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Price Leadership and Price Setting Behaviour

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We classified price leadership into dominant and barometric leadership, and then examined their effectiveness in Japan. Based on the results, we concluded the following: When the subordinate company's cost increase rate was higher than that of the leading company and when, in addition, the former acted as leader in the increase date, the positive influence of both on the price increase rate became considerable. When the leading company's price increase rate was higher than that of the subordinate company, the cost increase rate had a positive influence upon the price increase rate. That is to say, we understand that when the subordinate company's cost rose more than that of the leading company, and when the former leads the increase date and the latter leads the increase rate, price leadership is performed most effectively.

1. Introduction

Yamamoto (1988, pp.167-180) divided price setting behaviour into pricing method and the price setting system. Pricing method signifies the method which a firm utilizes in performing price making. That is, it is the method used to determine price. For example, when a firm takes a positive approach to price making, its method becomes the price-leader type, and if it takes a negative approach, its method becomes price-follower type. The price setting system shows the method used in determining the height of price level.

This paper aims to investigate the relationship between price leadership, which shows pricing method, and the full-cost principle (mark-up pricing), which signifies the price setting system. In the next section, we survey the existing study, and re-consider the empirical findings of Yamamoto's study (1988). Then, we summarize to arrive at a relationship between price leadership and full-cost principle. In section 3, we investigate the relationship between the price leadership type and price setting behaviour in Japan. Finally, section 4 contains some concluding remarks.

2. Existing Study: A Survey

2.1. Relationship between Price Leadership and Price Setting Behaviour

The controversy over price leadership started on its conditions of type and

formation. They originated from two types of leadership (i.e., dominant price leadership and barometric price leadership) which Stigler (1947, pp. 444–445) classified in order to examine existence of the kink point in a kinked demand curve¹). Thereafter, Bain (1960), Kaplan, Dirlam, and Lanzillotti (1967), Lanzillotti (1957), and Markham (1951) etc., re-examined the effectiveness of leadership and existence of the kink point by applying industry's data in the real world. Their study promoted research of an individual industry and re-examination of leadership, and added a new type of leadership (i.e., leadership by conscious parallelism). After these studies, Boulding (1941) and Uekusa (1982) etc., theorized their analytical results, and also Aspremont, Jacquemin, Gabszewicz, and Weymark (1983), Holthausen (1979), and Ono (1980) etc., have solved theoretically the stabilization of price leadership.

On the other hand, controversy over price setting behaviour originated from the full-cost principle which Hall and Hitch (1933) researched. According to their analysis, entrepreneurs in oligopoly industries²) did not determine on the basis of equality between marginal revenue and marginal cost, which the imperfect competition theory had taught. As a general rule, they adopted a price setting system which is called the full-cost principle. That is to say, "Prime (or 'direct') cost per unit is taken as the base, a percentage addition is made to cover overhead (or 'on cost', or 'indirect cost'), and a further conventional addition (frequently 10 percent.) is made for profit" (Hall and Hitch, *ibid.*, p. 19). However, as is well known, this price setting system did not explain the determination of mark-up ratio (i.e., percentage addition and conventional addition): In a word, we can not help judging that this system did not solve the determination of price level. Their research merely explained the price setting system in the business world. After their study, controversy concerning determination of the mark-up ratio began.

Main studies relating to determination of the mark-up ratio have been approached using two methods. First was the entry-preventing price theory by Bain (1956), (1968), Modigliani (1958), and Sylos-Labini (1962). Second was the study by the post-Keynesians (e.g., Aichner, 1976, Harcourt and Kenyon, 1976, and Wood, 1975), who linked price-setting behaviour with investment behaviour or economic growth. However, as Yamamoto (1988, pp. 200–209) analyzed their characteristics and limits in detail, these theories have many problems.

As a reason why the oligopoly industry adopts the full-cost principle, Eckstein and Fromm (1968, p. 1165) indicated that it is particularly suitable for price leadership. That is to say, the full-cost principle is the determining method for pricing by raising the price by a value equal to cost increase multiplied by a percentage which the entrepreneur wants to set as a target. This principle provides the mechanical calculation method in price setting, and at the same time is

able to judge easily cost conditions of the marginal producer. Therefore, Bain (1968) mentioned that when every company adopts the full-cost principle as the "common accounting system", and if the common cost factor among companies changes by the same degree, a parallel price increase becomes feasible. The leader can either use his own costs, or apply a standard costing procedure which provides an umbrella for higher cost producers (Eckstin and From, *ibid.*, p. 1165).

