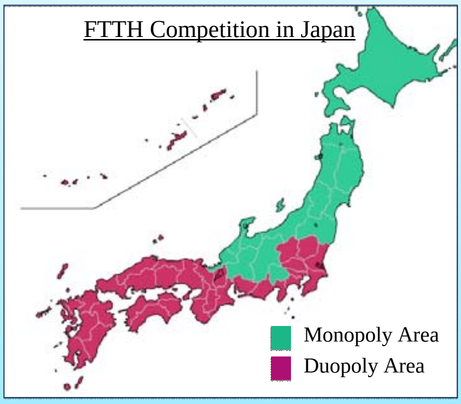
Investment Risks and the Public Policy to expand the broadband network in Japan

Yuki Shoji
The Graduate University of Advanced Studies

The Present Status of Broadband in Japan and the Purpose of this Presentation

In 2001, NTT started FTTH services which provide higher transmission speed and are more stable than DSL. Consequently, DSL subscribers gradually have been migrating to FTTH and in 2008, FTTH subscribers exceeded DSL subscribers. Providing FTTH services needs huge investment. Therefore, only a few operators can enter the market. In the green area of the map, NTT is the sole provider of FTTH service. In the red area, power utility companies constructed their own network and entered the markets.

Some operators insist that NTT have to open their FTTH network to new entrants (i.e. service competition). On the contrary, NTT insists that such open network policy will harm the infrastructure competition in red areas. In this presentation, the characteristics of infrastructure competition and service competition are examined by using an economic model in order to consider FTTH competition policy.

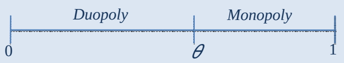


The Cournot Model of Broadband Competition

Outline of the Model: To analyze a geometrically asymmetric competition of broadband market, the model assumes that incumbent operator and an new entrant play two stages of Cournot duopoly game in a linear uniform demand market.

Definition of the Model

Linear Duopoly Market

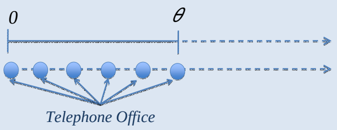


q_D: quantity of incumbent in [0, θ]
q_E: quantity of new entrantin [0, θ]
Demand Function: $p=a-1/\theta(q_D+q_E)$

Two stage game

First Stage: The new entrant determines service area (θ)
Second Stage: The incumbent and the entrant simultaneously determine their price and quantity produced

Cost of both firms



Marginal Cost: c_D, c_E
Fixed Cost: $F\theta$

Calculation of the Model

Profit Functions

$$\pi_D = \frac{1}{\theta}\left\{a - \frac{1}{\theta}(q_D + q_E) - c_D\right\}q_D + \frac{1-\theta}{\theta}\left\{a - \frac{1}{\theta}(q_D + q_E) - c_D\right\}q_E$$

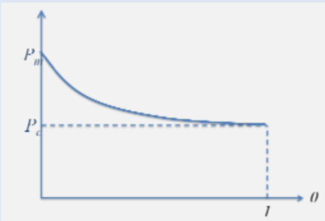
$$\pi_E = \frac{1}{\theta}\left\{a - \frac{1}{\theta}(q_D + q_E) - c_E\right\}q_D - F\cdot\theta$$

Reaction Functions

$$q_D = R_D(q_E) = \frac{-(2-\theta)}{2}q_E + \frac{\theta(a - c_D)}{2}$$

$$q_E = R_E(q_D) = \frac{-1}{2}q_D + \frac{\theta(a - c_E)}{2}$$

Relation between Price and Area Coverage

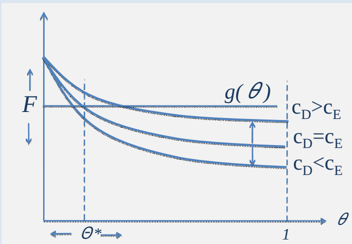


Conclusion of the Model

Decision of Entrant's Area Coverage (θ *)

$$\frac{\partial \pi_E}{\partial \theta} = \frac{(2-\theta)}{(2+\theta)^3}(a + c_D - 2c_E)^2 - F = 0$$

$$g(\theta) = \frac{(2-\theta)}{(2+\theta)^3}(a + c_D - 2c_E)^2 = F$$



Entrant's area coverage (θ *) will be decided by :
Fixed Cost: F
Marginal Cost: c_D, c_E

Investment Risks and the Public Policy

Measurement of Investment Risks

There are many methodologies to measure investment risks. NPV is one of the major methodologies.

$$NPV - I = \sum_t \frac{Cf_D^t}{(1+r)^t}$$

NPV: Net Present Value I: Investment Cf: Cash Flow

In our simplified static model, the one period profits of both firms " π_I" is used as substitute for the cash flow.

Profit Function of the Stage 2 Equilibrium

$$\pi_D = \frac{\{a + \theta c_E - (1+\theta)c_D\}^2}{(\theta+2)^2}$$

$$\pi_E = \frac{\theta(a + c_D - 2c_E)}{(2+\theta)^2}$$

Service Competition vs. Infrastructure Competition

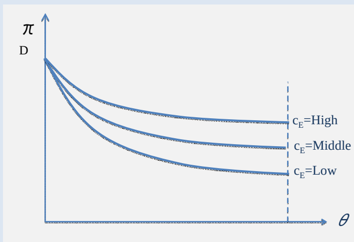
The Model shows relationship between the profit , investment and the marginal costs. The investment and marginal costs depend on whether the entrant constructs network by himself (Infrastructure Competition) or rent it from the incumbent (Service Competition).

	Investment	Marginal Cost
Service Comp.	Low	High
Infra-Comp	High	Low

Benchmark Assumptions

a=1, c_D=1, c_E(High)=1.2, c_E(Middle)=1, c_E(Low)=0.8

The Results of Simulation



The results of benchmark model imply that the low marginal cost which is realized by infrastructure competition may cause profits decline of the incumbent. This may reduce incentive of incumbent for further investment because of the risks of its return.