Mobile Market and Policy in Korea

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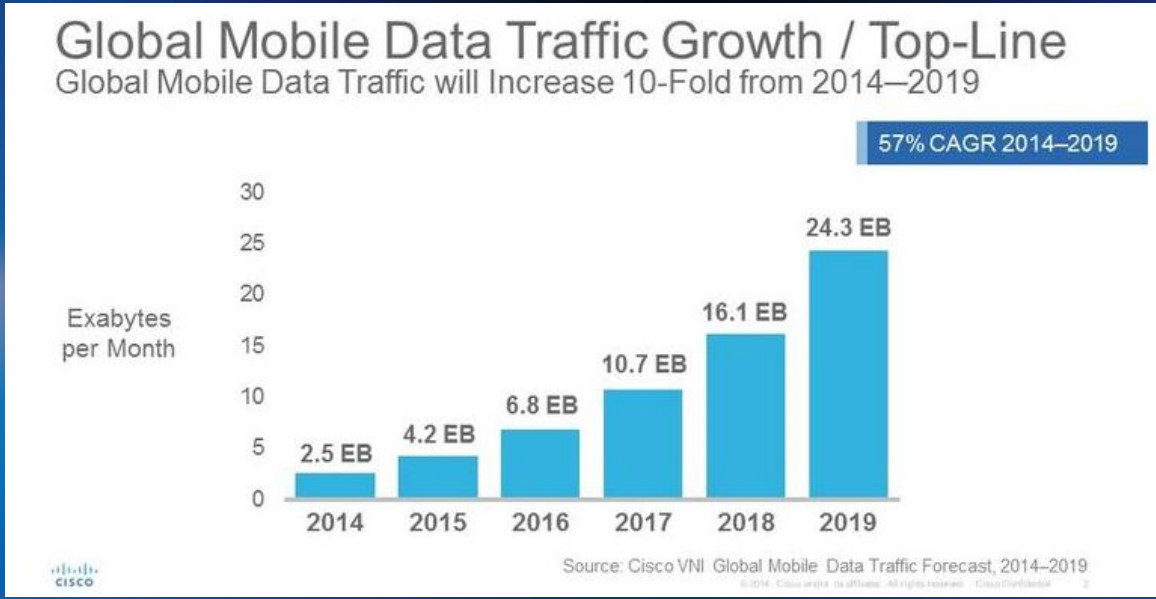
I. Market Issues
II. Implications
III. Is competition feasible in the telecommunications industry?
IV. How to assign spectrum and collect spectrum fees?
V. Spectrum fragmentation
VI. Conclusion

I. Market Issues

1. Mobile traffic is skyrocketing
   - Rapidly growing use of smart devices
   - Growing use of streaming services



I. Market Issues

2. Saturation and concentration in mobile markets

- Mobile subscription rate exceeded 100%
  - In the U.K. in 2005, reached 131.7% in 2009
  - In Korea in 2010, reached 103.9% in 2010.

