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Market Share Instability and Size Similarity
Some Evidences of Behavioral Similarity of the Japanese Firms

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ABSTRACT

Many anecdotes suggest that competing Japanese firms tend to adopt similar behavior. In this paper, we perform two different tests to explore similarities in firm behavior and market structure in Japan. The first test shows that firm sizes are more similar in Japan than in the US, while there is no difference in market concentration between the two countries. The second test relates to market share stability, which is a proxy for similar behavior. Prior studies have regarded market share stability as a result of collusion. If so, market share stability should be positively correlated with market concentration which promotes collusion. In contrast, if similar behavior stems from competitive interaction and mimetic isomorphism, market share stability should be positively correlated with firm size similarity reflecting similarity of firm capabilities and characteristics. We find that market share stability in Japan has a strong and positive association with firm size similarity, while it has no significant relationship with market concentration. These results suggest that Japanese firms tend to take similar behavior stemming not from collusion but from competition.

I. Introduction

Similarity of behavior among competitors is one of the remarkable characteristics of Japanese firms. The list of anecdotes is endless: In the Japanese soft drink industry, every successful new product is instantly imitated by rivals. Most Japanese steel manufacturers diversified their business into similar industries that are unrelated to their steel business, when the steel market stopped growing. Itami (1988) finds that the Japanese semiconductor manufacturers simultaneously invested in production capacity at the bottom of the demand cycle, which led to an increase in the Japanese share of global semiconductor market. Itami (1989) and Shintaku (1994) study the industries where Japan has competitive advantages such as VCR and color TV, respectively. They find that the competing firms in Japan pursued similar technological opportunities, while the US counterparts pursued different technologies and consequently, dispersed R&D efforts at the country level[1].

There are two competing interpretations of behavioral similarity. It might be natural to think that firms behave similarly because they collude[2]. With this interpretation, we expect that firms take similar behavior in highly concentrated markets, where it is considered easy for them to collude.

However, others regard behavioral similarity as the result of competition. Abegllen and Stalk (1985) point out that, as one of the fundamentals of the Japanese firms, they pay great attention to their competitors[3]. They said that, for Japanese firms, being behind their rivals is a more serious risk than incurring a deficit. Itami (1988) argues that the Japanese firms compare and compete with each other intensively. They closely monitor their rivals and follow their ways.

Similar behavior caused by competitive response is probable when competing firms have similar capability, because under such a situation, imitation is feasible and being forestalled is fatal (Knickerbocker, 1973). Moreover, the institutional theory of organization on mimetic isomorphism (DiMagggio and Powell, 1983) gives some explanations of mimicking. Imitating other organizations is appropriate for dealing with uncertainty when the imitator is similar to the other organizations. Therefore, with the interpretation of similar behavior as competition, we should see firms with similar capabilities behaving more similarly.

It is, however, very difficult to measure similarity in firms' capabilities. Firms are characterized with various dimensions. It is almost impossible to have a good measure of similarity that reflects such variety, especially for a cross-sectional study. Therefore, we use firms' market shares as a rough indicator of their capabilities, because one of the aggregate measures of firm capability and characteristics is its size (Hannan and Freeman, 1977; Porter, 1979; Porac et al., 1995). In this paper, we calculate the coefficient of variation of the four largest firms' market shares as the measure of firm similarity.

It is also very hard to have a good measure of behavioral similarity. Firms compete with each other in various ways, which may differ by industry. Therefore, we use market share stability as a proxy for behavioral similarity, because firms' market shares should not change much if they behave similarly. We calculate five year market share change

of the leading firms in several Japanese product markets.

In this paper, we specifically perform two different tests to explore similarity in market structure and firm behavior in Japan. One is to see if there are any differences in market structure between the US and Japan. If Japanese firms have distinctive characteristics of similar behavior, market structure, either concentration, or firm size similarity, should be different between the two countries. The other test is about the determinants of market share instability. Using the Japanese market share data at the two different data points, we examine between market concentration and firm size similarity, which has a stronger association with the instability of market shares.

