No. 320

The Role of Market Share in Persistent Profit Differences among Japanese Firms

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December 1986

I am most grateful to Hideki Yamawaki at International Institute of Management, Berlin, for kindly allowing me to use the results of our earlier joint research and for constructive advices. The responsibility for any error is all mine, however.

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1. Introduction

The influences of market share on individual firm's profitability has been examined and confirmed by several American researchers -- Shepherd (1972), Gale (1972), and Bothwell and Keeler (1976) using the firm data; Ravenscraft (1983), Martin (1983), Kwoka and Ravenscraft (1986), and Scott and Pascoe (1986), using the Line-of-Business (LB) data on both market share and profit rate; and Mueller (1986), using the sales-weighted average of LB shares and firm profit rate. There are interesting differences between the earlier studies and the recent ones. When four-firm concentration ratio or Herfindahl index was included in addition to market share, the effect of concentration was found positive by Shepherd but negative by Ravenscraft and Martin. The impact of market share on profitability was found stronger in more concentrated industries by Gale but weaker in these industries by Kwoka and Ravenscraft. Thus remains a puzzle: Do the differences indicate a structural change between the sixties and the seventies? Or is it because of the data difference -- the firm variable versus the LB variable -- or because of the particular year (1975) the LB study was conducted?

This paper adds another result for the share-profitability study using the data on Japanese firms. In Japan neither LB data nor the market share data for every industry is available, making our data less satisfactory and our sample less comprehensive. For all this deficiency, the study is hoped to yield new insights through an international comparison.

This is not the first to examine the share-profitability relationship in Japan. Iwasaki (1974) used the data of 72 firms and found the effect of market share on the firm profit rate positive but short of significance. He did not use the concentration ratio data. Nakao (1979) used the data of top firm in each of 32 industries and found a positive, mostly significant, effect of share on profit rate. In Nakao's study, therefore, the effect of concentration which supposedly applies to the entire industry and the effect of share which supposedly applies only to the relevant firm in the industry are not separated. In contrast, the present study uses both the share and concentration data and makes a comparison with the above American studies.

Another important aspect of our study is to investigate the role of market share in persistent interfirm differences in profitabilitiy. That is, we examine the influence of market share on not only the profit rate of the same year but also the movement of profit rate in the following nineteen years. The methodology for the study of persistence of profits originates in Mueller (1977) and sophisticated in Odagiri and Yamawaki (1985, 1986). The two of our profitability measures are actually taken from Odagiri and Yamawaki (1985) -- the projected long-run profit rate and the proportion that a short-run excess profit carries over to the next year (or one minus the speed of adjustment). More explanation on this methodology appears in Section 2.

The advantage of using these measures of profit persistence is substantial. Most importantly, contaminating the result by abnormal or disequilibrium profit movement can be avoided. Also important is the implication the study has on the causality of share-profitability relationship. Adelman and Stangle (1985) criticized the view that the positive share-profitability correlation indicates the presence in a large-share firm of either market power or scale economies, and instead argued in favor of the reverse causality that a more profitable firm tends to invest heavily thereby causing the share to increase. It is extremely unlikely, however, that a long-run profit rate projected on the basis of the profit rate during 1965-1983 affects the market share in 1964 through investment decisions. Hence, our study is easier to interpret as that of the effect of share on profitability. It is cautioned, nevertheless, that the positive effect of share need not be based on market power. The Demsetz (1973) hypothesis of an efficient firm achieving both a large share and a high profitability seems difficult to be ruled out. In other words, the positive correlation may or may not be socially undesirable.

The paper is organized as follows: In Section 2, a case study is made to illustrate the time-series relation of market share and profitability. The industry discussed is the beer industry, one of the most typically oligopolistic industry in Japan. Section 3 explains the data. Section 4 presents the results of cross-section analyses with 88 to 100 firms. Section 5 concludes the paper with summary and concluding remarks.

2. Time-Series Correlation of Market Share and Profitability: The Case of Beer Industry

The choice of beer industry for our case study was made for two reasons. The first is the limited data availabity. Our firm profit data covers the period 1965-1983; however, the market share (MS) data during this period can be obtained in a continuous manner only for seven industries. Three of these are inappropriate because the top firms are not in our sample.

The second is its being one of the most typically oligopolistic industry in Japan. Currently there are only four producers and the share of the top firm, Kirin, is around sixty percent -- a surprising concentration in the American or European standard where, for instance, the largest US brewery, Anheuser-Busch, captures twenty to twenty-five percent of the US market (Greer, 1981). Imports are increasing but still few partly due to the distance from the American and European Continents and partly due to the difficulty in access to the distribution channel. The industry is known for severe non-price competition by means of advertising, packaging, and such, but the price is uniform under, presumably, Kirin's price leadership. For these reasons, the Fair Trade Commission in Japan is keeping watch on the industry as a potential subject of the regulation of "monopolistic situation" and of "parallel price increase" under the Antitrust Law.

It will help the readers to give a brief historical review of the beer industry in Japan. The history begins in 1870 (only three years after the Meiji Restoration) when a Norwegian (with a

US citizenship) founded the Spring Valley Brewery in Yokohama originally to fulfill the demand of Americans and Europeans living in the city. In just several years a number of Japanese-owned breweries started to compete with imports, with the Spring Valley Brewery, and with each other. The Spring Valley Brewery lost in the competition, acquired by British investors in 1885, and, finally, acquired by the Japanese who renamed the company to the Kirin Brewery. In the 1890s to the 1900s, the market gradually became concentrated. The leading breweries were four: Kirin, Nippon, Osaka, and Sapporo, the last being started as an experiment station by the government in 1876 and sold to private ownership in 1886. In 1906, the latter three companies merged into an undisputable market leader, the Dainippon Brewery. Thus the market became one of two dominant firms, where one (Dainippon) is more than double the other (Kirin) in size, with a few fringe firms. Basically this remained invariant until the end of the World War II.

Though not the main theme of the present article, this history of the beer industry is quite suggestive. For one, direct investment by foreigners was not at all rare in the history of economic development in Japan and neither were mergers and acquisitions. For the other, imitation and entry activities were rapid and intense, suggesting that strong entrepreneurship was present when Japan was determined to industrialize following the Meiji Restoration. Governmental assistance was there in building an experimental plant but the operation as well as ownership was soon relegated to the private sector, indicating that the government was not the prime force in Japan's takeoff. Finally, the history was that of, say, chaotic entries and exits with fierce competition, followed by gradual concentration into the hands of only a few big firms. This was more or less observed before the War in many other Japanese industries as well.

In 1947 "the Law for the Elimination of Excessive Concentrations of Economic Power" passed under the pressure of the Supreme Commander Allied Power (the occupation army). In 1949 eleven companies were designated as applicable to this law and forced to break up. The Dainippon Brewery was one of them and split into the Japan Brewery and the Asahi Brewery. There were thus three firms at the time with the following shares: Japan, 38.6%; Asahi, 35.9%; and Kirin, 25.5%. Note that even with the breakup of Dainippon, Kirin remained behind the two decendents of Dainippon. The basic trend since then, however, has been the shift of share from Japan (renamed in 1964 to Sapporo) and Asahi to Kirin. Only in five years, namely in 1954, Kirin topped with the share of 36.6% against Asahi's 32.4% and Japan's 31.0%. From 1965 to 1983, the change in share is illustrated in Figure 1 showing that in recent years Kirin has been dominating the market with over sixty percent of share while Sapporo and Asahi trails far behind Kirin with the shares of around twenty and ten percent, respectively.

