Policy and Economics: Framework and Lessons from Case Studies

Steven S. Wildman
Quello Center for Telecommunication Management & Law
Michigan State University
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

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

<table>
<thead>
<tr>
<th>Feature</th>
<th>Access</th>
<th>Use</th>
<th>Management</th>
<th>Exclusion</th>
<th>Alienation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Open access</td>
<td>Administrative licensing</td>
<td>Administrative licensing</td>
<td>Open access</td>
<td>Open access</td>
</tr>
</tbody>
</table>

- **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)
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**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Access</th>
<th>Use</th>
<th>Management</th>
<th>Exclusion</th>
<th>Alienation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Open access</td>
<td>Commons</td>
<td>Commons</td>
<td>Commons</td>
<td>Open access</td>
</tr>
</tbody>
</table>

- **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**
  
<table>
<thead>
<tr>
<th>Access</th>
<th>Use</th>
<th>Management</th>
<th>Exclusion</th>
<th>Alienation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feature</td>
<td>Flexible licensing</td>
<td>Individual ownership</td>
<td>Individual ownership/Flexible licensing</td>
<td>Flexible licensing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Administrative licensing</td>
</tr>
</tbody>
</table>

- **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.