The structure of this paper is as follows; In section two, we survey existing related studies and propose hypotheses. In section three, we explain about the data and the method. In section four, we describe and discuss the results. Conclusion and future research agenda are in section five.

Ⅱ. Theory and Hypotheses

(1) Similarity of Behavior and Stability of Market Shares

Firms compete with each other in several ways such as price, quantity of supply, production capacity, advertising, R&D, and so on, which may depend on the characteristics of the industry to which they belong. Therefore, it is very difficult to have a single measure of behavioral similarity, especially for a cross-sectional study[4]. Traditionally, the cross-sectional industrial organization studies have not often examined firm behavior directly. This is because Structure-Conduct-Performance paradigm postulates that market performance is determined by market conduct, which is dependent on market structure. Studies in this paradigm therefore tend to examine the relationship between market structure and market performance.

Some exceptions exploring market conduct are the studies on mobility statistics such as the turnover among the leading firms and the instability of market shares (Joskow, 1960; Gort, 1963; Heggestad and Rhoades, 1976; Caves and Porter, 1978; Baldwin and Gorecki, 1994). Heggestad and Rhoades (1976) postulate that mobility constitutes a proxy for the overall conduct (price and non-price) of firms in a market. Caves and Porter (1978) argue, "The instability of market shares, especially among an industry's leading firms, provides a measurable indicator of rivals' behavior in oligopolistic markets (P. 289)." Baldwin and Gorecki (1994) state that, "[Mobility statistics] reflect the process that takes place within an industry as firms enter and exit, grow and decline whether via internal growth or mergers, whether due to luck or chance or purposive economic decisions (P. 93)."

We think that the change of the market shares among leading firms reflects the similarity of their behavior. Suppose that one firm took a successful strategy. If competing firms monitor each other very carefully, they would notice the firm's success and imitate the strategy. It is true that the firm can increase its market share temporarily with some successful behavior, however, the rivals can restore their shares by following it instantly. That is, if competing firms behave

similarly, the change of their market shares for a certain period should be small[5]. Thus, we use market share stability as the measure of behavioral similarity.

(2) Similar Behavior as Collusion

Instability of market shares has been considered a direct measure of intensity of competition that the Austrian school characterizes as a process (Schumpeter, 1934; Kirzner, 1973; Heggestad and Rhoades, 1976; Caves and Porter, 1978; Baldwin and Gorecki, 1994). Shepherd (1970) argues, "Successful cooperation will --- while it lasts --- usually hold company shares virtually constant. Such constancy may be used to infer cooperation, even when direct evidence is lacking. Constancy might also stem from vigorous but stalemated competition, as all competitors strain and "succeed" equally. But such a running standoff is relatively improbable. The greater the stability, the higher is the probability that overt or covert cooperation exists; a churning among the leading firms could suggest active competition, no matter how monopolistic the structure seems to be (P. 131)." Caves and Porter (1978) also postulate that stability of shares reflects the stability and completeness of the oligopolistic bargain.

If stability stems from collusion, mobility statistics should be negatively correlated with market concentration, because it is considered that firms in highly concentrated markets can collude easily[6]. Several studies for the US find the relationship consistent with this expectation. Gort (1963) calculates the correlation coefficient for the relation of 1947 and 1954 market shares in 205 US industries. He finds that the correlation of this coefficient and the concentration ratio for twenty largest firms is .529[7]. Heggestad and Rhoades (1976) adopt the rank changes among the three largest firms (Mobility) and the changes in identity of the three largest firms (Turnover) as stability measures, using the data of US commercial banking. They find significantly negative relationships between concentration and the mobility statistics.

The result of Caves and Porter (1978), however, is less clear. The regression coefficient of relative share instability on concentration is significantly negative for all the observations, but when the sample is divided, it is positive for low concentration industries (CR3≤50%), and insignificantly negative for medium concentrated industries (50.1%≤CR3 ≤77.5)[8]. Moreover, the regression coefficient of absolute share instability is significantly positive. Baldwin and Gorecki (1994) find the correlation coefficient between CR4 and absolute value of aggregate percentage point market share change is significantly negative in Canadian industries. Once the measures are recalculated on the basis of continuing firms only, however, the correlation coefficient becomes insignificant.