What gave Kirin this much advantage is not clear. The only plausible explanation seems to be the continuity of national brand (Konishi and Hashimoto, 1976). That is, Kirin had been the national brand both before and after the War, whereas, after the breakup of Dainippon, Japan adopted a new brand name, Nippon (later renamed into Sapporo), and Asahi was one of the local brands Dainippon used before the War. This undoubtedly must have been an important factor. Yet, it seems short of explaining the persistent rise of Kirin's share even after twenty years of the start of Nippon (Sapporo) and Asahi.

Entry into the industry took place merely twice after the War. The first was by Takara, a producer of Sake and other Japanese-style liquors, which entered in 1957 but exitted after ten years of operation with continuous loss. The second was by Suntory in 1963. Since Suntory had been an undisputed leader in domestic whisky distillation of more than seventy percent of share, its brand image must have been quite high (for whisky, that is). Nevertheless, its beer operation is said to have been red until only recently, suggesting continuous cross-subsidization from the whisky operation to the beer operation. Its market share of beer in 1983 was 8.5 percent. These episodes quite eloquently testify to the extremely high entry barriers of the industry, the most important of which must have been the brand image.[1]

Let us now turn our focus onto the profit rates of the three companies. It must be natural to conjecture that, one, they tend to earn above-normal profits due to the extremely high concentration; two, Kirin tends to earn more than Sapporo and Asahi due to its leading position; and, three, the intertemporal profit change tends to be associated with the intertemporal change in share. In addition, the implied profitability difference must be a persistent one.[2]

Let $P_i(t)$ denote the profit rate of Firm i in year t. We measure the profit rate by the rate of after-tax profits (inclusive of interest payments) to total assets.[3] To see if the firm is earning an above-average profit rate, we deduct from $P_i(t)$ the average profit rate of 376 manufacturing firms (our original sample; see the following section) to get the normalized rate as follows:

$$\pi_i(t) = P_i(t) - \bar{P}(t), \text{ where } \bar{P}(t) = \sum_{i=1}^{376} P_i(t)/376 \quad (1)$$

Obviously an above-average profit rate implies a positive $\pi_i(t)$. To examine the persistence issue, we employ an antoregressive model (see Odagiri and Yamawaki, 1986):

$$\pi_i(t) = \kappa_i + \lambda_i \pi_i(t-1) + u_i(t) \quad (2)$$

where κ_i and λ_i are constants pertinent to the firm i and $u_i(t)$ is an error term assumed to follow an iid normal distribution. λ_i indicates the extent that an above-average gain (or loss) in a certain year carries over to the following year; hence, it is interpreted as the measure of persistence of short-run excess profits. Its estimate, $\hat{\lambda}_i$, will be denoted by PYLMD. Also, since (2) is a partial adjustment model, $(1-\lambda_i)$ is interpretable as the speed of adjustment.

$\hat{\kappa}_i / (1-\hat{\lambda}_i)$, where $\hat{\kappa}_i$ is the estimate of κ_i, is the estimate of the long-run profit rate (denoted by PYLR) because, once π_i attains this level, it is expected to stay there indefinitely. If this is positive, the firm is estimated to earn above-average profits persistently.

Table 1 gives the result when Eq.(2) was estimated for Kirin, Sapporo and Asahi. The projected long-run profit rate, PYLR, is highest for Kirin followed by Sapporo and then Asahi, the ranking agreeing with that of market share. Interestingly, only Kirin is expected to earn above-average profits while the followers are expected to earn below-average. The average profit rate over the 316 firms during 1965-1983 was 6.3 percent; if this approximates the long-run average profit rate, then the estimates suggest that in the long run Kirin will earn 6.8 percent as the profit rate on assets; Sapporo, 5.6 percent; and Asahi, 5.2 percent. Thus suggested is that market concentration enhances profitability of only the leading firm or that share is more important than concentration.

PYLMD is smallest (and least significant) for Kirin. This, rather unexpectedly, implies that short-run disequilibrium gains disappear most quickly in Kirin. The Durbin-Watson statistics indicates indeterminacy for Sapporo and the absence of serial correlation for Kirin and Asahi. To illustrate how Eq.(2) approximates the actual profit rate movement, we show in Figure 2 the plot of actual value (bold line) and fitted value (dotted line) of $\pi_i(t)$ for each of the three firms. Vertically, the solid straight line corresponds to zero π (namely, the average profit rate) and the dotted straight line, each firm's PYLR. That the model explains the profit-rate movement reasonably well is visible.

This methodology is also applicable to market share to estimate the long-run market share. The result is 62.8 percent for Kirin, 19.6 percent for Sapporo, and 7.3 percent for Asahi. These are shown in the earlier Figure 1 by vertically straight dotted lines. It is noteworthy that the shares of both Kirin and Sapporo are estimated to have reached approximately the long-run levels; whereas Asahi's share is estimated to decline further.

To examine the intertemporal correlation of profit rate and share, assume the following model:

$$\pi_i = \alpha_i + \beta MS_i + \gamma Z + v_i \qquad (3)$$
$$i = \text{Kirin(K), Sapporo(S), Asahi(A)}$$

where MS_i is the share of i-th firm, Z is the vector of variables affecting the beer industry (factor prices, the prices of sake and whisky, weather, etc.), and v_i is the error term. The constant term α_i may be firm-specific while the slope coefficients are not. Since (3) can be applied to both Kirin and Sapporo, by taking the difference we get

$$\pi_K - \pi_S = \alpha_K - \alpha_S + \beta(MS_K - MS_S) + v_K - v_S \qquad (4)$$

We estimated this equation using the 1965-1983 time-series data correcting for serial correlation (AR1 procedure of TSP), to obtain

$$\pi_K - \pi_S = -2.532 + 0.098\ (MS_K - MS_S), \quad \bar{R}^2 = 0.193 \quad (5)$$
$$(-1.812)\ (2.629)$$

and similarly

$$\pi_K - \pi_A = -2.275 + 0.083\ (MS_K - MS_A), \quad \bar{R}^2 = 0.443 \quad (6)$$
$$(-2.592)\ (4.203)$$

As is evident from the t-values in parentheses, the slope coefficients are both significant. They are positive indicating that profitability differences move in the same direction as share differences. When Sapporo's (Asahi's) share increases by one percent point at the expense of Kirin's share, the profit-rate gap between Kirin and Sapporo (Asahi) is estimated to narrow by 0.2 (0.17) percent point.

The analysis in this section indicates that profitability and market share are intertemporally positively correlated and the profit rate differences as well as market share differences are expected to persist. Needless to say, a case study is always susceptible to the criticism that it may not be generalized to other cases. We thus proceed to a cross-section analysis of 88 firms in 43 industries.

3. Data

Our original sample consists of 376 Japanese manufacturing firms. This choice was made on two criteria: first, the firm was listed in Tokyo Stock Exchange (Market 1) in 1965 and remained to be listed until 1983 in any of the eight stock exchanges in Japan and, second, it experienced no large-scale merger during the period (see Odagiri and Yamawaki, 1985, for detail). The period of study is 1965-1983 in accounting year (April of the year to March of the following year). The financial data was obtained from the NEEDS data tape (Tokyo: Nihon Keizai Shimbun Sha) after necessary adjustment was made, for instance, to correct the differences in accounting period.

