

SPECTRUM MANAGEMENT:

PROPERTY RIGHTS, MARKETS, AND THE COMMONS

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Traditional Spectrum Allocation

- Since 1934, radio spectrum allocated by FCC and Commerce (FRA, 1927-34) by administrative fiat
 - Set aside bands for particular uses
 - Then allocate within bands to particular users
 - Comparative hearings (“beauty contests”)
 - “Public interest”
 - Political control
 - Broadcast radio, then TV most important uses
- Rationales: Interference and Scarcity
 - real or regulation-induced?

Features of Administrative Allocation

- License constrained to specified use
 - Technical constraints often tailored to that use
- Presumption of renewal
- License cannot be sold without FCC approval
 - No leasing (until very recently)
- No property rights conveyed (NextWave case)
- And “Free”
- Who else allocates scarce resources on this model?
- Former Soviet Union: *GOSPLAN*

Economists' Critique

- Ronald Coase-1959
 - Why is the government doing this? Virtually all other private goods in the US economy are allocated by the private market; auction *ALL* this stuff off! Huge increase in efficiency of use
 - Scarcity is artificial; induced by regulation for the interests of the broadcast industry
- “Is this a big joke?:
 - FCC commissioner, in response to Coase’s testimony
- 1993: FCC holds first auctions...*FINALLY!*

Is This Enough? Economics Part Deux

- Auctions used on a very small part of spectrum (120 Mhz). Remainder continued to be allocated administratively.
- The Economists' View:
 - *All* spectrum should be in the market; privately owned, bought, sold, leased, subdivided, aggregated, etc., subject to technical constraints to control interference (property rights).
 - Yes, even DoD and police.
- Spectrum is too important for administrative allocation; let the market do it to achieve maximum efficiency.

Who Trusts Markets?

- “Is this a big joke?” Why are markets efficient?
 - Self-interested owners will ensure spectrum is used by those who value it the most (via sale or lease)
 - Markets instantly reflect changing demand and changing technologies; spectrum will move to highest valued use.
- But aren't markets usually monopolized?
 - Most markets have no such problems; spectrum is so abundant market power is unlikely to be a problem, once it's all in private hands.
- What about public uses, such as police, Part 15?
 - Government usually buys its own inputs (police cars, computers, land) with tax money; why do we think spectrum should be any different?

The Engineers' Critique

- Engineers as frustrated with GOSPLAN as economists: inefficient use of spectrum.
- Critique based on new radio technologies
 - UWB: trades off power for bandwidth; emits “in the noise.”
 - Agile (software-defined) radio: dynamic allocation of bandwidth; frequency-hopping
 - Neither of these technologies problem-free
- Suggests many users can share the same bandwidth
- A Commons model, rather than ownership model.
- Economists and engineers have a common goal: more efficient use of spectrum and a distaste for GOSPLAN; but are we going in opposite directions? *Looks like it!*

Ownership or Commons: What Works?

- Ownership model works well if:
 - Scarcity! If spectrum will never be scarce, then no need for a market
 - High power dedicated frequency uses (Power 99 in Philadelphia: 50KW at 98.9 FM forever)
 - Legacy applications will be dominant for a long time
- Commons model works well if:
 - Spectrum will never be scarce
 - Everyone can use sophisticated transmitters/receivers for agile radio/UWB

Do We Need to Choose? A Proposal

- Place *all* spectrum into the market, using deVany et al. property rights proposal (*Stanford Law Review*, 1969)
- Two alternative spectrum ownership models:
 - Ownership with non-interference
 - I own the spectrum and have absolute use priority; others can use it but only if they don't interfere with this absolute use priority *UWB and agile radio OK; enforcement*
 - Ownership with real-time leasing
 - I own the spectrum and you can use it if you pay me.
 - Identifiable emitter
 - Real-time price, long-term lease price
 - Perfectly competitive market
 - Software to negotiate and bill (BMI and ASCAP models)
 - *UWB and agile radio OK; billing*

What's the Result?

- Either model accommodates both private ownership and commons-type uses
 - Who pays?
 - How robust with respect to scarcity?
- *In the medium term, both models are likely to have identical results* (if all spectrum placed in market)
- Moving *all* spectrum to markets and using dynamic allocation will free up so much spectrum the market price is likely to be close to zero: *de facto Commons!*
 - In the medium term, there is no real scarcity \Rightarrow \sim zero price
 - Except for “prime real estate,” such as cellular-friendly spectrum and legacy spectrum.

How Do We Get There?

- Current licensees heavily invested in present regime.
- Make the move to a new market-based regime a “win-win”
- Focus on achieving efficient use by getting *all* spectrum into the market without distortions
 - Not correcting perceived inequities in current distribution of licenses.

Kwerel & Williams “Big Bang” auction

1. Announce auction 1 year in advance
2. All current licensees may put all or some of “their” spectrum in the auction
 - Not required; but then constrained from market for 5 years
3. FCC puts all “white space” bands to auction
4. Bidding is opened; anyone can bid for any band offered, or combination thereof.
5. Licensees may choose to accept a bid; if they do, *they receive the bid money*

Kwerel & Williams “Big Bang” auction-2

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6. Licensees may choose to reject the bid and keep the spectrum.
 7. All spectrum placed in auction becomes private property, with all the technical (but not use) restrictions of the current licensee.
 - Repackaging of some bands may be helpful
 8. Secondary markets ensure that buyers and sellers can transact continuously
 - “Big Bang” creates liquidity
 9. Spectrum can be aggregated, subdivided, bought, sold or leased.
 10. FCC and NTIA retire from the allocation business.

Conclusion

- We all agree: GOSPLAN sucks
- Private markets work when scarcity an issue
- Commons work when scarcity not an issue
- But we can have it both ways:
 - Two alternative market-based regimes that give us the benefits of both
- Apparent conflict is bogus: engineers and economists can make common cause for radical reform
- Can we get there from here? *Yes!* With political constraints? *Yes!* If we move sloooooowly? *No!*