I. Market Issues

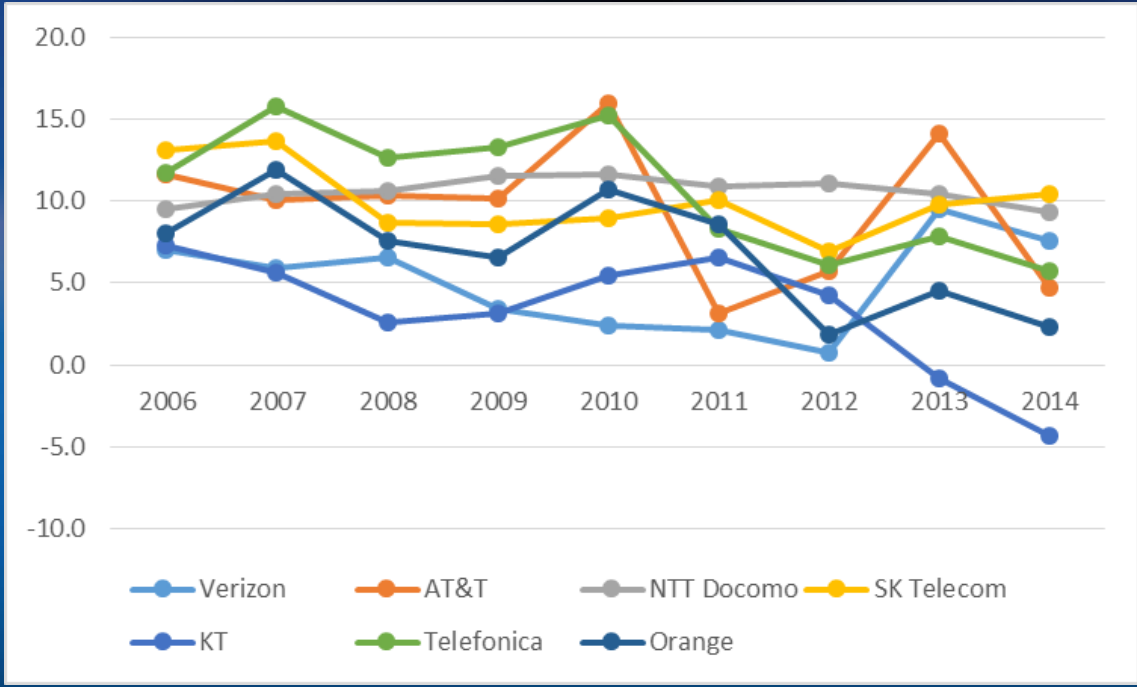
2. Saturation and concentration in mobile markets

- In the U.K., Orange and T-Mobile merged into Everything Everywhere in 2009: 5 MNOs to 4 MNOs.
- In Australia, Vodafone, AU merged with Hutchison in 2010: 4 MNOs to 3 MNOs.
- Korea has 3 MNOs and Japan 3 MNOs are dominating. Adding another one?

I. Market Issues

3. Stagnant or falling profit

- Recent changes in profitability since 2006 (net margin = net income/revenue)

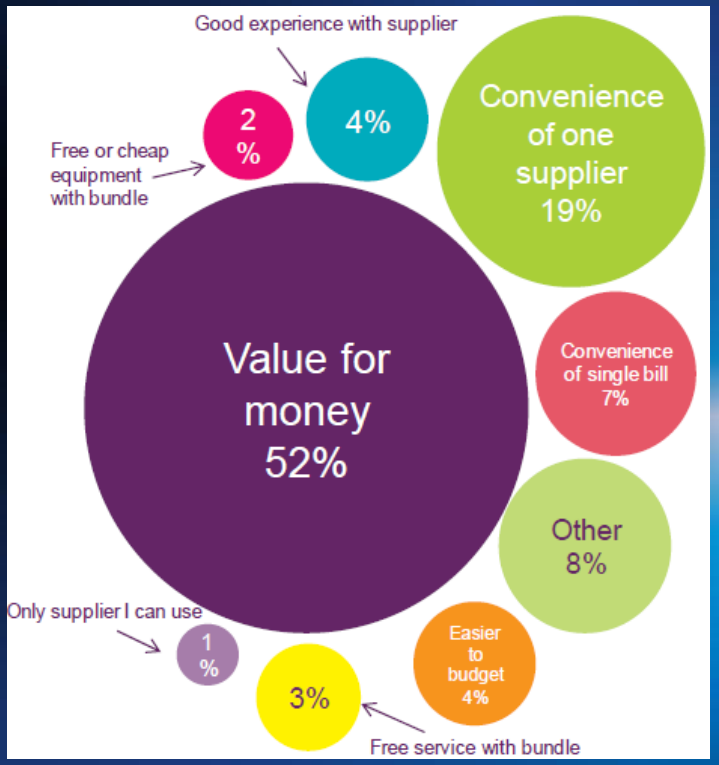


I. Market Issues

4. Evolution of wireless network service from voice service to data connection service
   - Wireless communications service is turning into a wireless Internet connection service
   - MNOs' business model is becoming similar to ISPs'
     - Stagnant revenue under a fixed monthly charge system
   - Saturated market + fixed charge per user, per month → Revenue prospect is dismal.