These results do not seem clear enough to believe that constancy of market shares means lack of competition or existence of collusion. The meaning of market share stability might be different among countries. Especially in the countries like Japan, where firms monitor their rivals carefully and imitate instantly their successful moves, constancy can stem from vigorous competition and all competitors strain and succeed equally. Such a running standoff is probable.

(3) Similar Behavior as Competition

If similar behavior is not the result of collusion, why do competing firms adopt similar behavior? In some special industries with network externalities, competing firms might be better off if they cooperate and establish a common industry standard[9]. However, even in the industries without such characteristics, behavioral similarity might happen for the reasons as follows.

First, competitive interaction among firms may promote similar behavior. As Abegllen and Stalk (1985) observe, Japanese firms make every effort not to be behind. Knickerbocker (1973) argues that under the uncertain circumstances, matching each other's moves is the risk-minimizing strategy. As far as rivals match with each other, none of them would be better or worse off. From the point of matching firms, this strategy guarantees that their competitive capabilities would remain roughly in balance[10].

Second, the institutional theories give an explanation for behavioral similarity, that is, institutional isomorphism. DiMaggio and Powell (1983) argue that rational actors make their organizations increasingly similar as they try to change them. This process of homogenization is best captured by the concept of isomorphism. Isomorphism is a constraining process that forces one unit in a population to resemble other units that face the same set of environmental conditions (Hawley, 1986). DiMaggio and Powell (1983) identify three mechanisms of institutional isomorphism: coercive isomorphism, mimetic isomorphism, and normative isomorphism.

Among them, mimetic isomorphism is the process that organizations model themselves on other organizations when the environment is uncertain[11]. Mimetic behavior is rational because it economizes on search costs when faced with uncertainty (Cyert and March, 1963). Mimetic behavior also gives legitimacy to mimicking organizations. It is often pointed out that managers are seldom fired for making the same mistake as their rivals, but they are badly blamed for their mistake when their rivals do the correct thing (Lieberman, 1987)[12].

The interaction between the Japanese electronic calculator manufacturers can be considered a typical example of similar behavior as competition. Casio and Sharp, the two leading manufacturers, were imitating the product line with each other. Once Sharp introduced a very thin type of products and took a lead, Casio instantly followed the move. When Casio introduced the calculators with various functions, Sharp also added similar products in its product line. As a result, their relative market shares did not change. Numagami et al. (1992) argue that the two firms learned their rival's way of business with each other by imitation and sophisticated their own strategic scheme. That is, Casio was Sharp's frame of reference, and vice versa. They were sharing and creating information.

Following the leader, however, is not always rational and feasible. If the imitating organization and its model are completely different, the latter is not a good reference for the former. Managers of small firms are not blamed for doing the different things from large firms. Neither Casio nor Sharp imitated other small manufacturers.

Moreover, small firms can not always imitate their large rivals. As many scholars of resource based view of the firm point out,

strategy is constrained by, and dependent on, the current level of resources (Collis, 1991; Teece, et al., 1991). Therefore, imitation is effective and feasible when organizations have very similar characteristics and capabilities.

