

Policy and Economics: Framework and Lessons from Case Studies

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The US is starting to experiment with unlicensed spectrum on a large scale

- Bulk of regulatory experience is with licensed exclusivity
- Unlicensed spectrum is shared
- Spectrum sharing can be managed in many ways
- Little attention to comparative merits of governance options at FCC
- Academic debate is spirited but still highly abstract

Standards for Assessing Performance of Governance Regimes

- *Workability*
- *Static Efficiency (realization of potential benefits)*
- *Dynamic efficiency (hospitable to innovation)*

Ongoing and planned research efforts

- More thorough application of governance/coordination theory to challenges posed by unlicensed spectrum
- Development of experience-based evidence on comparative merits of different governance regimes
 - Case studies of non-traditional regulatory models
 - Designed experiments

Features of Governance Regimes

- **Rights and Rights Assignments**
 - Determine legal/regulatory bounds on individuals' freedom of action
 - Influence incentives to innovate and coordinate
- **Administrative Functions**
 - Basic functions necessary to the smooth functioning of any rights regime

Assignment of Rights in Governance Regimes

| | Administrative licensing | Flexible licensing | Individual ownership | Commons (collective ownership) | “Open” access |
|-------------------|--|---|-----------------------------|---------------------------------------|-------------------------------------|
| Access | Contingent upon government license | Typically based on auction | Purchase of spectrum | Purchase or license | Anyone meeting minimal criteria |
| Use | As determined in license | As determined in license | Any decided by owner | Any decided by members of commons | Any |
| Management | Government | Government | Owners | Members of commons | None |
| Exclusion | Anyone without a license | Anyone without a license | Any non-owner | Any non-member | Anyone not meeting minimal criteria |
| Alienation | Limited transferability based upon government approval | Markets for licenses, with or without government approval | Owner | Members of commons | None |

Administrative Functions

- Setup functions
 - Band provisioning
 - Band allotment and assignment
- Ongoing functions
 - Rules provisioning
 - Adjustment
 - Coordination
 - Monitoring and enforcement

The Case Studies

- Experiences with 3 non traditional governance schemes in the U.S.
 - Citizen's band radio
 - Unlicensed PCS
 - 700 MHz guard bands
- Illustrate the range of governance options
- Lessons regarding effectiveness of user and industry coordination efforts

Citizens Band (CB) Radio

Historical Overview

- Established: 1958
- Objective: providing wireless services for the general public
- Evolution of market: Steady growth through most of history with exception of dramatic spike during 1974-1977

Governance Profile

- Rights regime

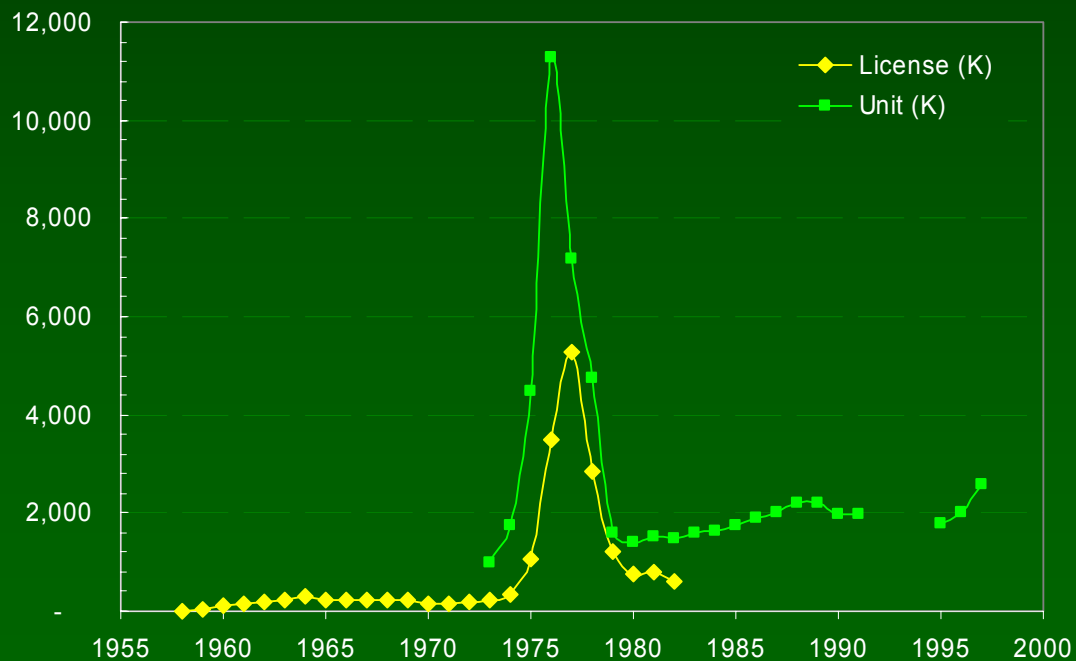
| | Access | Use | Management | Exclusion | Alienation |
|---------|-------------|--------------------------|--------------------------|-------------|-------------|
| Feature | Open access | Administrative licensing | Administrative licensing | Open access | Open access |