I. Market Issues

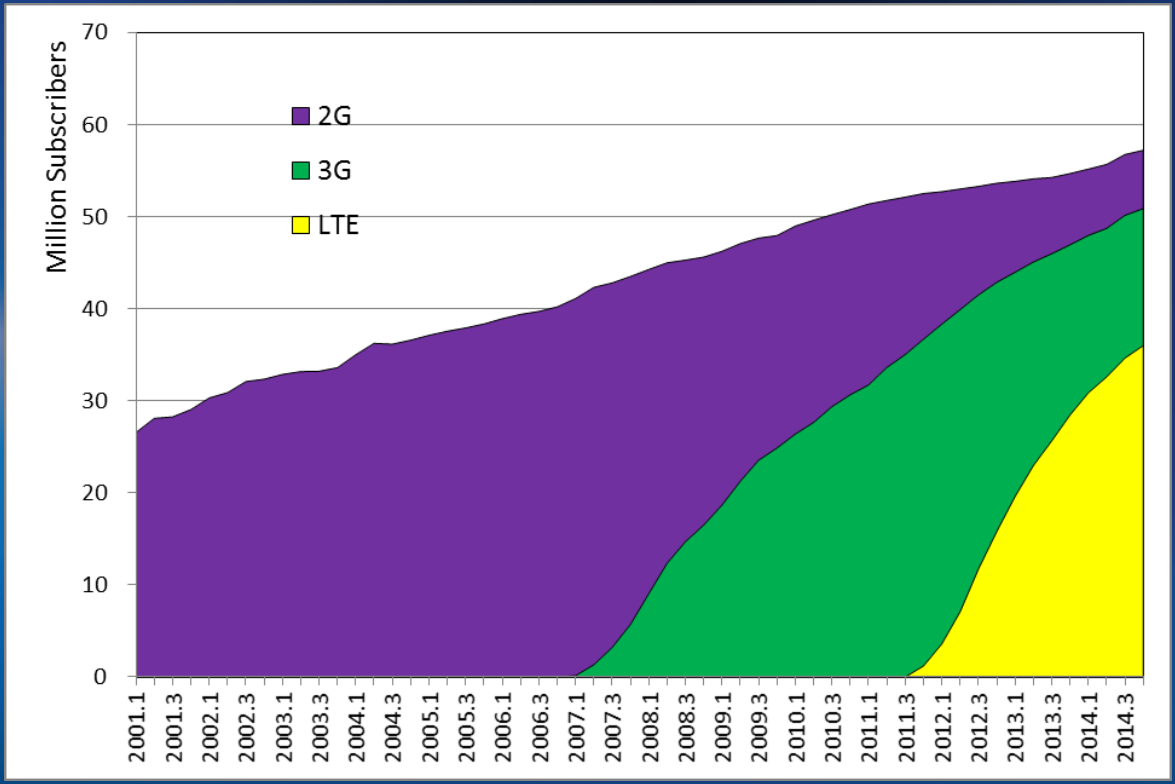
5. Intensified economies of scope: multi-purpose network
   - Reasons of bundled subscription of communications services
   - Economies of scope get stronger → more Concentration



Ofcom. (2010). *Communications market report*.

I. Market Issues

6. Upgrading services and changing revenue structure



II. Implications

1. Saturation and concentration, economies of scope in mobile markets
   - An implication: no room for new entrants and auctions will be among incumbents.
     - A two year contract becomes the norm after the adoption of smart phones → mobile markets become more rigid.
   - Facilitating competition: feasible? If not feasible, just give up?

II. Implications

2. More spectrum is needed. How to assign a swath of spectrum to users?
   - Additional spectrum and network upgrade to cope with rapidly increasing data traffic is not likely to bring much additional revenue
     - What's worse: if MNOs are required to pay large spectrum fees → Lowering MNOs' incentive to invest in network upgrades → Deter the growth of content industries.
   - Is auction still a good way to assign spectrum?