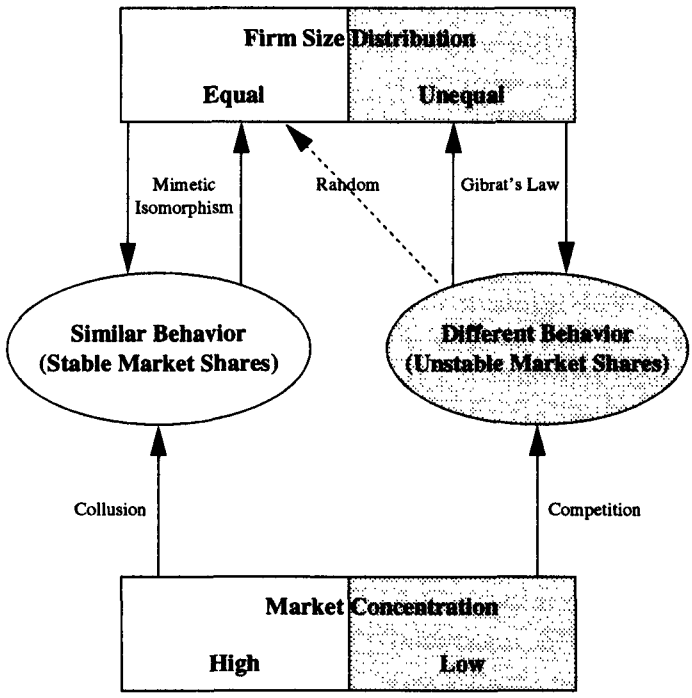
Since a firm is characterized in various dimensions, it is difficult to measure similarity of firm characteristics and capabilities. However, one of the typical variables that classifies the groups of similar firms is firm size. Porter (1979) classifies firms into two strategic groups, leaders and followers, based on their market shares. Porac et al. (1995) also argue that firms consider that the most similar organizations are their rivals and that firm size is one of the important determinants of firm characteristics. Firms of similar sizes regard similar and imitate with each other. On the other hand, as Hannan and Freeman (1977) suggest, organizations of different sizes employ different strategies.

One measure of firm size is its market share. In the Cournot model, firm's market share in equilibrium reflects its marginal cost[13]. Therefore, similar market shares among firms means that they have similar marginal cost, which is an important aspect of firm capabilities.

(4) Hypotheses

According to the traditional theory of industrial organization, market structure determines firm behavior. As shown in Figure 1, several relationships between market structure and firm behavior can be supposed.

Figure 1 : Market Structure and Firm Behavior



As described above, it is often argued that firms in highly concentrated markets can easily collude. Collusion results in similar firm behavior, which leads to the stability of market shares. In contrast, in the markets with low concentration, firms compete with each other. Competition might lead to different behavior and fluctuate their market shares.

On the other hand, from the point of similar behavior as competition and mimetic isomorphism, a different measure of market structure might be related with firm behavior. In the market with similar firm sizes, firms tend to adopt similar behavior, which leads to the stability of market shares. In contrast, when firms have different sizes, they adopt different behavior, which fluctuates their market shares.

In the latter case, it is not clear what kind of market structure will result from different behavior. A smaller firm might increase its market share and firm sizes might become similar, while firms might grow at the rates independent of their sizes and firm size distribution might become more skewed. The latter is essentially Gibrat's Law, which is the most commonly assumed form of stochastic growth models, although Gibrat's Law does not always hold[14]. In the case that firm sizes are similar, however, similar behavior stabilizes firms' market shares. As a result, firm size similarity is likely to be preserved.

Therefore, if similar behavior among competing firms is a feature of Japanese firms, there should be some differences between Japan and the US either in market concentration or in firm size similarity. There are several studies on international comparison of market concentration (Bain, 1966; Rotwein, 1964; Pryor, 1972; Caves and Uekusa, 1976), however, as far as we know, there is no study that compares firm size similarity among the countries. Thus, we have two hypotheses about the comparison of market structure between the US and Japan:

H1a: Markets are more concentrated in Japan than in the US.

H1b: Firm sizes are more similar in Japan than in the US.

We also have two alternative hypotheses on market share stability in Japan, which is considered to reflect similar behavior. If market share stability stems from collusion, we have a hypothesis as follows:

H2a: The more concentrated the markets are, the more likely the firms are to behave similarly and their market shares are to be stabilized.

On the other hand, if similar behavior is regarded as competition, the relationship between market concentration and market share instability is not clear. Rather, firm size similarity would be more important. Therefore, we have another hypothesis as follows:

H2b: The more similar firm sizes are, the more likely the firms are to behave similarly and their market shares are to be stabilized.

Ⅲ. Data and Variables

(1) Data

Primary data in this paper relate to market shares, which are used to construct the measures of market concentration, firm size similarity, and market share stability. We collected recent market share data of 80 prod-

ucts whose data is available both for Japan and for the US. The list of the products is shown in Table 1[15].

