Spectrum Buyouts

A Mechanism to Open Spectrum

Nobuo IKEDA
Research Institute of Economy, Trade and Industry
Lixin YE
Ohio State University

3 Approaches to Spectrum

- Command and control: Japan
  - Eminent domain: nominal compensation
  - Discretionary reallocation
- Property rights: the U.S.
  - Incentives for incumbents to exit
  - Fragmentation and monopoly
- Commons (public goods)
  - Technically efficient
  - No incentives for incumbents to vacate

RIETI
Research Institute of Economy, Trade & Industry, IAI

Spectrum:
Neither Property nor Commons

Marginal consumption cost	excludable	non-excludable
rival	Private goods	Commons
non-rival	Club goods	Public goods

Transaction cost

RIETI Research Institute of Economy, Trade & Industry, IAI

Spectrum as “Protocol”

- Spectrum management → device rights
  - Pricing terminals for the priority of channels
- Relocation by reverse auctions
  - Providing incentives without monopoly
  - Buying the spectrum → open
- Finance
  - General account
  - Spectrum usage fees (for device rights)
  - Auction fees (selling lower bands)

Auction Design

- "Bribing" incumbents
  - PCS auctions: selling at the highest price
  - Reverse auctions: buying at the lowest price
    - Requirement for the minimum bandwidth
- VCG mechanism
  - Winner's price = externality (second price)
  - Efficient: truth telling
    - Competitive → the cheapest price

Decision of Payment

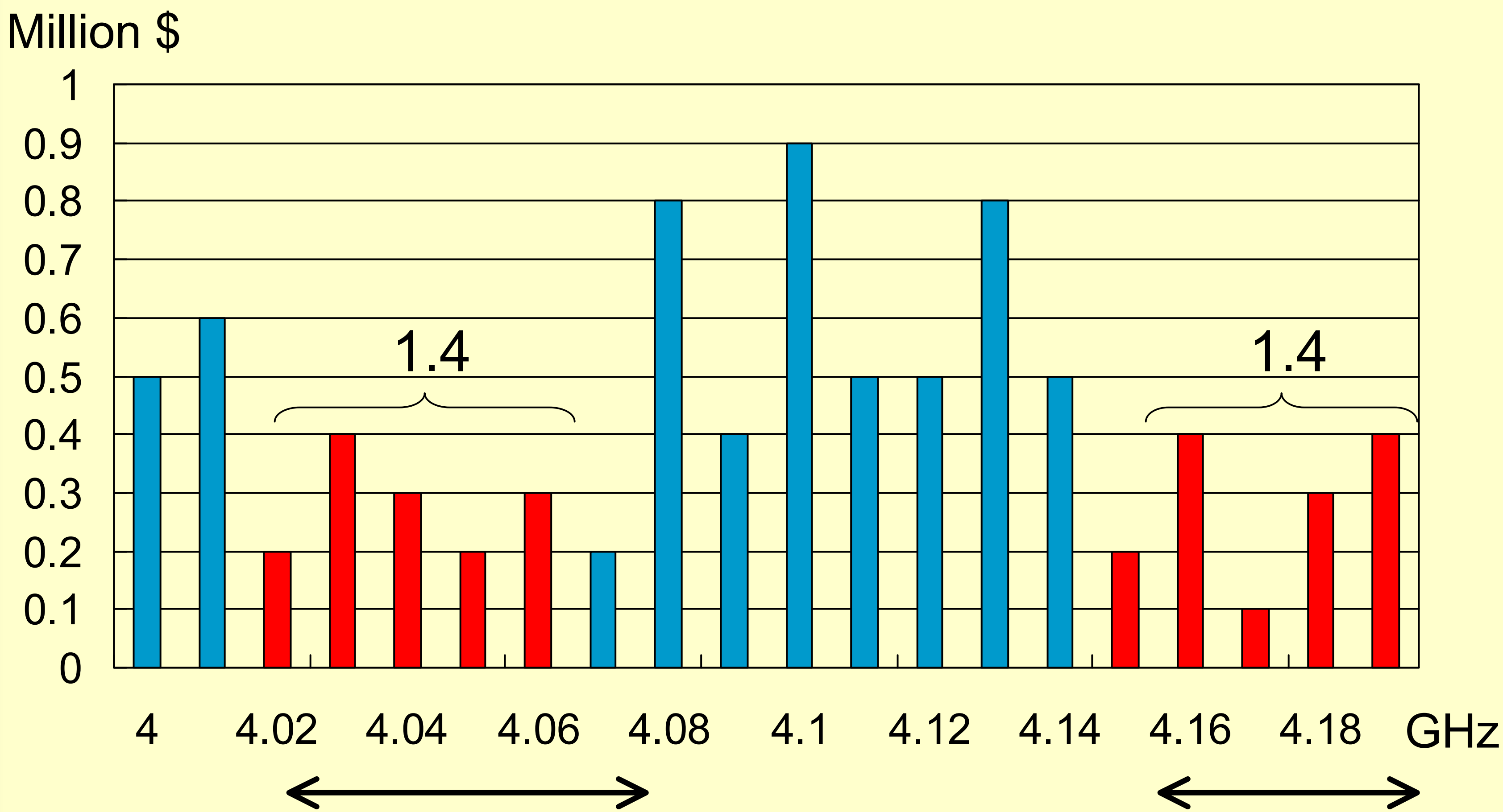
Price of i = alternative group's value - other's value

(if not for i) (in i's group)

$$t_i(\theta) = \sum_{j \neq i} v_j(x_{-i}^*(\theta_{-i}), \theta_j) - \sum_{j \neq i} v_j(x^*(\theta), \theta_j)$$

- θ: valuation
- x^*: efficient decision (1 or 0)
- $v(x, \theta) = x\,\theta$
- - i : firms other than i

An Example



Million $
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1.4
1.4
4
4.02
4.04
4.06
4.08
4.1
4.12
4.14
4.16
4.18
GHz

Results

- Proposition 1

  "Truthful reporting is a dominant strategy"

- Proposition 2

  "With increasing competition, the buyout prices will be close to the total value of the least efficient group"

Hybrid Approach