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Series No.46

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Merger Analysis in the Generalized Hierarchical Stackelberg Model

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Abstract

In this paper, we examine which mergers are profitable in the generalized hierarchical Stackelberg model. Extending the analysis of the existing literature, we show the general conditions in which mergers can generate profit. We also examine what form of mergers can generate higher profits. Further, we analyze the effect of mergers on social welfare.

Keywords: hierarchical Stackelberg, merger, oligopolistic competition

JEL classification numbers: D43, L11, L13

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1 Introduction

In this paper, we examine which mergers are profitable in the generalized hierarchical Stackelberg model with quantity competition. The paper also investigates what form of mergers can generate higher profits under the generalized hierarchical Stackelberg model.

Since the pioneering article by Salant, Switzer, and Reynolds (1983) analyzed profitable mergers in Cournot oligopoly, a volume of literature has been dedicated to studying the profitability of mergers by using the framework of oligopoly theory. Salant, et al. (1983) showed that mergers are not profitable under Cournot quantity competition if the market share of the merged firm is not sufficiently large. Perry and Porter (1985) and Farrell and Shapiro (1990) examined profitable mergers and welfare implications in the Cournot quantity competition. They showed that mergers can be profitable if costs are sufficiently convex.

In the Stackelberg model, Daughety (1990) examined mergers under the homogeneous quantity oligopoly with linear demand and cost functions. Daughety (1990) showed that a horizontal merger is potentially profitable for the merged firm and that this merger may be advantageous from the viewpoint of social welfare, although he focused only on the merger between two followers resulting in a firm that becomes a leader. Huck, Konrad, and Müller (2001) were the first to observe that mergers between a leader and a follower increase the joint profits of firms. They compared the profitability of mergers between two leaders with that of mergers between a leader and a follower in the Stackelberg model and showed that mergers between a leader and a follower are unambiguously profitable. Daughety (1990) and Huck, et al. (2001) analyzed mergers under the two-stage Stackelberg quantity competition.

We extend the two-stage Stackelberg model to a multi-stage model in order to generalize the analysis of the existing literature on mergers. This multi-stage Stackelberg model is termed as the hierarchical Stackelberg model. Under this model, firms choose their outputs sequentially. Anderson and Engers (1992) compared an $n$-firm Cournot model with an $n$-hierarchical Stackelberg model. They showed that the Stackelberg equilibrium price is lower, the total surplus is higher, and the total profits are lower. In their analysis, however, they considered only one firm at each level. In reality, there exist several firms at the same level and many firms choose the quantity level simultaneously. Existing literature has paid scant attention to mergers under the hierarchical Stackelberg model.

We extend the analysis on mergers under the generalized hierarchical Stackelberg model (hereafter, GHSM). Under the GHSM, firms compete under hierarchical Stackelberg oligopoly, in which the output decisions of firms existing at different levels is made sequentially, and there exist several firms at the same level. We investigate the Stackelberg model that is combined with Cournot quantity competition at each level. We present general results regarding the profitability of mergers, focusing on the timing of the decision-making regarding quantity.

Although we have focused our attention on the general analysis in the hierarchical Stackelberg model from a theoretical viewpoint, our paper is motivated by the profitability of the real mergers and acquisitions (M&A) which tend to be increasing and, recently, tend to assume various forms.
In order to emphasize the differences between firms, much of the existing literature has usually introduced the differences in firm size, cost difference, capacity constraint, and so forth. Even if there exists no difference in size and technology, however, firms have experienced differences in the timing of decision-making. In this case, mergers need to be analyzed in a more comprehensive model. We pay attention to the impact of the difference in the timing of the decision-making regarding quantity. By abstracting differences among firms, we examine the relationship between the profitability of mergers and the timing of decision-making. We analyze the effects that the different timing of the decision-making has on a firm’s profit and on social welfare. The paper attempts to present some merger guidelines.

By various reasons such as historical path-dependence, geometrical distance, innovation technology, the time of the announcement of production plans differs among firms. As an example, suppose a market competition between large companies and medium and small companies. Even if the difference in firm size is not taken into account, there still exists the difference in the timing of decision-making. It is well-known that in the semiconductor industry such as the DRAM industry, the leading manufacturers announce their production plan in advance. The manufacturers that enter the market late correspond by adjusting their quantity of DRAM produced.