II. Implications

3. Spectrum fee payments: Changing revenue structure between services
   - Upfront lump-sum fees do not take into account the changing revenue structures of mobile communications markets
   - Royalties allocate spectrum fees flexibly as the revenue structure of mobile industry changes
     - Upfront lump-sum fees increase financial burdens of MNOs and place full risks on MNOs → deter service provision and proliferation of new content services

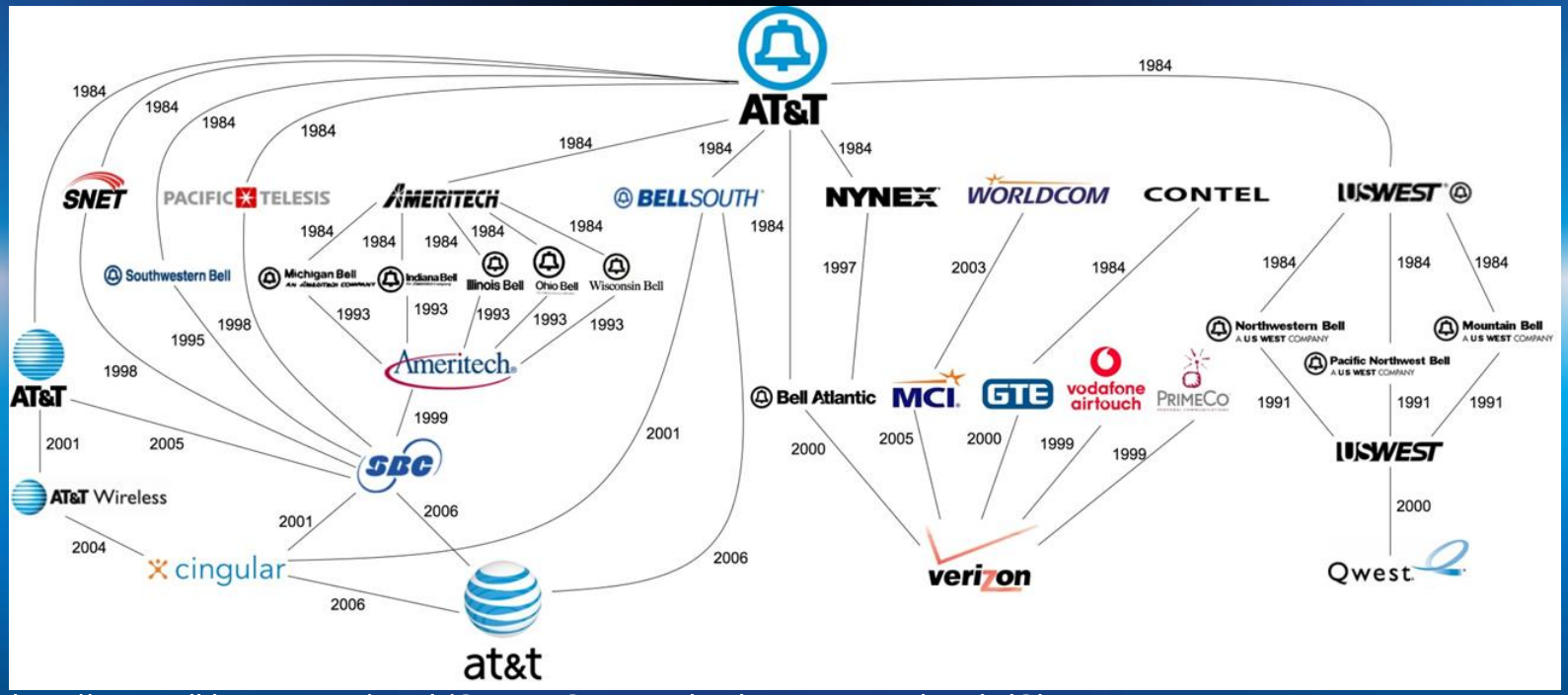
II. Implications

4. Spectrum fragmentation: a way to increase efficiency in spectrum use
   - Growing demand for wider channels
     - 2G channel width: 200 kHz
     - 3G CDMA: 1.25 MHz
     - WCDMA: 5MHz
     - LTE: 1.4, 3, 5, 10, 15, 20 MHz

   - LTE-A: 100 MHz channel by utilizing spectrum aggregation

III. Is competition feasible in the telecommunications industry?

- No!
  - History and recent M&A data show “not feasible!”