Considering the relationship between price leadership and price setting behaviour, it is useful to use an example by Sylos-Labini (1962, pp. 49-53). Let there be three types of technology ("technological discontinuities") and hence three types of firms in concentrated oligopoly (see **Table 1**).

Table 1. Firm Size and Cost Structure

	x	k	k/x	v
Firm 1	100	100	1	17.5
2	1,000	2,000	2	16
3	8,000	24,000	3	14

Source. Sylos-Labini (1962, Table, p. 42).

Let firms set prices according to the following full-cost equation.

$$P_m = (k/x + v)(1 + r_m).$$

Where k/x = average fixed cost, v = average direct cost, r_m = minimum profit rate, P_m = price corresponding to r_m .

Judging from output (x) and cost structure, Firm 3 is the leading company in this industry. The prices (P_m) depend on r_m . Let us assume that r_m is 5%. The prices (P_m), according to the above equation, are $P_1=19.4$, $P_2=18.9$, and $P_3=17.8$, respectively. The entry-preventing price with respect to firms in each group lies immediately below the respective P_m . The long-run elimination price coincides with the entry-preventing price. That is to say, the factor determining an upper bound of mark-up ratio is the entry-preventing price.

Firm 1 has the most disadvantageous position in price competition. Let us assume that Firm 1 is a marginal producer, and if either Firm 2 or Firm 3 become price leader to enable Firm 1 to exist within the industry, they will approximate their price level to the level of Firm 1. According to Stigler's classification, if Firm 3 acts as leader, then this type is called dominant price leadership, or if Firm 2 will be leader, such type is called barometric price leadership. When Firm 2 and Firm 3 set the minimum profit rate at 7.7% and 14.1% respectively, this industry has a unity price index of 19.4. Aims of price

leadership are not only formation of the unity price but also maximization of cooperative profit as a policy of “live-and-let-live”. Therefore, the firm that acts as leader determines its minimum profit rate in order to allow the marginal producer to exist within the industry, and thus maintains significant price differences⁹⁾ among firms.

2.2. Yamamoto's Study (1988)

Yamamoto analyzed in detail an existing entry-preventing price theory as the determination theory in mark-up ratio, and then concluded as follows: The reason why an existing oligopolistic price theory could not explain successfully the determination of mark-up ratio results in a “theoretical hypothesis, which reflected business activities in the real world, was not introduced into the economic theory” (Yamamoto, *ibid.*, p. 87).

Consequently, he re-examined an existing hypothesis of business behaviour, and furthermore proceeded to an empirical research on business behaviour in the real world to construct his theoretical hypothesis. Particularly he divided the price setting behaviour into pricing method and price setting system. Based on his analytical results, he concluded price setting behaviour as follows: Oligopoly industries (market share: over 41%) with pricing method of the price leadership type adopted the full-cost principle as their main price setting system, with price level determined to acquire the “target rate of return”. Such industries had sufficient “request power to realize margin” and admitted a “downward rigidity” of oligopolistic price. For this reason, many industries indicated that the degree of responsiveness of demand to price is “inelastic”.

Next we summarize some complementary thinking of Yamamoto's study in relation to points that we will examine later. (1) As Stigler mentioned, we have classified price leadership into dominant and barometric types. Though Yamamoto did not classify, we surmise that he defined dominant type as the leader type. However, differences of position in leader and follower reflect an effectiveness of price leadership. It is useful for us to classify the leader type in Yamamoto's study into dominant and barometric types. (2) We can divide price leaderships on increase (or reduction) rate or value and increase date. As many existing studies have noted, Yamamoto also analyzed the leadership on price increase rate or value, but we ought also analyze the price increase date. (3) Price level, according to the full-cost principle, depended on fluctuation of costs and the level of minimum profit rate. Yamamoto's study (*ibid.*, p.131) also researched this relationship, but though oligopoly industries had sufficient “request power to realize margin”, he did not determine any correlation between fluctuation of cost and margin. We ought to examine more clearly the relationship between fluctuation of cost and price level.

3. Price Leadership and Price Setting Behaviour : An Investigation

3.1. Analytical Technique

Period of analysis : 1977-1991. Number of industries : 18 (31 cases). These industries are reported reasons on parallel price increases by Article 18-2 in the Japanese Antimonopoly Law, from which we obtained all data (i.e., price increase rate, following date, cost increase rate, top three companies concentration ratio, and domestic total supply value). Industrial items : Tires and Tubes (Motor Vehicle), Cast Iron Pipe, Ham and Sausage, Daily Newspapers (Nation-wide), Beer, Cathode Ray Pipe Glass Valves, Mayonnaise and Dressing, Instant Coffee, Color Photographic Film (Popular), Whiskey, Synthetic Washing Preparations (Household), Welding Rods, Condensed Milk, Bus and Truck Chassis, Butter, Canned Goods (Food), Tractors (Construction), and Photographic Paper.