As another example, suppose the international market competition among domestic firms and foreign firms. Because of the time lag of import and the difficulty on acquiring market information, the quantity choice made by the foreign firms tends to be delayed. Because domestic and foreign firms differ in the timing of output coordination, a merger between a domestic firm and a foreign firm needs to be analyzed under the hierarchical Stackelberg model. On the other hand, suppose that the foreign multinational firms have the power of market control in a developing country. In these countries, the domestic firms decide their quantity after learning the output choice announced by the leading multinationals. When there is a difference in the timing of output choice, the market structure should be explained under the multi-stage hierarchical Stackelberg competition.

This paper examines whether or not mergers are profitable under the generalized hierarchical Stackelberg model. We show the conditions for a profitable merger. Further, we analyze the effects of mergers on social welfare.

The remainder of the paper is organized as follows. Section 2 describes the model. Section 3 derives the results with regard to the profitability of mergers. Section 4 examines the effect on social welfare. Section 5 includes the concluding remarks.

2 The Model

We consider quantity competition in the case of homogeneous goods in the hierarchical Stackelberg model that consists of $K$ levels. There exist $n_k$ identical firms at the $k^{th}$ level, $k = 1, 2, \cdots, K$. Firms compete under Cournot quantity competition at each level. The index of the firm at the $k^{th}$ level is denoted by $x$; $x = 1, 2, \cdots, n_k$. The total number of firms is $N \equiv \sum_{k=1}^{K} n_k$. $q_{xk}$ denotes the individual output of the $x^{th}$ firm at the $k^{th}$ level. Since all the firms at each
level are identical, the output is abbreviated as \( q_k \equiv q_{kk} \) \( \forall x \).

The inverse demand function is given by \( P(Q) = a - bQ \) with \( Q = \sum_{k=1}^{K} n_k q_k \), which denotes the aggregate industrial output. The cost function is linear and the marginal cost is denoted by \( c; c < a \). Given the linearity of the model, we assume that \( a = 1, b = 1, \) and \( c = 0 \) without loss of generality, that is, both the units of quantity and price are normalized.

The firm’s profit at the \( k \)-th level is \( \pi_k = P(Q) q_k \). Under the Stackelberg model, at the upper levels, the predecessor firms make their individual output choices independently and simultaneously, and at the lower levels, the successor firms make their decisions after observing the total quantity supplied by the predecessors. We focus on the symmetric subgame perfect equilibrium.

The output level in the equilibrium is as follows:

\[
q_k = \frac{1}{\prod_{i=1}^{k} (n_i + 1)}.
\] (1)

The aggregate industry output and the profit margin are calculated as follows: \( Q = \sum_{k=1}^{K} \frac{n_k}{\prod_{i=1}^{k} (n_i + 1)} \) and \( P(Q) = \frac{1}{\prod_{i=1}^{n} (n_i + 1)} \). The profit of the firm at the \( k \)-th level is as follows:

\[
\pi_k = \frac{1}{\prod_{i=1}^{k} (n_i + 1)^2 \prod_{i=k+1}^{K} (n_i + 1)}.
\] (2)

### 3 An Analysis of Merger Profit

In this section, we investigate whether mergers among firms are profitable. We denote the number of firms at each level by the vector \( N \equiv (n_1, n_2, \ldots, n_K) \) in the interest of brevity. The profit of a firm at the \( k \)-th level when the vector of the number of firms is \( N \) is represented by \( \pi_k(N) \).

First, we examine a merger within the same level.

**Proposition 1.** Consider a merger by \( m \) firms within the same \( k \)-th level, \( 1 < m < n_k \). For the merger to be profitable, the market share of the merged firm within the \( k \)-th level must exceed at least 80%. In other words,

\[
m \pi_k(N) < \pi_k(N'); N' \equiv (n_1, \ldots, n_k - m + 1, \ldots, n_K) \iff \frac{mq_k}{n_k q_k} > \frac{4}{5}.
\] (3)