Table 1 : List of Products Included in Data Sample

Product	Year		# of Firms	
	US	Japan	US	Japan
Gasoline	1990	1992	4	4
Aluminum	1992	1992	4	4
Boiler	1990	1992	2	4
Crawler Tractor	1991	1992	3	4
Bearing	1990	1992	4	4
Passenger Car	1992	1992	4	4
Truck	1993	1992	4	4
Motor Cycle	1993	1992	4	4
Photo Film	1988	1992	4	3
Steel	1992	1992	4	4
Electric Arc Furnace	1992	1992	4	4
Diesel Engine	1990	1992	4	4
Personal Computer	1992	1992	4	4
Desktop Page Printer	1991	1992	4	4
Ink Jet Printer	1991	1992	4	4
Copier	1992	1992	4	4
Refrigerator	1992	1992	4	4
Microwave Oven	1992	1992	4	4
Coffeemaker	1993	1992	4	4
Color TV	1993	1992	4	4
Videotape	1993	1992	4	4
Semicondactor	1992	1992	4	4
Connector	1992	1992	4	4
Gas Range	1992	1992	4	4
LDPE	1991	1992	3	4
LLDPE	1991	1992	3	4
HDPE	1991	1992	3	4
PET	1991	1992	4	3
Polypropylene	1992	1992	4	4
Polystylene	1992	1992	4	4
ABS Resin	1992	1992	4	4
Polyvinyl Chloride	1992	1992	4	4
Ethylene Propylene	1993	1992	4	3
Nitrile Rubber	1993	1992	4	3
SBR	1993	1992	4	4
Chlorate	1993	1992	4	3

Tire	1992	1992	4	4
Condom	1993	1992	4	3
Cheese	1992	1992	4	4
Ice Cream	1992	1992	4	4
Pasta	1992	1992	4	4
Chocolate	1992	1992	2	4
Snack	1993	1992	4	4
Chewing Gum	1992	1992	3	4
Candy	1992	1992	4	4
Beer	1993	1992	4	4
Wine	1993	1992	4	4
Coffee	1992	1992	4	3
Tea	1992	1992	4	4
Margarine	1993	1992	4	4
Spice	1992	1992	3	3
Frozen Vegetable	1993	1992	4	4
Newsprint	1992	1992	4	4
Uncoated Free-sheets	1992	1992	4	4
Coated Free Sheet Paper	1992	1992	4	4
Kraft paper	1993	1992	4	4
Vitamin	1993	1992	4	4
Lipstick	1991	1992	4	4
Eye Makeup	1991	1992	4	4
Nail Polish	1991	1992	4	4
Shampoo	1993	1992	4	4
Hair Conditioner	1993	1992	4	4
Toothpaste	1993	1992	4	3
Bar Soap	1993	1992	4	4
Lundry Detergent	1991	1992	4	2
Dishwasher Detergent	1992	1992	4	2
Sanitary Napkin	1992	1992	4	3
Diaper	1992	1992	2	3
Skiwear	1993	1992	4	4
Cough and Cold Preparation	1992	1992	4	4
Disk Drive	1992	1992	4	4
Clothes Dryer	1992	1992	4	4
Hairdryer	1992	1992	4	4
Camcoder	1993	1992	4	4
Ceramic Tile	1992	1992	3	3
Cement	1990	1992	4	4
Flat Glass	1989	1992	4	3
Acrylonitrile	1986	1991	4	4
Acetaldehyde	1986	1991	2	4
Ethylene	1986	1991	4	4

However, we do not have the market share data of the four largest firms in all the 80 products markets. Some markets are occupied by less than four firms. For the other markets, the data sources do not provide the market shares of smaller firms. As a result, we have 76 product markets that include the three largest firms' market shares for the US, 78 for Japan, and 74 pairs for the two countries. We have 69 products that include the four largest firms' market shares for the US, 65 for Japan, and 56 pairs for the two countries.

We also collected the data of the Japanese market shares in 1987 to calculate the stability of market shares[16]. However, we have the US data at the only one data point due to the limitation of data availability[17]. Therefore, we cannot construct a market share stability measure for the US. We examine the determinants of the stability of market shares only for Japan. We also constructed other control variables for the regressions of market share stability.