Our profitability measure, as in the previous section, is after-tax profits (inclusive of interests to debts) as a ratio to total assets. This measure is preferred to profit rate on sales because of the long-run nature of our study. It is expected that, without sufficiently high entry barriers, an industry with a high profit-to-asset ratio (but not necessarily a high profit-to-sales ratio) attracts entrants to the effect of reducing its profits. Hence it is the profit-to-asset ratio and not the profit-to-sales ratio that is expected to equalize in the traditional theory of competitive markets. In other words, any persistent difference in profit-to-asset ratio is the relevant and important issue to economists.

As in Eq.(1), the profit rate is defined as the deviation from its sample mean to eliminate the effect of general business condition. Four profit rates are used alternatively. Two have been already defined: PYLR, the projected long-run profit rate, and PYLMD, the extent that short-run gains (or losses) carry over to the following year or the slowness of adjustment. In addition, PYIN is the initial profit rate, as defined by an average over the first two years, namely, $\sum_{t=1965}^{1966}\pi_i(t)/2$, and PYAV is the average profit rate over the entire period, namely, $\sum_{t=1965}^{1983}\pi_i(t)/19$.

All the explanatory variables are measured around the initial year 1964 or 1965 to minimize the reverse causality and simultaneity problem. Admittedly this is a crude way to circumvent the problems but is certainly preferable to having both dependent and supposedly-independent variables measured in the same year.

Basically, the data for four-firm concentration ratio in 1964 (CR) is from the Fair Trade Commission (1969) and the data for market share in 1964 (MS) is from Toyo Keizai, Tokei Geppo (The Oriental Economist, Statistical Monthly). Neither of these, however, covers all the industries, forcing us to drop many industries. This lack of comprehensiveness, together with the lack in any comparable manner of sales composition of each firm, also forced us to omit diversified firms. Consequently our sample is 100 firms for CR and, among them, 88 firms for MS. Every one of these is reasonably specialized and matched to a certain industry.[4]

The second problem with the data is the difference in industrial coverage between the two sources and between years. Thus some industries are in the Toyo Keizai data but not in the

FTC data, in which case CR was calculated from the Toyo Keizai data. Some industries, on the contrary, are only in the FTC data. Fortunately, until 1966, FTC published the shares of individual top ten firms anonymously. When the names of these firms could be inferred confidently, the data were used for MS. There are also instances where Toyo Keizai listed the MS data not in 1964 but in reasonably close years, say 1967, or where FTC started reporting the CR data (without individual share data) after 1967. These were also utilized in this study. Appendix to this paper lists the names of the companies with notes on data sources and the years CR or MS is measured. Each of the company name is followed by its rank in 1964 in parenthesis. When the rank is not given, the firm is with CR but not MS.

It is warned that the industrial classification does not follow any standard classification scheme. Hence some industries are narrowly defined (for example, monosodium glutamate) while others are widely defined (for example, petroleum). This is unavoidable due to the data limitation but we made efforts to have the data reflect the true market power of each firm. When other sources indicate that the industrial classification or the data does not accurately depict the market position of a firm, it was eliminated from the sample.

The difficulty in industrial matching also arose in calculating the rate of growth of industrial shipments, GIND, defined as the ratio of the shipment in 1983 to that in 1965 converted into an annual-rate form. The shipments data were taken from the Census of Manufactures (Ministry of International

Trade and Industry) which follows the Japanese Standard Industrial Classification scheme. To make the classification comparable to that of CR or MS, some industries were defined at the three-digit level, some at the four-digit level, and some as the sum of two four-digit industries. Yet some differences in industrial category inevitably remained between CR or MS and GIND. Much pains were taken, however, to define the industries so that the variables reflect the reality. For instance, the fermented milk product industry, without a corresponding SIC industry, was identified with the beverage industry and not the milk product industry because most consumers take it as substitutable to beverages than to milk.

The data for remaining variables are all from the financial statement of each company. Many but not all the firms reported advertising expenditures and R&D expenditures in 1966[5]. Many of those not reporting them, presumably, did not expend at all; often, however, a firm failed to report whereas others in the same industry did report. Since it is unlikely that a firm (even Hitachi or Nissan) did not make research while the rival (say, Toshiba or Toyota) did, it was considered better to omitthe non-reporting firms. Hence, among the 88 firms with the MS data, 78 are with AD and 37, with both AD and RD, where AD is the advertising-to-sales ratio and RD is the R&D expenditures-to-sales ratio.

4. Cross-Section Analyses

4.1 The Persistence of Profitability Differences

Odagiri and Yamawaki (1985) used the sample of 376 firms to find that the correlation coefficient between PYLR and PYAV is 0.8687 and that between PYLR and PYIN is 0.3046; that is, a firm initially earning an above-average (below-average) profit rate tends to earn an above-average (below-average) profit rate even in the indefinite future. This phenomenon was called "the persistence of profits" after Mueller's (1977) pioneering work.

Table 2 shows that this persistence is also observed with the present sample of 100 firms: the correlation between PYLR and PYAV or PYIN is again highly significant. In fact the coefficient is somewhat larger here than with the 376 firms. A conjecture from this finding is that the determinants of PYAV or PYIN will also explain the important part of interfirm differences in PYLR. This will be verified presently.

Another finding is the significant correlation between PYLMD and any of the three other variables. This suggests that a firm with an above-average initial, average, or projected profit rate is slow at adjusting against short-run disequilibrium gains. Because a firm initially earning an above-average rate usually decreases its rate over time,[6] a larger PYLMD in such a firm implies its gaining short-run excess profits for a longer period. The persistence of above-normal profits in the long run, we may say, tends to be associated with longer gains over the course of adjustment.

4.2 Effects of Concentration Ratio and Market Share

The first set of ordinary-least-squares estimation result is in Table 3. They regress each of four profit-rate variables on CR and/or MS as well as industrial growth rate GIND. There are three important findings. The first pertains to the comparison among the profit-rate variables. Invariably PYAV and PYIN performed better than PYLR. This is nothing to be surprised because, firstly, PYLR is an indirect measure estimated by means of least squares, possibly vulnerable to estimation errors, whereas PYAV and PYIN are not, and, secondly, the lag between MS or CR (1964) and PYIN (1965-1966) or PYAV (1965-1983) is much shorter than that between MS or CR and PYLR (theoretically, indefinite future). It is more important, in fact, to note the significance of the coefficients even in the PYLR equation, namely, the tendency that the market structure variables persistently influence the profit rate. This clearly indicates that the positive correlation between profitability and concentration/share is not a short-run disequilibrium phenomenon as argued by Brozen (1970).

Second, MS explains the profitability differences better than CR, suggesting that intraindustry differences among firms are important and, thereby, suggesting the crucial importance of using the firm data.[7] An exception occurs regarding PYLMD which is explained better by CR. Presumably, therefore, the speed of erosion of excessive profits is not as much dependent on firm characteristics as industrial characteristics.