**Proof.** The condition under which the profit of the merged firm exceeds the sum of the profits of \( m \) identical firms before the merger is \( m \pi_k(N) < \pi_k(N') \). Substituting (2) into this condition, \( m(n_k - m + 2)^2 < (n_k + 1)^2 \) is obtained. Arranging this, \( n_k \leq m - 1 + \sqrt{m} \) is derived. The share of the merged firm at the \( k \)-level is \( \alpha \equiv \frac{mq_k}{n_k q_k} = \frac{m}{n_k} \); therefore, for the share to be profitable for the merged firm, it must satisfy the following inequality: \( \alpha \geq \alpha(m) \equiv \frac{m}{m - 1 + \sqrt{m}} \), where \( \alpha(m) \) is the minimal share required for a profitable merger. The first-order and the second-order derivatives of \( \alpha(m) \) are \( \alpha'(m) = \frac{1/2 \sqrt{m - 1}}{(m - 1 + \sqrt{m})^2} \) and \( \alpha''(m) = \frac{-3(m - 1)^{1/2} + 7}{4(m - 1 + \sqrt{m})^4} \), respectively. By solving the f.o.c. of minimization, \( \alpha'(\hat{m}) = 0, \hat{m} = 4 \) is obtained. Since the s.o.c., \( \alpha''(4) > 0 \),
is satisfied in the neighborhood of \( \hat{m} \), \( \hat{m} \) is a local minimum value. Moreover, \( \alpha(m) \) is strictly decreasing when \( 0 \leq m < \hat{m} \) and strictly increasing when \( m > \hat{m} \). Thus, \( \hat{m} = 4 \) is the global minimum value. The minimal share is \( \alpha(\hat{m}) = \frac{4}{5} \).

This proposition reinforces the result of Salant, et al. (1983) that derives the condition in which mergers generate a profit under Cournot competition. We show that under the Stackelberg model, the merger of firms at the same level is not profitable unless it covers more than 80% of the market share at the same level. Further, whether a merger within the same level is profitable is independent of the number of firms at other levels. As an example, when there are five firms at the same level and four of them merge, their merger can generate a profit under the least market share at this level.

Next, we examine a merger between two firms across different levels. In accordance with the existing literature, it is assumed that the merged firm will belong to the upper level after the merger.

**Proposition 2.** Suppose that two firms belonging to the \( k^{th} \) and the \( l^{th} \), \( k < l \), levels merge and that the merged firm belongs to the \( k^{th} \) level. This merger across different levels is essentially profitable. That is,

\[
\pi_k(N) + \pi_l(N) < \pi_k(N^{-l}); N^{-l} \equiv (n_1, \ldots, n_k, \ldots, n_l - 1, \ldots, n_K). \tag{4}
\]

**Proof.** When the number of firms changes from \( N \) to \( N^{-l} \), the difference in the profits due to the merger is defined by \( \Delta \pi(N, N^{-l}) \equiv \pi_k(N^{-l}) - (\pi_k(N) + \pi_l(N)) \). It is calculated as follows:

\[
\Delta \pi(N, N^{-l}) = \frac{\prod_{i=k+1}^{l}(n_i + 1) - n_l}{n_l \prod_{i=1}^{l}(n_i + 1)^2 \prod_{i=l+1}^{K}(n_i + 1)} > 0. \tag{5}
\]

The positive sign is immediately obtained because \( \prod_{i=k+1}^{l}(n_i + 1) > n_l \).

This result reinforces that was presented by Daughety (1990) and Huck, et al. (2001) who insisted that mergers across different levels are always profitable under a two-stage Stackelberg model. It is difficult for a merger within the same level to be profitable, while mergers across different levels are always profitable. Mergers between firms that decide about the output quantity at the same time are relatively unprofitable; however, mergers between firms that make decisions at different times generate profit. The two propositions mentioned above suggest that heterogeneity with regard to the decision of firms may be an important factor in a merger.

Next, we compare the profitability of mergers across different levels. We define the difference in the increasing profits due to mergers between two firms of different levels, the \( l^{th} \) and the \( l'^{th} \) levels, as \( \Delta^2 \pi(N^{-l}, N^{-l'}); l < l' \). Since the increment in profits due to a merger between two firms of different levels, the \( k^{th} \) and \( l^{th} \) levels, is denoted by \( \Delta \pi(N, N^{-l}); k < l \), the difference

\[1\text{If } n_l = 1 \text{ before merger, the number of levels decreases from } K \text{ to } K - 1 \text{ after merger, although the calculation is always held.} \]
in the increasing profits is calculated as follows:
\[
\Delta^2 \pi(N^{-l}, N^{-l'}) \equiv \Delta \pi(N, N^{-l}) - \Delta \pi(N, N^{-l'}) = (\pi_k(N^{-l}) - \pi_l(N)) - (\pi_k(N^{-l'}) - \pi_l(N))
\]
\[
\equiv \frac{(n_l - n_i) \prod_{i=k+1}^{l'} (n_i + 1) + n_t n_l (1 - \prod_{i=k+1}^{l'} (n_i + 1))}{n_t n_l \prod_{i=1}^{l'} (n_i + 1) \prod_{i=1}^{l'} (n_i + 1)}
\]  
(6)

Next, we compare the size of the increasing in profits due to mergers across different levels.