(2) Market Structure Variables

We constructed two kinds of market structure variables, CR_n and CV_{ij}. CR_n is a cumulative concentration ratio for the n largest firms (n=1, 2, 3, 4), and CV_{ij} is a coefficient of variation of market shares of the ith through the jth largest firms (i=1, 2, j=2, 3, 4, and i≠j). The coefficient of variation is standard deviation divided by mean of market shares and stands for the degree of similarity of firm size[18].

(3) Instability of Market Shares

For the same sample of products described above, we constructed market share instability measures in Japan. The procedure is as follows. First of all, we specified the four largest firms in each product market in 1987 and collected the market shares (s_{it}: i=1,2,3, or 4; t=87 or 92) of the four firms in 1987 and 1992, which may or may not be included in the largest four in 1992. Then, we recalculated their market shares (r_{it}) relative to the sum of the four firms' shares as follows:

$$r_{it} = s_{it} \Big/ \sum_{j=1}^{4} s_{jt}$$

The reason for this recalculation is as follows. We take the instability of market shares as an indicator of the difference of behavior among the firms. However, even if the four leading firms take the same behavior, the market shares of the four firms would change for the time period because new firms enter the market or smaller firms decline and exit from the market. Therefore, to neutralize the influence of entry and exit, this recalculation is necessary.

Next, to calculate market share instability measures, we took the percentage-point change of market shares between 1987 and 1992. We suppose that this five year interval is long enough to allow firms to counter their rivals' successful moves. On the other hand, other studies often use annual year changes of market shares. They might ignore firms' countermove and emphasize temporary share instability. Since we are examining whether similar behavior is collusion or countermove, our measures fit our purpose better.

Finally, we calculated two kinds of market share instability measures, absolute and relative share instabilities, *An* and *Rn* (n=2 or 4) as follows[19].

$$An = \sum_{i=1}^{n} | r_{i87} - r_{i92} |$$

$$Rn = \sum_{i=1}^{n} | (r_{i87} - r_{i92}) / r_{i87} |$$

Thus, we constructed four market share instability measures as follows:

A4: Sum of the absolute share instability of the four largest firms.

A2: Sum of the absolute share instability of the two largest firms.

R4: Sum of the relative share instability of the four largest firms.

R2: Sum of the relative share instability of the two largest firms.

(4) Independent Variables

We include the two kinds of independent variables in the regressions of market share instability. First one is CV_{14}, which is calculated using the data in 1987, the initial year of the calculation of market share instability measures. If similar behavior stems from competition, the more similar the firms are in terms of size, that is, the smaller CV_{14}, the smaller the change of their market shares would be. Therefore, the sign of the regression coefficient of this variable should be positive. On the other hand, Caves et al. (1980) argue that within the n-firm core, the presence of a dominant firm facilitates the formation and policing of a stable collusion. Therefore, if similar behavior and market share stability reflect collusion, the sign of the regression coefficient of CV_{14} should be negative.

On the other hand, if similar behavior and market share stability reflect collusion, instability of market shares should have a negative correlation with concentration. Therefore, the second independent variable is CR_4, which is calculated using the data in 1987. The expected sign of the regression coefficient is negative.

(5) Control Variables

Some control measures are included in the regressions to reflect various market conditions and strategic variables that would be likely to influence the stability of market shares. First, firms compete with each other in several ways such as price, new product development, advertising, and process innovation[20]. For example, in homogeneous goods markets with mature technology, firms have to compete in terms of price, while in differentiated goods market with frequent technological innovation, firms have various strategic options. In the former, firms tend to take a similar strategy, price reduction, while in the latter, firms have some discrepancy about which strategies they pursue and might take different behaviors with each other[21]. We constructed two kinds of variables that reflect strategic varieties, whose expected sign is positive[22]:

ADR: Average of advertising-sales ratio of each firm in the market.

RDR: Average of R&D intensity of each firm in the market.

