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"NEW ENTRIES WITH COOPERATION" GAME IN THE MOBILE TELECOMMUNICATION MARKET

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ABSTRACT

The structural barriers to entry to the mobile telecommunication market are discussed. We develop a Cournot(-type) competition game where the cooperative action is strategically executed by every player in the market, and show that "one of the structural barriers to entry to the market is the distribution of share achieved by small MNOs."

1 INTRODUCTION

This paper aims to evaluate the structural barriers to entry to the mobile telecommunication markets. The government, especially the Japanese government, frequently tried to facilitate new entries into the oligopoly market by introducing new regulations. However, there are many cases that the new MNOs (Mobile Network Operators) tied up with or formed a merger with the existing MNOs. It implies that a few MNO rarely succeed in the entry of the market independently. In this paper, we develop a mathematical model based on the game theory, where the cooperation between new and the existing MNOs is incorporated. By employing real market data, we analyze the MNOs' cost structure. We evaluate the structural barriers to entry to the market by the likelihood of the cooperation between MNOs.

2 PREVIOUS STUDY

The game-theoretic approach is one of the mainstreams in studying the oligopoly markets. Regarding the mobile telecommunication market, Louis dealt with the French case [1]. In this paper, we invoked Louis's approaches and extended the game theory models to consider cooperation between MNOs.

3 DATA AND METHODOLOGY

To evaluate the structural barriers to entry to the telecommunication markets,

1) we firstly develop mathematical models based on the game theory and find equilibrium solutions,
2) by analyzing the equilibrium solutions and the actual market data, we estimate the MNOs' cost structure,
3) we finally evaluate the structural barriers to entry to several markets by the previous cost structures.

We assume the market with n MNOs and one new MNO. In the market, MNOs are assumed to compete under Cournot competition. The revenue of MNO is as follows:

$$\Pi_i(q_i) = Pq_i - c_i q_i, \quad P = a - bQ = a - b\sum_{i=1}^{n} q_i. \tag{1}$$

Every MNO try to maximize their revenue (Π_i) by controlling the number of customers (q_i). The price(P) is a unified market price and each MNO has different marginal costs (c_i). We can obtain the equilibrium solutions as functions of the marginal costs (c_i).

$$\bar{q_i} = (a - c_i - b\bar{Q})/b, \quad \bar{Q} = (na - \sum_{i=1}^{n} c_i)/((n+1)a). \tag{2}$$

We compared the MNO's market share (Table1) and estimated the marginal costs (c_i). Using the marginal costs (c_i) based on our models, two cases are considered; the cooperation case where the new MNO cooperates with one existing MNO, and the competition case where the new MNO competes with all existing ones. We defined collective payoff, which new MNO can gain by forming a coalition, as the alliance advantage value. The higher the alliance advantage value, the more collective payoff. Because the alliance advantage value varies according to the market share of the new MNO, we calculated the alliance advantage value while varying the share. Figures 1, 2, 3, and 4 show the results. We found the market with small MNOs' share distribution, e.g., the Japanese market, is the market with high entry barriers. It implies when a new MNO cooperates with the existing MNOs, they can obtain more profit than the case when they compete with all MNOs. In such a market, the new MNO tends to take a cooperation strategy.

Table1. Share of MNOs

Country	4G Market Share (%)			
	MNO 1	MNO 2	MNO 3	MNO 4
U.S.A.	41	32	16	11
U.K.	38	25	21	16
Japan	45	31	24	-
China	61	19	20	-

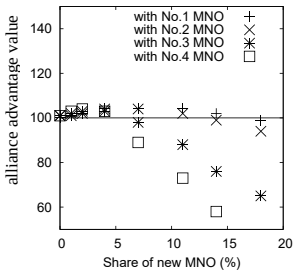

Figure1: U.S.A.

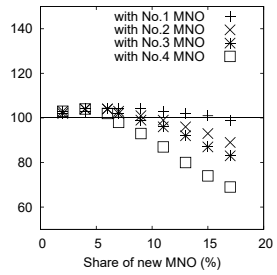

Figure2: U.K.

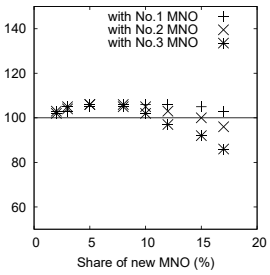

Figure3: Japan.

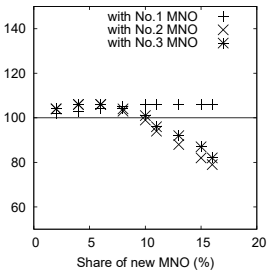

Figure4: China.

4 FURTHER STUDY

In our model, we assumed that all MNOs provide their service at the same price and quality. In the actual market, however, the service quality is the key to define the MNOs' discrimination strategy. It is important to extend our models by employing their service quality (X_i). MNO's revenue (Π_i) is extended to;

$$\Pi_i(q_i, X_i) = Pq_i - c_i q_i - d_i X_i - \gamma X_i^2, \quad P = a - bQ = a - b\sum_{i=1}^{n} q_i + \beta X_i. \tag{3}$$

5 CONCLUSION

Analyzing the mathematical models based on game theory with actual market data, we evaluate the structural barriers to entry to the mobile telecommunication markets. Our results imply that "one of the structural barriers to entry to the market is the distribution of share achieved by small MNOs."

REFERENCES

de Mesnard, L. 2011. "More firms, more competition? The case of the fourth operator in France's mobile phone market." *Int. J. Production Economics* 130:186-195.