Third, when both CR and MS are used as explanatory variables, CR tends to lose significance while MS is still significant with the exception of, again, PYLMD, It was found that the simple correlation coefficient (r) between CR and MS is significantly high at 0.619; no doubt, therefore, multicollinearity is present. To circumvent this problem, a proxy variable for share was sought. The rank of the firm in the industry in terms of share (RANK), its inverse (RINV), and a dummy variable (RDUM) taking the value of one if and only if the firm is the leader (namely, if and only if RANK=1) were examined and RINV was found best. It is significantly correlated with MS (r=0.573) and yet virtually uncorrelated with CR (r=0.040); hence, multicollinearity is unlikely. The estimation results with RINV are in Table 4. As expected, both CR and RINV become significant (with the exception of RINV in the PYLMD equation), suggesting that the leading firm in a concentrated industry tends to be most profitable.

Fourth, the rate of growth of industrial shipment GIND has a positive but insignificant effect on PYLR, PYAV or PYIN, and a negative effect on PYLMD which is weakly significant in Table 4. That PYLMD is smaller in a growing industry seems reasonable because growth will induce entry thereby eroding the disequilibrium gains of incumbent firms more rapidly.

These results, particularly the positive effects of both concentration and share (or inverted rank), agree with Shepherd's (1972) study of the US company data but not with Ravenscraft's

(1983) study of the US LB data. The finding warrants a deeper inquiry, which we will undertake next.

4.3 Interactive Effects of Concentration and Share

Recently Kwoka and Ravenscraft (1986, hereafter KR) and Mueller (1986) both proposed the use of interactive term, CR×MS or CR×(1-MS), as a determinant of the profit rate of an oligopolistic firm. KR assumes a constant number of firms in the industry (namely, no entry or exit) of a homogeneous product, and a constant marginal cost. From the profit-maximization condition for the i-th firm, they obtain

$$(P-MC_i)/P = MS_i(1 + \mu_i)/\eta \qquad (7)$$

where P is the output price, MC_i is the marginal cost, MS_i is the market share, η is the price elasticity of demand, and μ_i is the conjectural variation as defined by $\sum_{k\neq i} \partial X_k/\partial X_i$ where X_k is the k-th firm's output.

What KR calls the "Cowling-Waterson model" after Cowling and Waterson (1976) hypothesizes that $\mu_i = \gamma CR$, that is, μ_i is proportional to the concentration ratio of the industry. Substituting this into (7) yields

$$(P - MC_i)/P = (MS_i + \gamma CR \times MS_i)/\eta \qquad (8)$$

What KR calls "the Clarke-Davies model" after Clarke and Davies (1982) hypothesizes that $(\partial X_k/\partial X_i)/(X_k/X_i) = \delta CR$; that is, one-percent increase in own output is expected to increase every rival's output by δCR percent. Together with (7), this yields

$$(P - MC_i)/P = [MS_i + \delta CR(1-MS_i)]/\eta \qquad (9)$$

Hence, the price-cost margin or the profit rate on sales depends on CR×MS in the Cowling-Waterson model and CR(1-MS) in the Clarke-Davies model, in addition to MS.

KR estimated these equations as well as what they called "the shared asset model" in which MS and CR are both independent variables in a linear form, using the LB cross-section data. The results were (1) the superior explanatory power of the shared asset model and the Clarke-Davies model (our Eq.9) over the Cowling-Waterson model (our Eq.8), (2) a consistently positive and significant effect of MS, and (3) a consistently negative effect of CR, CR×MS, or CR(1-MS).

Mueller (1986) obtained an equation basically identical to (9) from a somewhat different set of assumptions and found, like KR, a positive effect of MS and a negative effect of CR(1-MS), both significantly. Unlike KR, however, Mueller used the projected profit rate on assets (our PYLR) of the firm as the dependent variable.

We also use the profit rate on assets on the ground discussed in Section 3:[8] the estimation results are in Table 5. We only report the results for PYLR because they are similar for

PYAV and PYIN and because we consider PYLR to be the best measure of the firm's inherent profitability.

The first three equations give the results a la Kwoka and Ravenscraft. Obviously none is any better than the equation with MS and GIND only (compare to Table 3). The column in the far right indicates the seriousness of multicollinearity. In fact MS and CR×MS or CR(1-MS) are correlated with the high coefficient of 0.98. To circumvent this problem, it is again considered sensible to use RINV as a surrogate for MS. The results are in the equations (iv) to (viii) in Table 5. In (vii) and (viii), the interactive terms between CR and RINV are used. Multicollinearity again are serious in these equations because of the high correlation between RINV and CR×RINV or CR(1-RINV). Thus the best results appear to be (iv), (v) and (vi); however, (v) and (vi) are actually indistinguishable because of the virtually perfect negative correlation between CR×MS and CR(1-MS): $r<-0.9999$. Therefore a comparison between the Cowling-Waterson model and the Clarke-Davies model (as called by Kwoka and Ravenscraft) is irrelevant.

The signs in (v) and (vi) imply that γ in Eq.(8) is positive and δ in Eq.(9) is negative. Since Kwoka and Ravenscraft interpret the negativity of these two parameters for the US data as an evidence of rivalry among firms, our Japanese results are perplexing. This leads us to two questions. First, why are CR×MS and CR(1-MS) perfectly negatively correlated in Japan while they are apparently not so in the United States? Because CR(1-MS) = CR - CR×MS, the two should be perfectly negatively correlated if CR is constant; however, CR varies between 28.5 and 100 in our sample.

Second, is the negativity of γ or δ necessarily imply rivalry (and the positivity, cooperation)? In that the positivity of γ or δ implies a smaller equilibrium industry output, the effect may appear to be that of cooperative behavior. However, the positivity implies that, in making the output decision, the firm expects the rivals to increase their output against its own output increase, whereas the negativity implies that it expects the rivals to decrease their output. Can we not say that the firm expects the rivals to <u>retaliate</u> in the first case and to <u>concede</u> in the second? If so the first appears more like rivalry than cooperation and the second, more like cooperation than rivalry. The methodology of Kwoka and Ravenscraft seems far from conclusive to this critical question.

4.4 Analyses for Leader Firms

Among the 88 firms with the MS data, 40 firms were leading firms in their industries. The mean PYLR of these 40 firms was 0.275, significantly higher than that of 48 followers, -0.531. That is, on average the leading firms are projected to earn the profit rate 0.8 percent point higher than the followers. The difference in PYIN was even larger at approximately one percent point. This higher profitability of leading firms is certainly consistent with the positive effect of RINV in Table 4.

Define FOL by CR - MS. Since CR is the four-firm concentration ratio and MS is now the leader's share, FOL is the sum of the shares of second, third and fourth ranking firms. Table 6 presents the regression results for the forty leading firms with PYLR as the dependent variable.

Equation (i) indicates that the leaders with larger shares earn more than the leaders with smaller shares. The effect of rival firms' shares is positive but insignificant.[9] (ii) and (iii) were estimated to make a comparison with Kwoka and Ravenscraft. For (ii), they found the coefficient of MS to be insignificantly positive (t=0.51) and the coefficient of MS(1-MS) to be insignificantly negative (t=-1.33). In an equation similar to (iii), KR found the coefficient of S2(1-MS) to be significantly negative and the coefficients of MS, MS(1-MS), S3(1-MS), and S4(1-MS) to be insignificantly positive (t<0.7), where Si(i=2,3,4) is the share of i-th ranking firm. This differs from our result that FOL(1-MS) is insignificantly positive. Obviously a strict comparison is impossible because our data on followers' shares is only in the form of sum, FOL=S1+S2+S3. Yet the difference in sign between the effects of KR's S2(1-MS) and our FOL(1-MS) seems to suggest some difference in the impact of the followers' strength on the leaders' profitability. Though KR again interprets the negative sign as the result of rivalry between the leader and the second firm, the interpretation does not appear as convincing as they claim for the reason discussed in the previous subsection.