The price setting system in these industries is clearly the full-cost principle. For example, Arai (1992) examined parallel price increases during the period from December 1977 to February 1992, and then classified reasons (250 cases) for price increases by causes. Many reasons for price increases were due to cost increases, which held first rank, and occupied 54.4% (138 cases) of the total cases. Improvement of revenue and revision of profit rate, which require an increase in the mark-up ratio to secure normal profit in the full-cost principle, held 11.2% (28 cases). Including other costs, reasons for cost increases held 94.8% (237 cases) of the total cases.

In this section, we will estimate the following model to examine the relationship between price leadership and price increase rate.

$$\text{PIR} = a_0 + \sum a_i \cdot X_i + U_i.$$

Where PIR : Price increase rate,

PIR-L : the leading company's increase rate is higher than that of the subordinate company,

PIR-S : the subordinate company's increase rate is higher than that of the leading company.

Independent variables (X_i) are

CIR : cost increase rate,

CIR-L : the leading company's increase rate is higher than that of the subordinate company,

CIR-S : the subordinate company's increase rate is higher than that of the leading company,

CR₃ : top three companies concentration ratio,

FD : following date,

FD-L : the leading company's increase date precedes that of the subordinate company,

FD-S : the subordinate company's increase date precedes that of the leading company,

TSV : domestic total supply value.

PIR and CIR are the fiscal year average. CR₃ and TSV are the figures obtained when the item concerned was published in the separate table of application standards of Article 18-2. FD is the difference between the last increase date and the first date. Data source is the *Annual Report* (Japanese Fair Trade Commission).

3.2. Results of Estimation

Table 2 shows regression results for cost increase rate and total supply value which do not directly reflect competitive relationships. As mentioned above, when the many reasons for price increases were due to cost increases, the cost increase rate had a positive and significant correlation. On the other hand, an increase of supply value had a negative correlation. We surmise that this negative correlation is caused by lag in the period between the year in which supply value is published and the year in which price increase was actually performed. This relationship might also suggest that when the supply value increases, the cause of price increase is due to other factors.

The following estimation result is for CR₃ and FD which is considered to reflect a competitive relationship.

$$\begin{aligned} \text{PIR} = & 16.881 + 0.299* \cdot \text{CIR} - 0.116 \cdot \text{CR}_3 + 0.026 \cdot \text{FD} - 0.0008 \cdot \text{TSV}. \\ & (0.972) (2.166) \quad (-0.593) \quad (0.464) \quad (-1.427) \\ & \bar{R}^2 = 0.16, \text{ D.W.} = 1.868 [2.429], N = 31. \\ & * : \text{Significant at the 5\% level (two-tailed test).} \end{aligned}$$

In this case, cost increase again is an important factor to price increase rate. We postulate that, as the concerned industries belong to the high concentrated type oligopoly industry, intra-industry competition is not active. Therefore, we consider that the effect of CR₃ and FD does not clearly appear. However, as we analyze later, it is more useful to estimate their influences in relation to the differences of price increase rate, cost increase rate, and following date.

Table 3 shows regression results for the two types of price increase date. When the leading company acts as leader in its increase date (FD-L), there is a positive and significant correlation. When the subordinate company acts as leader (FD-S), correlation and its significance were negative, absent respectively.

Table 2. Regression Results for Cost Increase Rate and Total Supply Value

	Constants	CIR	TSV	\bar{R}^2	D.W.	N
PIR	5.781** (2.602)	0.329*** (2.381)		0.135	1.883 [5.669***]	31
	12.783* (6.88)		-0.001**** (-1.919)	0.082	1.522 [3.682]	31
	8.42* (3.134)	0.291*** (2.142)	-0.0009 (-1.65)	0.183	1.825 [4.363***]	31

Note. $PIR = a_0 + a_1 \cdot CIR + a_2 \cdot TSV + U_i$

\bar{R}^2 : Coefficient of determination adjusted for degrees of freedom.

(): t-Values, [] : F-Values.

*: Significant at the 1% level (two-tailed test).

**: Significant at the 2% level (two-tailed test).

***: Significant at the 5% level (two-tailed test).

****: Significant at the 10% level (two-tailed test).

Table 3. Regression Results for Following Date

	Constants	CIR	CR ₃	FD-L	FD-S	TSV	\bar{R}^2	D.W.	N
PIR	-16.849 (-0.388)	0.17 (0.809)	0.29 (0.558)	0.142**** (0.83)		-0.001 (-1.234)	0.177	2.005 [1.753]	15
	18.061 (1.748)	0.48*** (2.368)	-0.153 (-1.334)		-0.01 (-0.23)	-0.0005 (-1.169)	0.384	1.829 [3.335]	16

Note. See the notes to Table 2.