**Proposition 3.** Consider a merger by two firms of different levels.

(i) If the number of firms at an upper level is greater than that at a lower level, the merging firm will prefer to merge with the firm at the lower level.

If \( n_l \geq n_t \) and \( l < l' \), \( \Delta^2 \pi(N^{-l}, N^{-l'}) < 0 \).  
(7)

(ii) Suppose that the number of firms at an upper level is smaller than that at a lower level, \( n_l < n_t \). The necessary condition for a firm to prefer to merge with the firm at the upper level is that the number of firms between the \( k^{th} \) and the \( l^{th} \) levels, \( k < l \), is sufficiently larger than that between the \( l^{th} \) and the \( l'^{th} \) levels, \( l < l' \). That is,

If \( \prod_{i=k+1}^{l} (n_i + 1) > \prod_{i=l+1}^{l'} (n_i + 1) \), \( \Delta^2 \pi(N^{-l}, N^{-l'}) > 0 \).  
(8)

**Proof.** (i) By \( \prod_{i=l+1}^{l'} (n_i + 1) > 1 \), the second term of the numerator of (6) is negative. If \( n_l \geq n_t \), the first term is also negative. Thus, \( \Delta^2 \pi(N^{-l}, N^{-l'}) < 0 \). (ii) Since the first term of the numerator of (6) is positive, the necessary condition under which \( \Delta^2 \pi(N^{-l}, N^{-l'}) > 0 \) is that the positive first term exceeds the negative second term, e.g., it is necessary to satisfy the condition that \( \prod_{i=k+1}^{l} (n_i + 1) \) is sufficiently larger than \( \prod_{i=l+1}^{l'} (n_i + 1) \).  

The proposition insists that whether or not one firm should merge with another firm from a lower level depends on the number of firms of the level that the merging firm belongs to. In the case of mergers across different levels, the increment in profits due to a merger is larger since the number of firms of the level that the merging firm belongs to is smaller. Part (i) of the proposition implies that a firm should merge with another firm from a lower level if the number of firms at the upper level is larger than that at the lower level. This is because, since the number of firms at the lower level is smaller, market competition is more likely to be alleviated. Part (ii) presents the necessary condition in which one firm should merge with another firm from an upper level. Under this condition, the degree of competition mitigation due to a merger depends not only on the number of merged firms at that level but also on the number of firms at other levels.

Let us suppose a case in which the necessary condition of Part (ii) in Proposition 3 is not satisfied. If the number of firms at the upper \( l^{th} \) level is larger than that in the lower \( l'^{th} \), and the number of firms between the \( k^{th} \) and the \( l^{th} \) levels is smaller than that between the \( l^{th} \) and
the $l'$th levels, the absolute value of the difference, $\Delta^{2}\pi(N^{-l}, N^{-l'}) < 0$, grows largely. In other words, mergers between firms from a lower level result in a smaller increase in profit for the merging firm.

Next, we investigate the comparative statics of the size of the merger profit due to mergers across different levels. We consider the comparative statics of $\Delta^{2}\pi(N^{-l}, N^{-l'})$ with respect to the number of levels. In order to simplify the analysis, it is assumed that the number of firms at each level is the same, that is, $N = n_k \forall k$. The following proposition compares mergers of two firms within the same level with regard to the increment in the number of levels at the upper and lower levels. We consider two mergers that happen at different times and present the comparative statics regarding the size of the merger profit.

**Proposition 4.** Consider mergers by two firms at different levels. Suppose that the number of firms at every level is equal. If the interval between two upper levels is longer than that between two lower levels, the merger of two firms at the upper levels acquires smaller increment in the profit than that of two firms at the lower levels. That is,

$$\Delta^{2}\pi(N^{-k}, N^{-k'}) \leq \Delta^{2}\pi(N^{-l}, N^{-l'}) \quad \text{if} \quad k' - k \geq l' - l; \quad k < k' < l < l',$$

where $N^{-k} = (n_1, \ldots, n_k - 1, \ldots, n_K)$. The equality holds when $k' - k = l' - l$.