In any of the equations our result implies a significantly positive effect of leaders' shares on their profitability, which contrasts to the insignificant effects in KR. As discussed in

Section 1, the result agrees with Nakao's (1979) previous result for Japan. The magnitude of the contribution of MS is also reasonably similar. Nakao found this to be around 0.04 to 0.05: in ours, keeping FOL constant, the marginal effect of MS is 0.033. In contrast to Nakao's interpretation, however, we consider the effect to be fairly large. Recall that the average leader is projected to earn 0.275 percent higher profit rate than the average of 376 firms since PYLR=0.275 on average; hence, a ten percent point decrease in share more than cancells out the average profit-rate advantage of the leaders. Whether this is to be interpreted as a large effect of share or the unimportance of leaders' advantage we have no means to determine; nevertheless, that the positive impact of share should not be easily dismissed appears evident.

4.5 Effects of Advertising and R & D Intensity

Major results when the advertising-to-sales ratio AD and/or the R&D expenditures-to-sales ratio RD are added as explanatory variables are given in Table 7. The number of observations is smaller than in Tables 3 to 5 due to the lack of AD or RD data for a number of firms. Equations (iii) and (vii) follow the model of Kwoka and Ravenscraft and (iv) and (viii) follow that of Mueller. In every equation except (i) and (v) we present the result when RINV is used in place of MS to minimize multicollinearity.

Generally, neither advertising nor R&D exerts a significant effect on PYLR.[10] The effect of AD is negative, contrary to KR's and Mueller's results. Mueller's equation, (iv) or (viii), gives the best fit, with AD×MS in (viii) being weakly significant; however, the negative sign, according to Mueller's model, implies a greater substitutability among heavily-advertised products, which disagrees with the traditional view of advertising as a means of product differentiation.[11]

The coefficients of RD are positive but not at all significant. GIND becomes weakly significant in some of the equations; this, however, is mostly due to the sample difference and not to the inclusion of AD.

5. Conclusion

Using the sample of 88 Japanese manufacturing firms, we found a positive association between profitability and market share or, to a lesser extent, concentration. In addition, the following two are noteworthy. First, share (or inverted rank) and concentration in 1964 are associated with not only the profit rate in 1965-1966 (PYIN) or in 1965-1983 (PYAV) but also the long-run profit rate (PYLR) projected by means of an autoregressive model. That is, share and concentration are positively related not only to contemporaneous profits but also to persistent profits. This finding does not support the view that the concentration-profitability correlation is mostly a disequilibrium phenomenon (Brozen, 1970) or the view that profits attract investment causing the share to increase (Adelman and Stangle, 1985).

The slowness of convergence to the long-run profit rate or the extent that disequilibrium gains or losses carry over to the following years (PYLMD), we found, is also positively associated with concentration and share. Interestingly this is more strongly correlated with concentration than with share, in contrast to the profit rates, PYLR, PYAV and PYIN.

Secondly, when share (or inverted rank) and concentration are both included as explanatory variables, both were found to give positive effects on profit rates. This agrees with Shepherd's (1972) study with company data but not with Ravenscreft's (1983) study with the Line-of-Business data, both in the United States. When interactive terms of share and concentration are used together with inverted rank (a proxy variable for share to avoid multicollinearity), we found a negative coefficient of CR(1-MS) as in Kwoka and Ravenscraft (1986) and Mueller (1986) but a positive coefficient of CR×MS in contrast to the negative coefficient in Kwoka and Ravenscraft. Even if the interpretation by Kwoka and Ravenscraft is correct, therefore, we cannot determine if the Japanese firms are cooperative or rivalrious in concentrated industries. We actually questioned their interpretation, however.

The study, therefore, revealed important international similarities in the way firm profit rates are determined; in particular, the persistence of profits and the association with market share and concentration. There remained a few perplexing differences which, we cannot know at present, may be due to a true Japan-US difference or due to the different data source, particularly, company data versus LB data.

FOOTNOTES

1 Since all the brands are now nationally known, however, it is doubtful if current advertising is conducive to maintaining the difference in brand image. In fact the advertising-to-sales ratio was lowest in Kirin at 1.0 percent and highest in Asahi at 3.4 percent (Sapporo is at 2.2 percent) in 1983. The advertising expenditure (not the ratio) was largest in Kirin owing to the larger size but even this was smallest among the three until 1974, namely, while Kirin was rapidly expanding the share.

2 Suntory is excluded from our analysis because the company is not listed in any stock exchange so that the financial statement is not publicly available, and because the share of beer in the company's sales is presumably smaller than that of whisky.

3 The analyses in this section were also made with the ratio of profits to sales. The results were less evident but qualitatively similar.

4 Sales in the matched industry, on average, accounted for 73 percent of total sales in each of the 100 companies. The milk product industry is an exception to the above rule because MS, CR and sales ratio were available for five milk products; hence, the sales-weighted averages of MS and CR were calculated for each of the three companies.

5 For unknown reasons, NEEDS does not provide these data for 1965 and before.

6 The following estimation results imply that a firm with positive PYIN (i.e., above-average profit rate) is projected with a smaller PYLR, namely, that PYIN includes temporary excess profits:

$$PYLR = -0.191 + 0.377PYIN \qquad \bar{R}^2 = 0.254$$
$$(-1.306) \quad (5.897) \qquad n(\text{sample size}) = 100$$

7 Reestimating the equations with CR (and GIND) using the 88 samples to eliminate the effect of sample differences, we found the t-values of the coefficients of CR to be larger than in Table 3 but still smaller than those for MS (except for the PYLMD equation).

8 Repeating the regressions using PSZ = PYZ × K/S, where Z = LR, AV, IN and LMD, and K/S is the asset-to-sales ratio in 1965, we confirmed that the results are essentially insensitive. In fact the correlation coefficient between PYLR and PSLR exceeded 0.9, explaining why the regression results hardly differ.

9 Since FOL=CR-MS using FOL or CR in this equation makes no difference; however, because CR and MS are highly correlated (r=0.836) while FOL and MS are not (r=0.086), the coefficient of MS turned out insignificant when CR was used in place of FOL in equation (i).

10 The effect on PYAV, PYIN or PYLMD is similarly insignificant.

11 It may be consistent with the view that emphasizes the information-disseminating role of advertising; see, for instance, Lynk (1981).