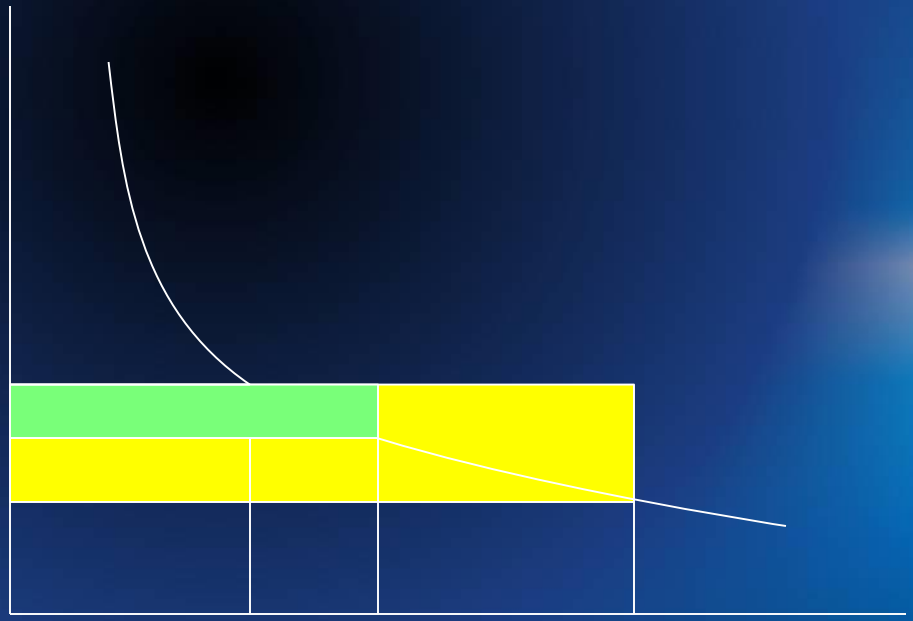
http://www.wikinvest.com/stock/Qwest_Communications_International_(Q)

III. Is competition feasible in the telecommunications industry?

- Stephen Colbert's comment
  - AT&T Divestiture in 1984 and following M&A Cases

III. Is competition feasible in the telecommunications industry?

- Economies of scale: Competition is not feasible!
  - AT&T Case
  - SKT: 252,000
  - KT: 29,300
  - LGU+: 10,600



III. Is competition feasible in the telecommunications industry?

- Is enhancing competition in the telecommunications network service market merely a myth?
  - Competition as a process
  - Or as a result.

III. Is competition feasible in the telecommunications industry?

- Policy alternatives to enhance competition
  - Functional separation: Openreach in the U.K.
  - Australian model
    - Australia is establishing a monopoly that builds and operates the national broadband network on a wholesale-only open access basis.
  - 4th player in Korea? Competition as a process.

IV. How to assign spectrum and collect spectrum fees?

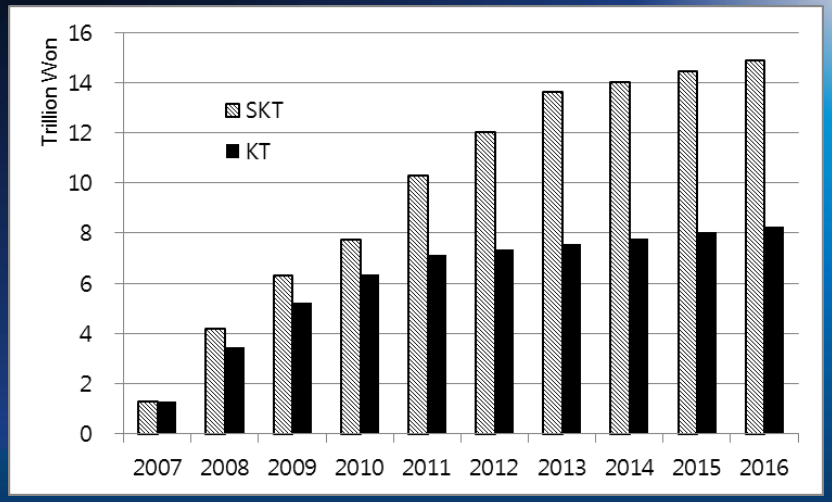
- License fees under upfront lump-sum fees and royalties
  - 40 MHz bandwidth per MNO was assigned for 3G service through a comparative hearing in October 2000
    - KT and SKT were obliged to pay 1.3 trillion Korean Won as license fees
  - The U.K. was the first country that auctioned 3G license and it garnered £22.5 billion in 2000.