In event of the latter, cost increase rate was an important factor to price increase rate. Its correlation held a positive and high significance. When we observe its effect on the CR₃, neither leadership case has any significance. When the leading company acts as leader, CR₃ has a positive influence to price increase rate, and in the event of the subordinate company's leadership, it has a negative influence.

Table 4 shows regression results between price increase rate and independent variables. When the leading company acted as leader in price increase rate (PIR-L), the cost increase rate had an important influence over the increase rate. While its significance was absent, CR₃ had a positive influence to the increase rate. On the other hand, when the subordinate company acts as leader (PIR-S), no coefficient bears significance, and again CR₃ has a negative influence to the increase rate.

Table 4. Two Types of Price Increase Rate (PIR-L and PIR-S)

	Constants	CIR	CR ₃	FD	TSV	\bar{R}^2	D.W.	N
PIR-L	-4.117 (-0.385)	0.389*** (2.562)	0.103 (0.868)	0.013 (0.403)	-0.0006*** (-2.845)	0.457	2.578 [3.312]	12
PIR-S	21.063 (0.761)	0.278 (1.416)	-0.162 (-0.507)	0.054 (0.605)	-0.0008 (-0.79)	0.058	2.188 [1.277]	19

Note. See the notes to Table 2.

Table 5 shows regression results between price increase rate and cost increase rate. When the subordinate company's cost increase rate is higher than that of the leading company (CIR-S), this variable has a positive and significant correlation to the price increase rate. Furthermore, we find a relationship that, whereas the coefficient has no significance, the price increase rate heightened as the difference of the following date lessened.

Table 5. Regression Results for Cost Increase Rate (CIR-L and CIR-S)

	Constants	CIR-L	CIR-S	CR ₃	FD	TSV	\bar{R}^2	D.W.	N
PIR	3.427 (0.055)	0.269 (0.916)		0.041 (0.06)	0.134 (0.637)	-0.003 (-0.986)	-0.24	2.003 [0.564]	10
	20.648 (1.495)		0.447**** (1.858)	-0.172 (-1.112)	-0.0004 (-0.009)	-0.0006 (-1.497)	0.21	1.612 [2.326]	21

Note. See the notes to Table 2.

4. Concluding Remarks

The main results of this paper can briefly be summarized as follows: (1) Cost increase rate has an important influence to price increase rate. (2) Supply value has a negative influence to price increase rate. Particularly, when the leading company acts as leader on the increase rate, its influence is most significant. Supply value is the figure indicated when the item concerned was published in separate table of application standards of Article 18-2, and there is a possibility that its figure decreased in the year when price was increased practically. In other words, we understand that reduction of supply value causes an oligopoly industry to raise its price to secure profit rate. If this is a reasonable deduction, then price increase rate moves conversely to supply value. The same thinking can apply in relationship to concentration ratio. (3) When the leading company acts as leader on increase date, price increase rate rises. Furthermore, we confirmed the possibility that concentration ratio also has a positive influence upon increase rate. (4) When the leading company assures leadership on increase rate, cost increase rate has a positive and greater influence on price increase rate than when assured by the subordinate company. We confirmed that concentration ratio has the same influence as the following date. (5) When the subordinate company's cost increase rate is higher than that of the leading company, it yields an important influence on price increase rate. At the same time, we confirmed the possibility that price increase rate heightened as the difference of following date lessened.

To sum up, when the subordinate company's cost increase rate was higher than that of the leading company, and when the former acted as leader in the increase date, the positive influence of both on price increase rate became consid-

erable. When the leading company's price increase rate was higher than that of the subordinate company, cost increase rate had a positive influence upon price increase rate. That is to say, we can understand that, when the subordinate company's cost rose above that of the leading company, the former acting as leader in the increase date and the latter as leader in the increase rate, price leadership is performed most effectively.

A remaining subject for empirical investigation is the relationship between mark-up ratio and investment behaviour which the post-Keynesians constructed.

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Notes

- 1) Stigler (1947, pp. 444-445) clarified that demand curve did not kink in industry where dominant price leadership is popularized.
- 2) Companies which proceed with vertical integration and invest positively in the distribution sector are able to predict sufficiently fluctuation of demand in price setting. Thus, it is obvious that such industries can easily perform cost-based pricing.
- 3) These price differences are easily formed as the "price band" in differentiated oligopolistic industry (Uekusa, 1982, p. 74, pp. 176-178).

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