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Figure 1: Market Shares of Three Breweries: 1965-1983

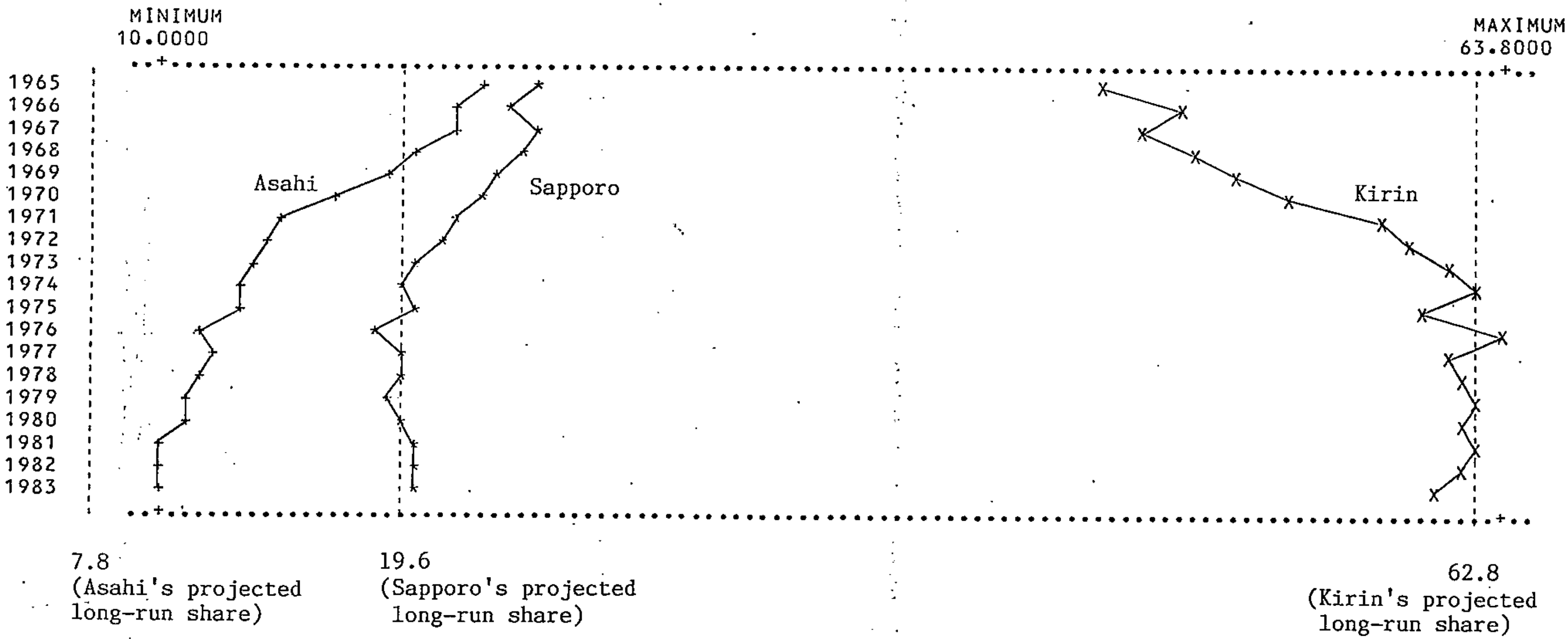
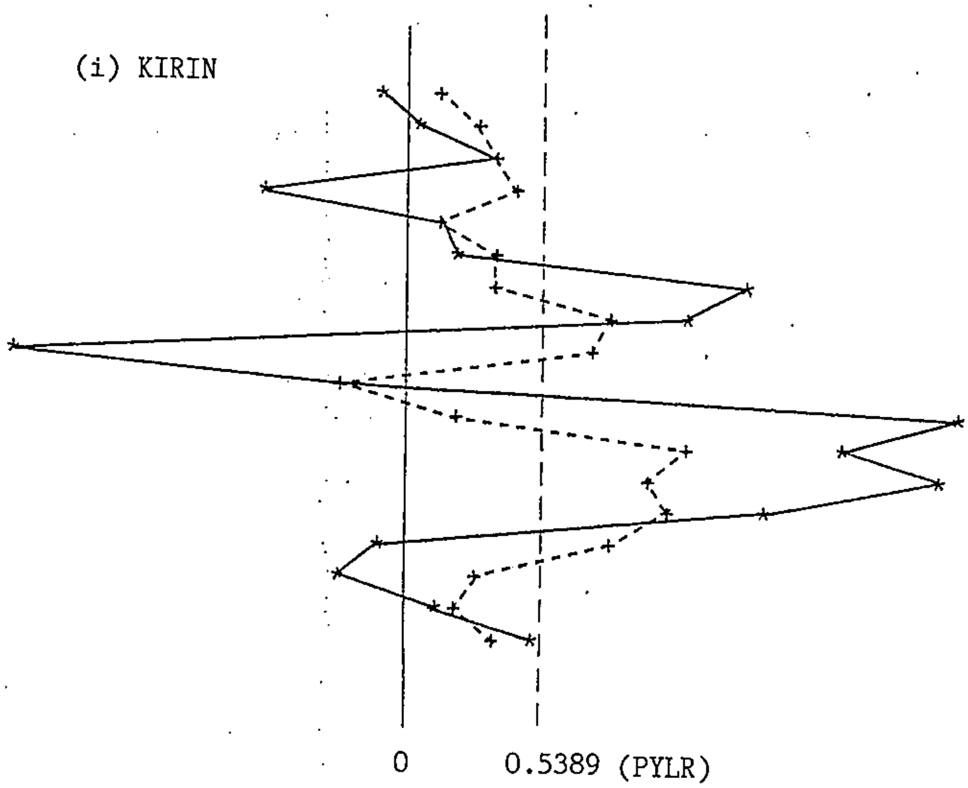
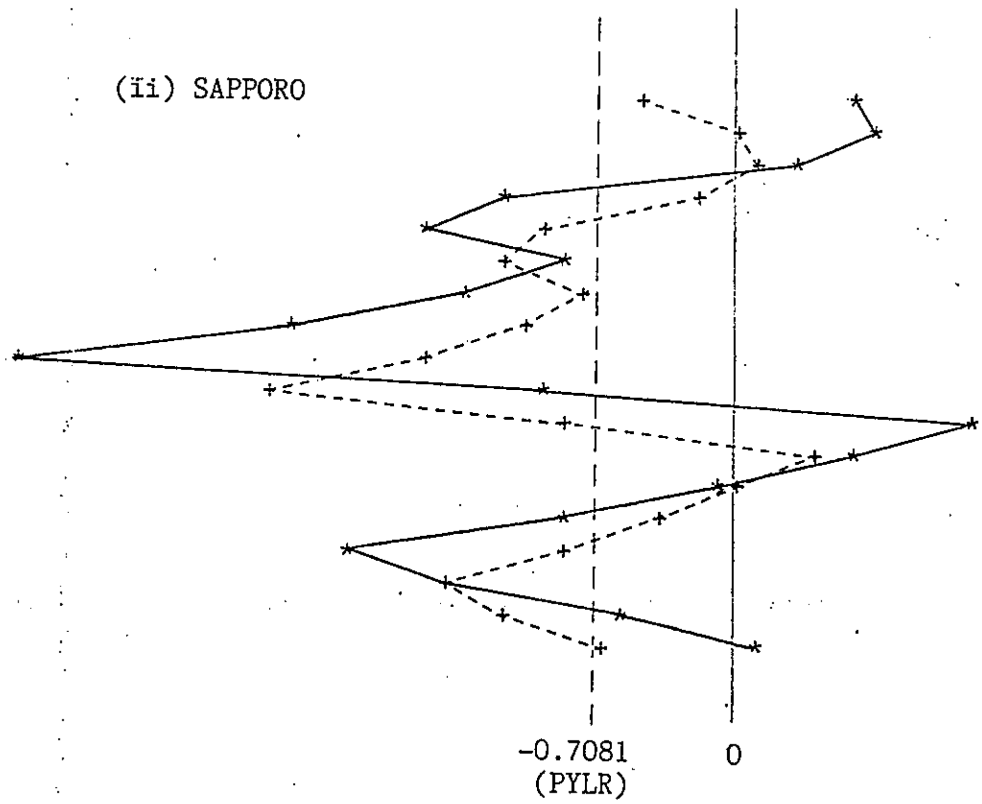