IV. How to assign spectrum and collect spectrum fees?

- Did MNOs pay an exorbitant amount?
  - What if they could have paid royalties?

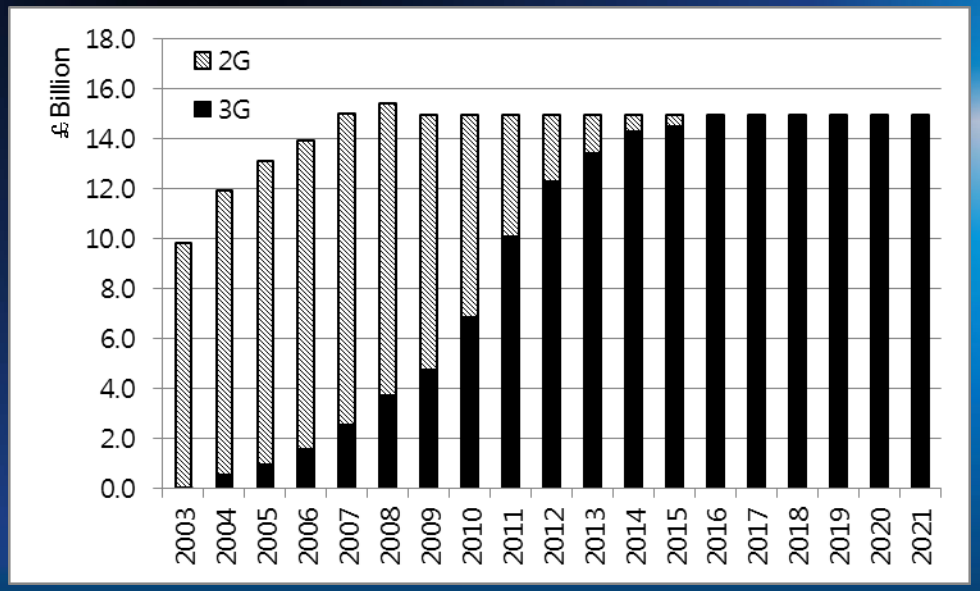
$$\text{PV of estimated total royaties} = \text{royalty rate} \times \sum_{i=1}^{15} \frac{Estimated\ 3G\ Revenue_i}{(1+r)^i}$$

  - SKT and KT
    - Revenue growth: 3%



IV. How to assign spectrum and collect spectrum fees?

- Did MNOs pay an exorbitant amount?
  - UK MNOs
    - Revenue growth: currently falling but assumed to be stable.
    - 3G subscription ratio: assumed to be mimicking Japan's.



IV. How to assign spectrum and collect spectrum fees?

- The case of Korea: SKT and KT cases

Estimated royalties of KT and SKT in year 2001 value (billion Won, royalty rate is 3%))

Discount rates	6.8	5.8	4.8	3.8	2.8	1.8
KT	898.2	996.1	1106.4	1230.9	1371.7	1531.1
SKT	1382.5	1539.2	1716.3	1916.9	2144.4	2402.9

  - The analysis indicates that KT apparently paid much larger spectrum fees than it should have in 2001, while SKT paid less than it was supposed to pay.
  - Lump-sum fees could help the bigger get bigger and the smaller get smaller.

IV. How to assign spectrum and collect spectrum fees?

- The case of the U.K. 3G auction

Estimates of U.K. MNOs' royalties in year 2001 value (£, million)

Royalty rates	2%	3%	5%	10%	20%
Royalties	1,963.0	2,944.5	4,907.5	9,815.0	19,629.9

  - U.K. MNOs paid exorbitant license fees in 2000.
    - They actually paid as much in license fees as they would have paid when the royalty rate was more than 20%
    - The hypothetical royalty rate of U.K. MNOs is about seven times higher than that of Korean MNOs

IV. How to assign spectrum and collect spectrum fees?

- Are auctions still a useful means to assign spectrum?
  - Auctions were supposed to increase efficiency in spectrum use and further competition in the mobile communications market.
  - Auction is no longer effective in the current environments
    - Auctions to assign additional spectrum for increasing data traffic are likely to be a competition only among incumbents.
    - What if all incumbents need to acquire additional spectrum?
    - Today, the only purpose served by the auction method is to extract spectrum fees

