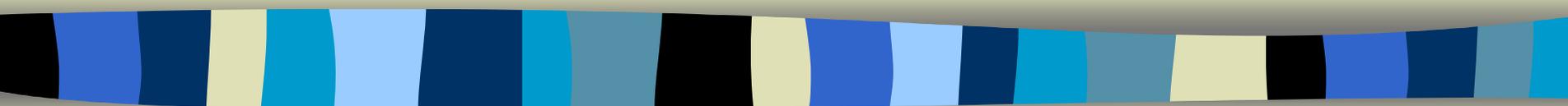# Spectrum Buyouts
A Proposal for the Transition to Open Spectrum

IKEDA Nobuo

Research Institute of Economy, Trade and Industry

FCC: "Exclusive Rights" Approach

- **SPTF:end of "command and control"**
  - Technically progressive
  - Economically poor
  - Circularity: justify exclusive rights by "scarcity" created by exclusion

- **Property rights for frequency**
  - + Incentives for incumbents to relocate
  - – Segmentation and monopoly

False Theories

- **Faulhaber-Farber: confused**
  - Sticks to legacy technologies
  - Trading private property -> commons?
    - Buyers buy the assets that will become worthless
    - Or monopolize them by proprietary protocols
- **"Big Bang" auctions (Kwerell-Williams)**
  - Buying and selling simultaneously
  - Dangerous and Irreversible
    (e.g., 700MHz, NextWave)

Spectrum:
Neither Property nor Commons

	excludable	non-excludable
rival	Private goods	Common Pool Resources (CPR) road, park, fishery
non-rival	Club goods software subscription services	Public goods national defense mathematical theorem

"Commons" Approach

- Open spectrum as public use
  - Technically efficient
  - Politically difficult
- No valuation and priority
  - Congestion and interference
  - Infinite bandwidth: OK, but how?
- No incentives for relocation
 - Lack of mechanism to take back spectrum

Spectrum Buyout

- **Transition strategy**
  - Providing incentives without monopoly
- **Reverse auction by government**
  - Buying the spectrum from incumbents
  - Release for unlicensed band
- **Expense:**
  - General account
  - "radio tax" for all terminals/Hz

Auction Design

- The lowest bidder per band: winner
  - PCS auctions: the most efficient user
  - Reverse auctions: the least efficient user
- Band should be vacated nationwide
  - Price: sum of bidders
- Continuous band is valuable
  - Requirement for the minimum bandwidth

Bids for the Band Groups (example)

Billion yen

ISART
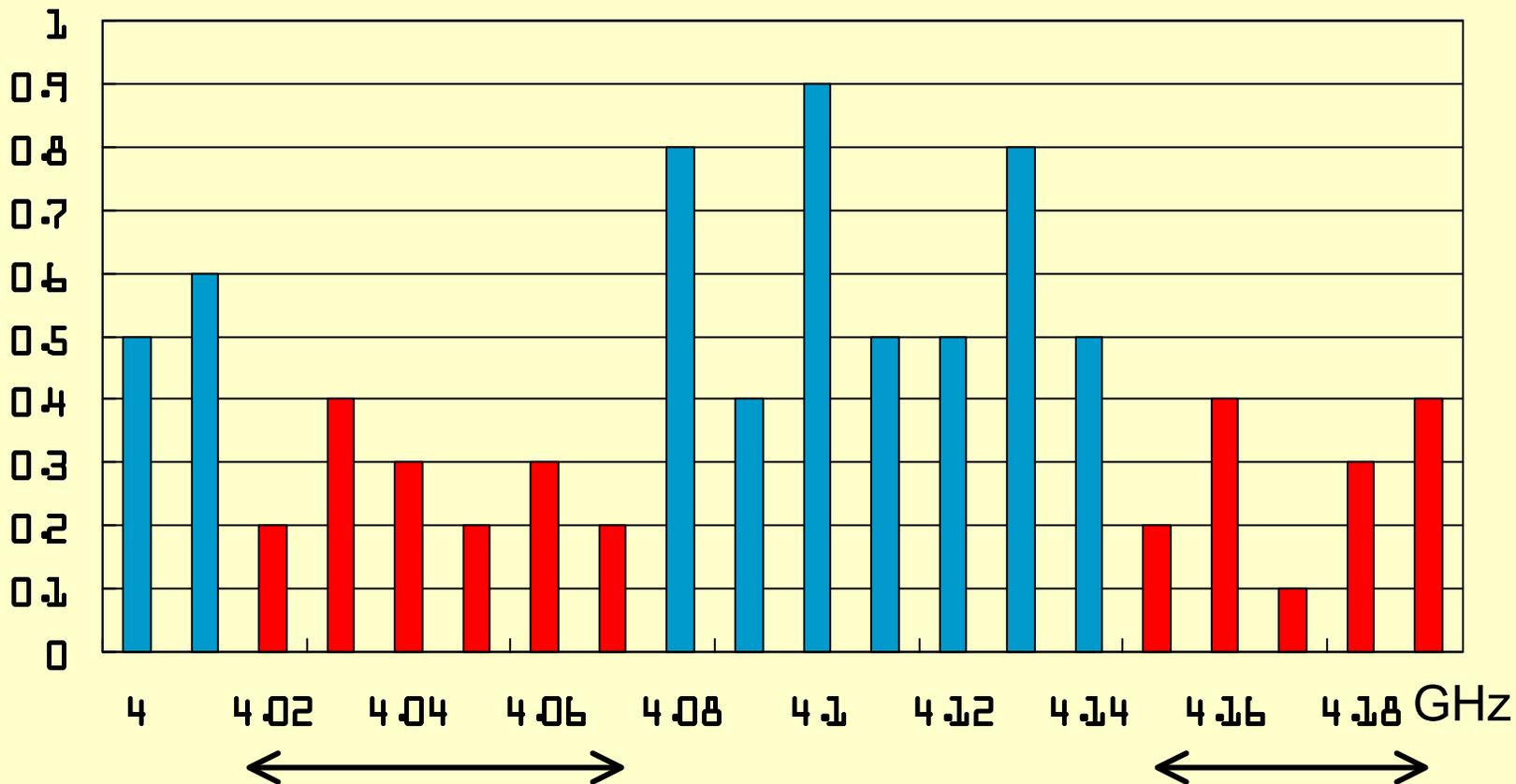
Bids will approach equipment prices

- **Bid = opportunity cost**
  - $Q_k(x) = v_k + (1-q)v_k + (1-q)^2 v_k + \ldots (1-q)^x v_k + z_k.$
  - *q:* probability of taking
  - *v:* monopoly rent
  - *z:* value of equipment

- **Equilibrium price**
  - $p^* = v_k/q + z_k \longrightarrow v_k + z_k \longrightarrow z_k$

Hybrid Approach

30MHz   2GHz

Legacy   Easement   Open spectrum
(exclusive)   (overlay)   (public use)