Figure 2: Actual (bold line) and Fitted (dotted line) values of Normalized Profit Rates: 1966-1983

(i) KIRIN




(ii) SAPPORO
-0.7081
(PYLR)
0

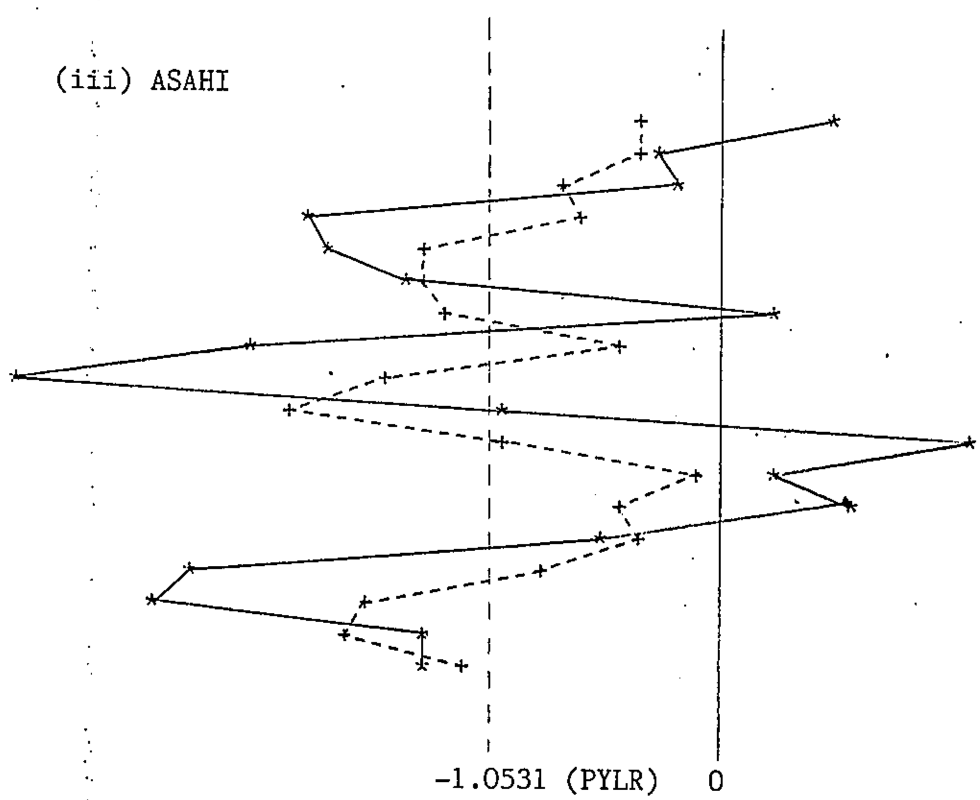

(iii) ASAHI
-1.0531 (PYLR)
0

Table 3: Effects of Concentration and Market Share on Four Profit Measures

Dependent Variable	Constant	CR	MS	GIND	$\bar{R}^2$
I. Number of observations = 100					
PYLR	-1.686[b]	.019[b]		.030	.052
	(-2.585)	(2.492)		(.808)	
PYAV	-1.838[a]	.026[a]		.013	.101
	(-2.979)	(3.533)		(.374)	
PYIN	-2.068[b]	.035[a]		.007	.093
	(-2.387)	(3.445)		(.136)	
PYLMD	.362[a]	.003[a]		-.007	.111
	(4.499)	(3.599)		(-1.620)	
II. Number of observations = 88					
PYLR	-1.788[a]		.043[a]	.051	.151
	(-3.367)		(3.979)	(1.433)	
PYLR	-2.131[a]	.009	.035[b]	.043	.149
	(-3.282)	(.919)	(2.493)	(1.179)	
PYAV	-1.693[a]		.050[a]	.037	.200
	(-3.302)		(4.790)	(1.076)	
PYAV	-2.249[a]	.015	.037[a]	.024	.213
	(-3.622)	(1.559)	(2.748)	(.693)	
PYIN	-1.818[b]		.071[a]	.030	.191
	(-2.452)		(4.728)	(.601)	
PYIN	-2.585[a]	.021	.053[a]	.012	.202
	(-2.874)	(1.485)	(2.742)	(.244)	
PYLMD	.459[a]		.004[a]	-.005	.074
	(6.561)		(2.783)	(-1.011)	
PYLMD	.336[a]	.003[b]	.001	-.008	.133
	(4.064)	(2.586)	(.584)	(-1.616)	

t-values in parentheses. Significance levels are : a, one percent; b, five percent; c, ten percent.

Table 4: Regressions with Inverted Rank

Dependent Variable	Constant	CR	RINV	GIND	$\bar{R}^2$
PYLR	-3.107[a]	.024[a]	1.319[b]	.036	.152
	(-4.199)	(3.092)	(2.547)	(.989)	
PYAV	-3.272[a]	.031[a]	1.384[a]	.016	.215
	(-4.625)	(4.116)	(2.793)	(.474)	
PYIN	-3.817[a]	.043[a]	1.641[b]	-.001	.180
	(-3.669)	(3.982)	(2.253)	(-.027)	
PYLMD	.368[a]	.004[a]	-.048	-.008[c]	.134
	(3.895)	(3.860)	(-.726)	(-1.810)	

Number of observations = 88. For notation, see Table 3.

Table 5: Interactive Effects of Share (or Inverted Rank) and Concentration on PYLR

No.	Constant	MS	RINV	CR	CR×MS	CR(1-MS)	CR×RINV	CR×(1-RINV)	GIND	$\bar{R}^2$	r
(i)	-2.131[a]	.035[b]		.009					.043	.149	.619
	(-3.282)	(2.493)		(.919)					(1.179)		
(ii)	-1.602[b]	.019			.023				.047	.143	.976
	(-2.427)	(.380)			(.478)				(1.289)		
(iii)	-2.290[a]	.045[a]				.011			.043	.150	-.977
	(-3.061)	(4.075)				(.952)			(1.190)		
(iv)	-3.107[a]		1.319[b]	.024[a]					.036	.152	.040
	(4.199)		(2.547)	(3.092)					(.989)		
(v)	-1.780[a]		.593		.0004[a]				.048	.152	.450
	(-2.991)		(1.024)		(3.098)				(1.340)		
(vi)	-1.759[a]		.587			-.0004[a]			.048	.152	-.454
	(-2.956)		(1.011)			(-3.088)			(1.346)		
(vii)	-1.596[a]		-.559				.028[a]		.042	.132	.807
	(-2.640)		(-.627)				(2.723)		(1.167)		
(viii)	-4.234[a]		4.039[a]					.040[b]	.040	.109	-.911
	(-3.340)		(3.129)					(2.238)	(1.071)		

Number of observations = 88. r is the correlation coefficient between explanatory variables other than the constant and GIND. For other notation, see Table 3.