**Proof.** Substituting $n = n_k$ into (6), the difference in the increment in the profit is as follows: $\Delta^{2}\pi(N^{-l}, N^{-l'}) = \frac{1-(n+1)^{l'-l}}{(n+1)^{K+l'}}$. Comparing the difference of the upper levels with that of the lower levels, $\Delta^{2}\pi(N^{-k}, N^{-k'}) - \Delta^{2}\pi(N^{-l}, N^{-l'}) = \frac{(n+1)^{l'-k'} - (1-(n+1)^{k'-k}) - (1-(n+1)^{l'-l})}{(n+1)^{K+l'}}$ is obtained, where $k < k' < l < l'$. If $k' - k \geq l' - l$, $(n+1)^{k'-k} \geq (n+1)^{l'-l}$. Combining $1 - (n+1)^{l'-l} \leq 1 - (n+1)^{l'-l'} < 0$ with $(n+1)^{l'-k'} > 1$, $(n+1)^{l'-k'}(1 - (n+1)^{k'-k}) \leq 1 - (n+1)^{l'-l} < 0$ is satisfied.

This proposition implies as follows: If the interval between the levels of two upper firms is longer than that between the levels of two lower firms, the increment in the profit due to a merger of two firms at different upper levels is smaller than that of two firms at different lower levels. The length of the levels among firms can be interpreted as the difference in the timing of decision-making. When the difference in the timing of decision-making increases, the increment in the profit due to a merger between upper firms decreases. Therefore, the relative advantage of the upper-level mergers becomes smaller.

Finally, we investigate the relationship between the profitability of mergers across different levels and the number of firms. We consider the comparative statics on the number of firms.

**Proposition 5.** Suppose that a firm merges with another firm from a different level. If the number of firms at the other level is smaller, the merger acquires a larger increment in the profit. That is, if $n_j < \tilde{n}_j$,

$$N < \tilde{N} \Rightarrow \Delta\pi(N, N^{-l}) > \Delta\pi(\tilde{N}, \tilde{N}^{-l}); \quad \tilde{N} = (n_1, \ldots, \tilde{n}_j, \ldots, n_K).$$
Proof. Note that \( \Delta \pi(N, N^{-l}) = \frac{\prod l=1(l, n_i)}{n_i \prod l=1(n_i + 1)} \) by (5). First, we consider the \( j \)th level when \( j \neq k + 1, \cdots , l \). In this case, only the denominator of the above equation increases as \( n_j \) grows. Thus, \( \Delta \pi(N, N^{-l}) \) decreases with \( n_j \). Second, when \( j = k + 1, \cdots , l - 1 \), the difference is \( \Delta \pi(N, N^{-l}) - \Delta \pi(\hat{N}, \hat{N}^{-l}) = \frac{\prod l=1(l, n_i)}{n_i \prod l=1(n_i + 1)} \) \( \prod l=1(n_i + 1)(\hat{n}_j + 1), \) which includes \( (n_i + 1)(\hat{n}_j + 1) \), is larger than the second term, \( n_i(\hat{n}_j + n_j + 2) \). Finally, when \( j = l \), the first term in the square bracket of the numerator, \( \sum i=1(l, n_i) \), which includes \( (n_l + 1)(\hat{n}_l + 1)(\hat{n}_l + n_l + 1) \), is always larger than the second term, \( n_l(\hat{n}_l + n_l + 2) \), because \( (n_l + 1)(\hat{n}_l + 1) - n_l(\hat{n}_l + n_l + 2) = (\hat{n}_l + n_l + 1)^2 - \hat{n}_l n_l > 0. \)

This proposition implies that the fewer the firms at a level, the larger will be the increment in profit by a merger across different levels. When the pressure of market competition at a level is lower, the merger tends to be more profitable.

4 Social Welfare

In this section, we examine the effects of mergers on social welfare. Social welfare is defined as the sum of the consumer’s and the producer’s surpluses. The producer’s surplus is the sum of the consumer’s and the producer’s surpluses. The social welfare, \( W(Q) \equiv CS(Q) + PS(Q) \), is given by

\[
W(Q) = \frac{Q^2}{2} + \frac{Q}{\prod K=1(n_k + 1)} = \frac{1}{2} \left[ 1 - \frac{1}{\prod K=1(n_k + 1)^2} \right].
\]

By (11), social welfare depends on \( Q \). The lower the price, the higher is the welfare.

