SPECTRUM MANAGEMENT: PROPERTY RIGHTS, MARKETS, AND THE COMMONS

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Allocating “Scarce” Resources

- Since 1934, radio spectrum allocated by FCC (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
- Scarcity: real or regulation-induced?

Administrative Allocation

- Based on early technology
- License constrained to specified use
- Presumption of renewal
- License cannot be sold without FCC approval
  - No leasing
- Circumscribed property rights (NextWave case)
- Free…
- ….Like GOSPLAN

Whose Idea Was This?

- 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 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!*

Barely a Start…The Economists' View

- Auctions used on a very small part of spectrum (180 Mhz at start). Remainder continues 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.
  - 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?

But Wait…There's More!

- 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
- 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!*

Let's Sort It Out…

- 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)
    - This traditional use 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?

- Two spectrum ownership models accommodate the new technologies:
  - 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*

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*
- Moving to markets and dynamic allocation will free up so much spectrum the market price is likely to be close to zero!
    - At present, there is no real scarcity $\Rightarrow$ zero price
    - Except for "prime real estate," such as cellular-friendly 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.

Kwerel & Williams “Big Bang” auction-2

5. Licensees may choose to accept a bid; *they receive the bid money*
6. They 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.
8. Secondary markets ensure that buyers and sellers can transact continuously
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 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*!