- Administrative functions

- Adjustment: FCC placed additional restrictions (1965) and expanded channel capacity (1977) to deal with concerns over abuse and congestion
- Coordination: Power-limits and antenna height, FCC required communication procedures plus informal conventions
- Monitoring and enforcement: Shared by the FCC and users

A tragedy of the commons???

- Growth in licenses and units sold



Source: Dealerscope Merchandising, Cobra Electronics, FCC, Goldenber et.al. (2002).

Unlicensed PCS (UPCS)

Historical Overview

- Established: 1994
- Objective: Fostering innovation and creating versatile personal communications services
- What has happened: wireless PBX has become the dominant application in the voice band, whereas no data device has been developed

Governance Profile

- Rights regime

| | Access | Use | Management | Exclusion | Alienation |
|---------|-------------|---------|------------|-----------|-------------|
| Feature | Open access | Commons | Commons | Commons | Open access |

- Administrative functions

- Band provisioning: Self-governing organization administered the funding and clearing process
- Band allotment/assignment and Rule provisioning : FCC decision and suggestions from self-governing organizations
- Coordination: Specifications and built-in etiquette in hardware, along with frequency coordinator

Reasons for Failure of Data Band

- Narrow bandwidth
- Incompatibility with incumbents' operations
- High band clearing cost
- Competition from the ISM band

700 MHz Guard Bands

Historical Overview

- Established: 2000
- Objective: Protecting adjacent public safety users while promoting efficiency through market mechanism
- Limited development so far

Governance Profile

- **Rights Regime**

| | Access | Use | Management | Exclusion | Alienation |
|---------|--------------------|----------------------|---|--------------------|--------------------------|
| Feature | Flexible licensing | Individual ownership | Individual ownership /Flexible licensing | Flexible licensing | Administrative licensing |

- **Administrative functions**

- Band provisioning: The FCC oversees the TV incumbents' relocation
- Band allotment and assignment: Band managers
- Coordination: (1) Emission criteria (2) In-band and out-of-band frequency coordination (3) Prohibition of cellular-like network

Factors Influencing Development

- Slow pace of clearing incumbent broadcasters
- Lack of equipment supply
- Competition from SMR services
- Uncertainties created by Nextel rebanding proposal

Case Study Insights

- The CB radio experience is not example of a tragedy of the commons, though not proof that a tragedy can't occur
- CB is example of effective user-originated coordination mechanisms and monitoring/enforcement
- UPCS is example of apparently effective commons-type governance

Insights (cont.)

- Failure of UPCS data band illustrates the importance of exogenous factors when coordination with other in-band services required
- The 700 MHz Guard Bands experience illustrates uncertainties created by strategic behavior
- Experimental methods may allow more systematic examination of comparative performance questions.