Table 6: Determinants of PYLR for Leader Firms

No.	Constant	MS	FOL	MS(1-MS)	FOL(1-MS)	GIND	$\bar{R}^2$
(i)	-1.199	.033[b]	.003			.026	.048
	(-1.100)	(2.147)	(.142)			(.419)	
(ii)	.065	.050[b]		-.088		.022	.081
	(.048)	(2.361)		(-1.144)		(.363)	
(iii)	-.333	.071[b]		-.142	.041	-.0002	.084
	(-.237)	(2.441)		(-1.538)	(1.053)	(-.003)	

Number of observations = 40. For notation, see Table 3.

Table 1: Autoregression Results for Beer Breweries

Company	$\hat{\kappa}$	$\hat{\lambda}$ (PYLMD)	$\bar{R}^2$	DW	$\hat{\kappa}/(1-\hat{\lambda})$ (PYLR)
Kirin	0.3399 (1.2684)	0.3691 (1.6400)	0.0904	1.7189	0.5389
Sapporo	-0.3062 (-1.0993)	0.5676[b] (2.7271)	0.2747	1.2666	-0.7081
Asahi	-0.6010 (-1.7916)	0.4293[c] (1.9714)	0.1451	1.6961	-1.0531

t-statistics in parentheses. Significance levels (two-tailed test) are: b, five percent; c, ten percent.

Table 2: Correlation Coefficients

	PYLR	PYAV	PYIN
PYAV	.8994		
PYIN	.5118	.7682	
PYLMD	.3723	.4568	.4201

Number of observations : 100

Table 7: Effects of Advertising and R&D on PYLR

No.	Constant	MS	RINV	CR	CR×(1-MS)	AD	AD×MS	RD	RD×MS	GIND	$\bar{R}^2$
I. Number of observations = 78											
(i)	-2.107[a]	.047[a]				-.057				.073[c]	.175
	(3.632)	(4.070)				(-.737)				(1.952)	
(ii)	-3.541[a]		1.433[b]	.026[a]		-.025				.056	.168
	(-4.355)		(2.512)	(3.066)		(-.324)				(1.465)	
(iii)	-2.043[a]		.605		-.0004[a]	-.052				.070[c]	.171
	(-3.115)		(.937)		(-3.109)	(-.675)				(1.844)	
(iv)	-2.181[a]		.581		-.0005[a]		-.003			.072[c]	.186
	(-3.362)		(.909)		(-3.298)		(-1.396)			(1.916)	
II. Number of observations = 37											
(v)	-1.317	.020				-.090		.251		.051	.039
	(-1.480)	(1.042)				(-.699)		(.585)		(.890)	
(vi)	-2.399[c]		.960	.014		-.109		.336		.045	.047
	(-1.929)		(1.125)	(1.112)		(-.841)		(.775)		(.795)	
(vii)	-1.513		.804		-.0001	-.137		.402		.051	.016
	(-1.628)		(.802)		(-.451)	(-1.055)		(.904)		(.875)	
(viii)	-1.589[c]		.890		-.0002		-.008[c]		.011	.061	.084
	(-1.786)		(.920)		(-.719)		(-1.863)		(.751)	(1.157)	

APPENDIX: LIST OF COMPANIES

Industry	Company (Rank in 1964 in parentheses)
Wheat	Nisshin Flour Mills(1), Nippon Flour Mills(2)
Sugar	Taito(3)
Milk and milk products	Snow Brand Milk(1), Morinaga Milk(2), Meiji Milk(3)
Ham and sausage	Prima Meat Packers
Beer	Kirin(1), Asahi Brewery(2), Sapporo(3)
Fermented milk product[b]	Calpis(1)
Food oil[b]	Nisshin Oil(1), Yoshihara Oil(2), Hohnen Oil(3) (MS,CR:1967)
Soy sauce[b]	Kikkoman(1)
Monosodium glutamate	Ajinomoto(1)
Paper	Oji(1), Jujo(2), Daishowa(3)
Oxygen gas	Daido Oxygen, Osaka Sanso, Nippon Sanso (CR:1967)
Detergent[a]	Kao(1)
Medicine[a]	Takeda(1), Sankyo, Tanabe
Paint	Dai Nippon Toryo, Nippon Paint, Kansai Paint
Printing ink	Dainippon Ink and Chemicals(1)
Photo Film[a]	Fuji Photo Film(1), Konishiroku(2)
Petrokeum[b]	Nippon Oil(1), Mitsubishi Oil(4), Maruzen Oil(6) (MS:1968)
Tires[a]	Bridgestone(1), Yokohama Rubber(2), Toyo Tire(3)
Sheet glass[a]	Asahi Glass(1), Nippon Sheet Glass(2)
Cement	Onoda Cement(1), Nihon Cement(2), Osaka Cement(4)
Synthetic graphite[a]	Tokai Carbon(1), Nippon Carbon(2), Kyowa Carbon(3)
Sanitation fixtures	Toto (CR:1967)
Insulators[a]	NGK Insulators(1)
Refractories	Shinagawa Refractories(1), Kurosaki Refractories(2)
Steel	Kawasaki Steel(3), Nippon Kokan(4), Sumito Metal(5)
Alumina	Nippon Light Metal(1) (MS:1968)

Rolled aluminum[a]	Sumitomo Light Metal(1)
Electric wire and cable [a]	Sumitomo Electric(1), Furukawa Electric, Hitachi Cable
Die casting[b]	Ryobi(1) (MS,CR:1966)
Cans[a]	Toyo Seikan(1), Hokkai Can(3)
Bridges	Miyaji Iron Works(1), Yokogawa Bridge Works(2), Matsuo Bridge(4) (MS:1965)
Steel wire ropes[b]	Tokyo Rope(1)
Springs[a]	NHK Spring(1)
Textile machineries[a]	Toyoda Automatic Loom Works(1)
Cultivators	Kubota(1), Iseki(2)
Pumps[a]	Ebara(1)
Sewing machines[b]	Riccar(1), Janome(2), Brother(3)
Bearings[a]	Koyo Seiko(1), NTN Toyo Bearing(2), Nippon Seiko(3)
Heavy electric equipments[b]	Hitachi(1), Mitsubishi Electric(2), Toshiba(3) (MS,CR:1965)
Computers[b]	Nippon Electric(1), Fujitsu(3), Oki(5)
Storage batteries[a]	Japan Storage Battery(1), Yuasa Battery(2)
Shipbuilding[b]	Ishikawajima-Harima(2), Hitachi Zousen(3),Mitsui Engineering & Shipbuilding(5)
Passenger cars[b]	Toyota(1), Nissan(2), Toyo Kogyo(3)
Train cars[b]	Nippon Sharyo(1), Kinki Sharyo(4) (MS,CR:1963)
Cameras	Canon(1), Minolta(2), Olympus(3) (MS:1966)
Watches and clocks[a]	Hattori Seiko(1), Citizen Watch(2), Ricoh Watch(4)
Pianos[a]	Nippon Gakki(1), Kawai Musical Instruments(2)

Notes: a indicates the use of the FTC data for MS. b indicates the use of the Toyo Keizai data for CR. Otherwise MS is from Toyo Keizai and CR is from the FTC. (MS:1968), etc., indicates that MS is for the year 1968, etc. When no such statement appears, both MS and CR are for the year 1964.