IV. How to assign spectrum and collect spectrum fees?

- Are upfront lump-sum payments still a useful way of collecting spectrum fees?
  - Upfront-lump sum fees:
    - Unbalanced financial burdens on MNOs and they could be exorbitant → Intensifying economies of scale in the long-run
  - Royalties do not hinder the evolution of mobile communications service
    - Under upfront lump-sum fees MNOs will be manipulative in determining evolution speed
    - Royalties will be flexibly adjusted as subscribers and revenues immigrate from old to new service

IV. How to assign spectrum and collect spectrum fees?

- First auction (2011.8): Three bandwidth and reservation prices
  - 10MHz bandwidth in 800MHz band: about $261 million
  - 20MHz bandwidth in 1.8GHz band: about $445.5 million
  - 20MHz bandwidth in 2.1GHz band: about $445.5 million
- Auction results
  - Simultaneous multiple round (On average 10 rounds per day)
  - 1.8GHz band: 83 round for nine days and bid rises to $995 million (SKT).
  - 800MHz band: KT
- Evaluation
  - Three bidders for three bandwidth: auctions only among incumbents.
  - 2.1GHz band went to LGU+ at the reservation price (predetermined).
  - The largest market player gets the most preferred band.

IV. How to assign spectrum and collect spectrum fees?

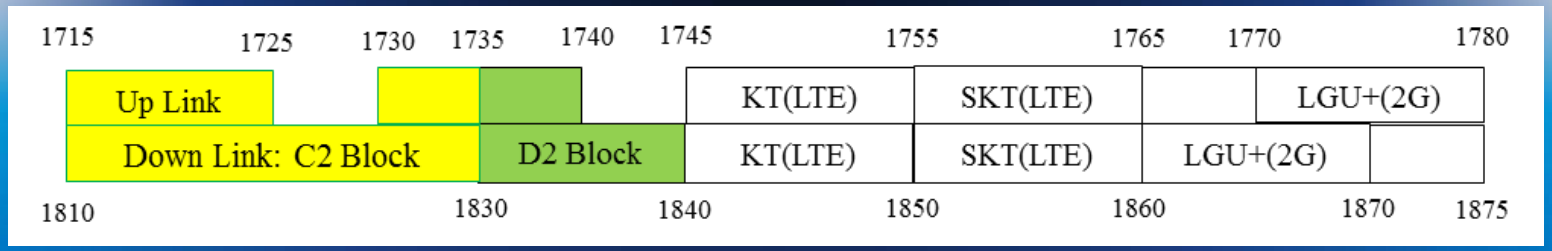
- Second auction (2013.8) Three bandwidth and reservation prices
  - 40MHz (20×2) bandwidth in 2.6GHz band: about $478.8 million
  - 35 MHz (20+15) bandwidth in 1.8GHz band: about $673.8 million
  - 15MHz bandwidth in 1.8GHz band: about $288.8 million
- Auction results
  - Simultaneous multiple round (50 rounds + Last sealed bid auction)
  - LGU+ 2.6GHz: $478.8 million, SKT 35MHz: $1,050 million (SKT).
  - KT 15MHz: $900.1 million
- Evaluation
  - Three bidders for four bandwidth: auctions only among incumbents.
  - LGU+ got 2.6GHz band at the reservation price again.
  - The largest market player gets the most preferred band.

IV. How to assign spectrum and collect spectrum fees?

- Should MNOs pay spectrum fees?
  - Japan has not levied license fees on MNOs and is the first country to have completed 3G service transition.
  - License fees are nothing but a money spinning tool to raise public funds
    - Function of spectrum fees as a screening device is withering away
  - Spectrum fees can be justified only when the government can use public funds more efficiently than MNOs
  - It may be better not to charge spectrum fees at all that could possibly deter network upgrades

V. Spectrum fragmentation

- A wider channel means more data throughput per second
  - Three MNOs in Korea (SKT, KT, LGU+)
  - KT: D2 block should be put up for LTE auction!
  - SKT and LGU+: D2 should not!