Let us examine the effects of mergers on social welfare. Since mergers decrease social welfare in this analysis, we examine the size of the welfare loss by a merger. The welfare loss generated by a merger, \( \Delta W(N, N') \equiv W(N) - W(N') \), is calculated as follows:

\[
\Delta W(N, N') = \frac{1}{2} \prod K=1(n_k' + 1)^2 - \frac{1}{2} \prod K=1(n_k + 1)^2.
\]

We investigate which types of mergers cause a smaller welfare loss in the GHSM. The welfare loss generated by a merger of two firms within the same \( h \)th level is equal to that by a merger across different levels between the firms at the \( h \)th and the \( k(> h) \)th levels. In this case, the welfare loss is calculated as follows:

\[
\Delta W(N, N') = \frac{2}{2} \prod K=1(n_i + 1)^2 \frac{2n_k + 1}{n_k^2}.
\]
where $N' = (n_1, \cdots, n_k - 1, \cdots, n_K)$. The welfare loss generated by a merger of $m \geq 2$ firms within the same $k^{th}$ level is larger than that by a merger between firms across different levels $h^{th}$ and $k^{th}$ ($h > k$). That is,

$$\Delta W(N, N') > \Delta W(N, N''),$$

where $N'' = (n_1, n_2, \cdots, n_k - m + 1, \cdots, n_K)$. It is calculated that

$$\Delta W(N, N'') = \frac{1}{2}\left(\frac{n+1}{2}\right)^2 K \frac{m(2(n_k+1)-m)}{(n_k-m+1)^2}.$$  

As $\partial \left( \frac{m(2(n_k+1)-m)}{(n_k-m+1)^2} \right) / \partial m = \frac{2[(n_k-m+1)^2 + (2(n_k+1)-m)]}{(n_k-m+1)^3} > 0$ is satisfied, the welfare loss increases with $m$.

We can now state the comparative statics on the number of levels.

**Proposition 6.** Suppose that the number of firms at every level is identical ($n = n_k$). The impact on the welfare loss is independent of the degree of levels of the merging firms.

**Proof.** $\Delta W(N, N'') = \Delta W(N, \overline{N''}) = \frac{1}{2(2(n_k+1)-m)} m(2(n_k+1)-m)$, where $\overline{N''} = (n_1, \cdots, n_k - m + 1, \cdots, n_K)$. If the mergers are across different levels, this loss is calculated as $m = 2$. \(\square\)

The welfare loss due to a merger of two firms at the $k^{th}$ level is equal to that of a merger at the $h(< k)$ level. Likewise, the welfare loss generated by a merger between firms across different levels $h^{th}$ and $k^{th}$ ($k > h$) is equal to that by a merger between firms at the $k^{th}$ and $l^{th}$ ($l > k$) levels. This proposition implies that the levels of the merging firms are not related to the size of the welfare loss due to the merger. Initially, this result appears peculiar since a merger between firms from an upper level acquires a larger increment in profit, as shown in Proposition 3. From the viewpoint of social welfare, however, both the upper-level and the lower-level mergers result in an equivalent aggregate output.

This proposition implies that the redistribution of industrial profits among firms does not affect welfare loss at all. Furthermore, it implies that a merger of two firms within the same level has the same effect on the welfare loss as a merger across different levels, and mergers of some firms within the same level tend to cause a larger welfare loss compared with mergers across different levels.

5 Concluding Remarks

We examined whether various types of mergers can generate profit in the GHSM with quantity competition. We examined which mergers are profitable and also what form of mergers can acquire higher profits. Analyzing mergers within the same level and across different levels, we showed that a merger across different levels essentially generates profit; however, mergers within the same level do not. We stated the conditions in which a merger can generate higher profits. Moreover, we analyzed which type of mergers is more undesirable in the view of social welfare.

In this paper, we presented comprehensive results under the GHSM. Our result implies that mergers between firms that differ in their timing of decision-making tend to generate profits and reduce social welfare.
Acknowledgements

We gratefully acknowledge financial support by Japan Securities Scholarship Foundation. This study was partially supported by Grants-in-Aid for Scientific Research (No.16730095 (Kojun Hamada) and No.18730177 (Yasuhiro Takarada)) from JSPS and MEXT of the Japanese Government. This study is also supported by the Pache Research Subsidy I–A–2 (Nanzan University, 2006). The usual disclaimer applies.

References


