ECONOMIES

UNIVERSAL SERVICE INFRASTRUCTURE

A mixing of Technical Options:



Start-up Point:

- Fixed and Mobile Penetration
- Prepaid Penetration

	Region	% Prepaid
DEVELOPING	AFRICA	96%
	ASIA	91%
	LATINAMERICA	89%
DEVELOPED	ASIA	15%
	NORTHAMERICA	22%
	EUROPE	33%

	%	Developed	Developing	Ratio
FIXED NETWORKS				
1	<i>Fixed Network Penetration</i>	45.0%	12.0%	3.75
2	<i>Fixed Broadband Penetration</i>	25.0%	5.0%	5.00
3	<i>BB/Fixed Network</i>	55.6%	41.7%	133.3%
MOBILE NETWORKS				
4	<i>Mobile Network Penetration</i>	120.0%	80.0%	1.50
5	<i>Mobile BB Penetration</i>	55.0%	8.0%	6.88
6	<i>BB/Mobile Network</i>	45.8%	10.0%	4.58
UNIVERSAL BB SERVICE				
	<i>Total BB Penetration (Fixed + Mobile)</i>			
7		80.0%	13.0%	6.15
8	<i>Gap to 100% BB</i>	20.0%	87.0%	0.23
9	<i>Gap BB through Fixed (1-2)</i>	20.0%	7.0%	2.86
10	<i>Gap BB through Mobile (8-9)</i>	0.0%	80.0%	

4. SCENARIOS FOR DEVELOPING ECONOMIES

Developed Economies:

- High penetration of Fixed Networks (45%)
- High penetration of BB mobile (55%)
- Lower prepaid portion (~25%)
- Universal Service: Very low dependency from New Mobile broadband Networks
- Spectrum Auctions: larger relevance to revenues; soft coverage requirements

Developing Economies:

- Low penetration of Fixed Networks (12%; ROU: 21.9%)
- Very low penetration of BB mobile (8%; ROU: 14.1%)
- Higher prepaid portion (~90%; ROU 69.6%)
- Universal Service: Very high dependency from New Mobile broadband Networks
- Spectrum Auctions: **harder coverage requirements vs. lower relevance to revenues?**



4. SCENARIOS FOR DEVELOPING ECONOMIES

Developing Economies:

- Fixed Network deployment curbed in a very low value (12%)
- Mobile Networks depict a much larger penetration (>80%)
- Mobile Users profile is mainly prepaid (>90%)
- Total Broadband penetration (fixed or Mobile) is still very low (<15%)

Achieving full Universal Service coverage of Broadband Access must essentially be based on:

- Mobile
- Prepaid

Spectrum Auctions for mobile broadband services should be closely associated to Universal Service roadmaps

Strong trade-off between reference prices and coverage obligations

Auctions Indicators shall take care of it

4. SCENARIOS FOR DEVELOPING ECONOMIES

Auctions Benchmarking

The most common measure pattern is: \$/MHz/Pop

That pattern solely does not reflect the diversity of scenarios, and difference in national priorities, e.g.:

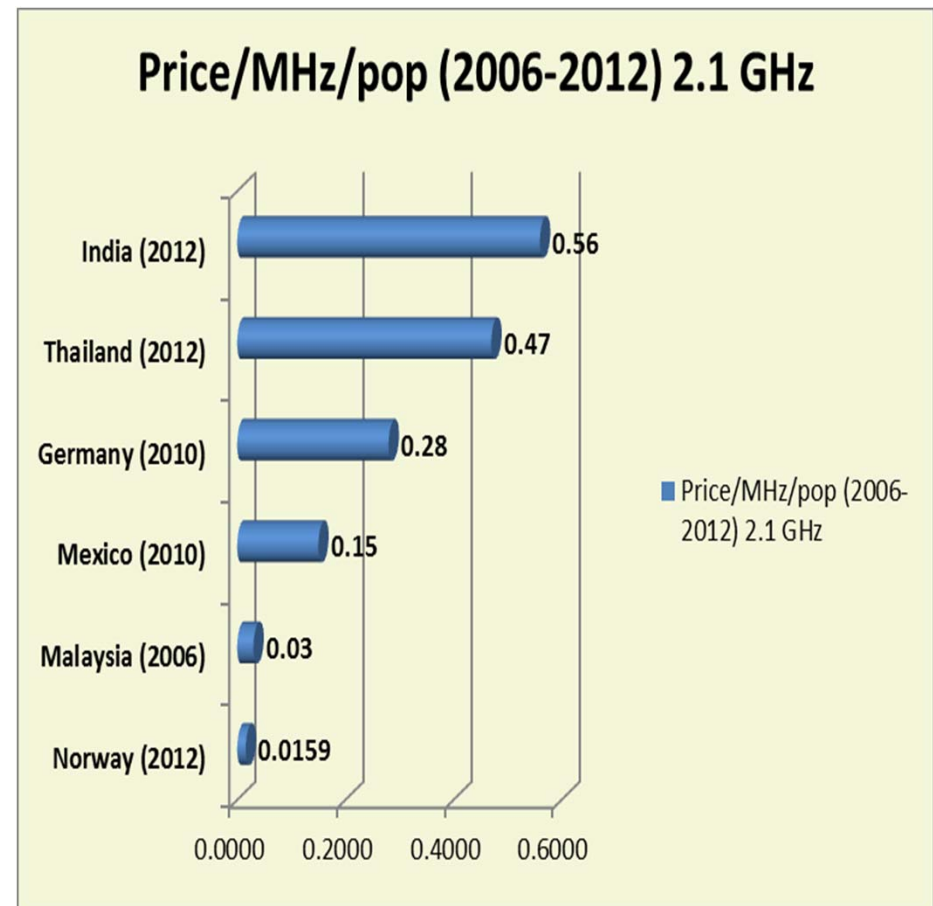
- Economic Growth (PPP)
- Sector Growth (Mobile average ARPU)
- Auction Fee Installments (net present value)
- License term (years)
- Auction and Sector Competition (Bidders, New Operators)
- Auction relative result (reference price vs. final fee)
- Refarming Impact
- Universal Service Obligations (% coverage/year)
- Specific Band (above or below 1 GHz?)

4. SCENARIOS FOR DEVELOPING ECONOMIES

Auctions Benchmarking: Example

Big differences in:

- PPP, ARPU
- Mobile BB Penetration
- License time term
- License fee installments
- Coverage Obligations
- Taxes and Fees
- Reference prices
- Amount of Bidders



4. SCENARIOS FOR DEVELOPING ECONOMIES

Auctions Benchmarking: Key Spectrum Issues

- **Refarming?:** How clean are the Bands; planning (and funding) refarming
- **Frequency Band Plan?:** compared to neighbors countries (harmonization)
- **3G or 4G?:** Definitions might be different
- **4G Bandwidth:** larger Frequency Channels (up to 20 MHz); smaller channels = lower data speed
- **Coverage Obligations:** on the licensed band only? other bands might be used?
- **Spectrum Trading/Sharing?**
- **Bundling?:** Bands above and below 1 GHz
- **Spectrum Cap:** by Band?; by Auction?

**Mid and Long Term Roadmap for IMT Bands:
(re) allocation; licensing; Network deployment**



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5. CONCLUSIONS

1. Stakeholders vision and priorities for spectrum auction are very diverse, so the indicators related to it.
2. States will reflect their particular strategies and priorities for auction, through:
 - a) Macroeconomic environment
 - b) ICT Sector Environment
 - c) IMT Roadmap
 - d) Specific Auction conditions
3. In Spectrum auctions for Mobile Broadband, Developing economies face a strong trade-off between Coverage Obligations and reference prices
4. Auction *ex-ante* and *ex-post* analysis shall take care duly of these trade-off, with pertinent indicators
5. Analysis shall be largely socialized with stakeholders

Thank you...

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