V. Spectrum fragmentation

- What causes spectrum fragmentation?
  - Rapid growth in data traffic demand
    - Greater data throughput/sec → wider channel width
    - One million-fold capacity increase in mobile communication for the past 45 years (Chandrasekhar et al., 2008)
      - 25 times increase: more spectrum
      - 25 times increase: transmission technology improvement
      - 1600 times increase: reduced cell size
    - Another dimension ignored in the past: channel width

V. Spectrum fragmentation

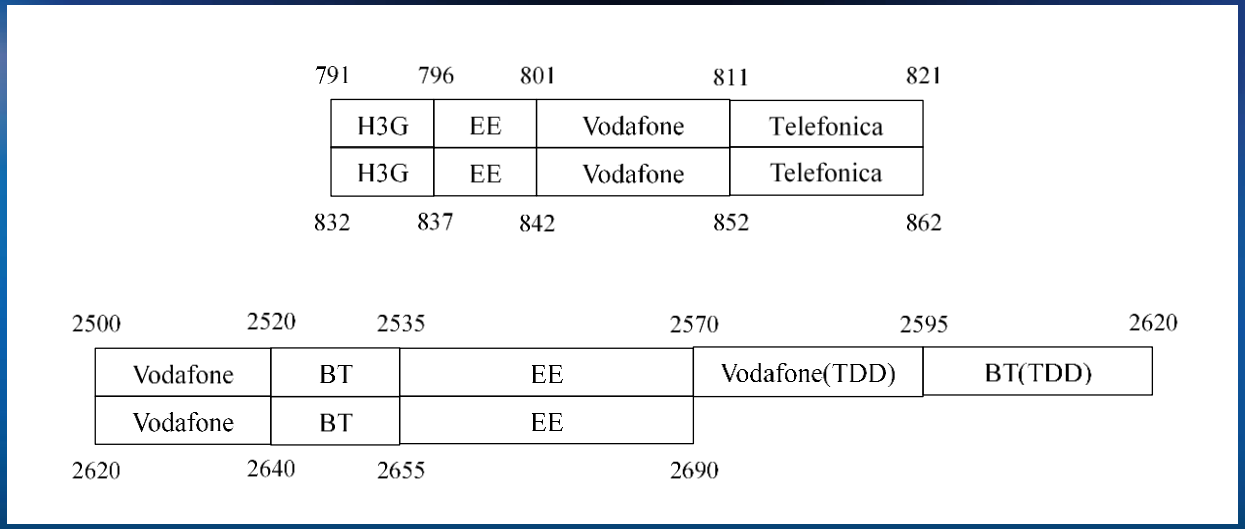
- What causes spectrum fragmentation?
  - Path dependence & fast service evolution
    - Coexistence of multiple generations of services
      - 2G and 3G uses narrow channel widths: 10 MHz bandwidth was not a problem
    - Facilitating the termination of 2G and 3G services

V. Spectrum fragmentation

- What causes spectrum fragmentation?
  - Limited functionality of spectrum trading
    - Information asymmetry and transaction costs
    - Limited spectrum property rights
    - Permission is often needed for trading and leasing

V. Spectrum fragmentation

- What causes spectrum fragmentation?
  - Oligopolistic market structure
    - Spectrum auction is used to boost competition
    - More MNOs means potentially more fragmentation
    - UK 4G auction 2013: 5~20 MHz



VI. Conclusion

- Present mobile communications market situation
  - International markets are saturated
  - The number of MNOs is declining
  - Mobile profits are stagnant or falling
  - MNOs are becoming wireless ISPs
  - Economies of scope are strengthening
- Upfront lump-sum fees can be exorbitant
  - Reducing rather than boosting competition by increasing fixed costs and placing unbalanced fees on MNOs
  - Deterring a smooth transition of mobile service from 2G to 3G, and then 4G

VI. Conclusion

- Governments need to consider assigning additional spectrum to incumbents without auctions and adopting royalties as a way of collecting spectrum fees
  - Collecting spectrum fees in and of itself cannot and should not be the first objective of the governments
  - It may be better to assign additional spectrum to incumbents without charging at all
- Competition and Increasing efficiency in spectrum use
  - Facility based competition?
  - Wholesaler approach + service competition
  - Terminating old services

Q&A