Second, if a large amount of capital is required to increase production capacity, firms refrain from expanding capacity and their market shares are likely to be stabilized. In this paper, we take the cost of constructing a single plant of minimum efficient scale divided by the sales of the product market as an indicator of capital requirements (*CAPREQ*), whose expected sign is negative[23].

Although the measurement of minimum

efficient scale is problematic, it is defined as the size of the industry's median plant in this paper. The cost of constructing a plant of this size is book value of such fixed assets as building and equipment (k) multiplied by the ratio of the shipment of the median plant (m) and industry as a whole (s)[24]. Therefore, *CAPREQ* was constructed as follows;

$$CAPREQ = [k*(m/s)]/s.$$

Third, growth in market demand gives a chance for market share disturbance. Firms increase or decrease the supply and the production capacity depending upon market growth. Hymer and Pashigian (1962) find that the variance of growth rates for individual firms in the industry is positively related with the industry's growth. On a basis of this empirical finding, Bloch (1981) argues that the variance in firm growth rates is large in growing industries. Therefore, we have to control the impact of market growth.

To do so, first of all, we calculated the average annual growth rate (*AAGR*) of the sales between 1987 and 1992[25]. The definition of *AAGR* is as follows:

$$AAGR = 100*(\sqrt[5]{Sales_{92}/Sales_{87}} - 1)$$

The demand is growing for some products in our sample while it is declining for others. Since positive and negative growths might have different effects to the market share instability, we performed F-tests of linear constraints. The results indicated that the positive growth and the absolute value of the negative growth had equivalent effects[26]. Therefore, we constructed, *ABSAAGR*, the absolute value of *AAGR* and used it as a market growth variable in this paper. The expected sign of *ABSAAGR* is positive.

Mean, standard deviation, and a correlation coefficient matrix of the variables are **shown in Table 2.**

Ⅳ. Results and Discussions

(1) Comparison of Concentration and Firm Size Similarity between Japan and the US

The results of the tests for differences in market structure between the US and Japan are **shown in Table 3.** The tests in the upper part of the table show that Japan and the US are almost identical in terms of market concentration. This is consistent with several existing studies on international comparison of concentration measures (Bain, 1966; Rotwein, 1964; Pryor, 1972; Caves and Uekusa, 1976). This consistency also shows that our sample is not strange.

On the other hand, the tests in the lower portion of Table 3 show that there are significant differences between the two countries in some coefficients of variation of market shares. In every coefficient of variation except for CV_{12}, the mean is lower in Japan than in the US. There is a significant difference of CV_{24} between the two countries at 5% level for two-tailed test. CV_{14} and CV_{23} are also different between the countries at 10% level. That is, size similarity among the top and other three firms is not different between the two countries. Excluding the leader, however, the difference in firm size similarity between the two countries is significantly large.

Table 2 : Mean, Standard Deviation, and Correlation Matrix

	A2	*A4*	*R2*	*R4*	*CV14*	*CR4*	*RDR*	*ADR*	*ABSAAGR*	*CAPREQ*
A2	1									
A4	0.90652	1								
R2	0.96475	0.83401	1							
R4	0.82736	0.95032	0.74487	1						
CV14	0.43415	0.41799	0.44512	0.5155	1					
CR4	0.20665	0.18199	0.10072	0.21312	0.52419	1				
RDR	0.24444	0.10354	0.24275	0.086387	0.06344	-0.13427	1			
ADR	0.19363	0.33439	0.18217	0.41059	0.23917	0.0030323	0.10111	1		
ABSAAGR	0.48358	0.29017	0.4338	0.37169	0.21467	0.23362	0.18566	-0.17085	1	
CAPREQ	-0.17092	-0.16441	-0.17265	-0.12725	-0.000875	0.12952	-0.12607	-0.12617	-0.050939	1
Mean	7.80405	14.1916	0.25733	0.73605	0.47693	70.96304	2.34037	2.00374	4.93653	0.019588
Std Dev	7.01479	11.43998	0.23031	0.70361	0.27206	16.57298	2.64108	2.46341	5.385	0.092924

Table 3 : Paired Two Sample t-Test for Difference in Means of Concentration Ratios and Coefficients of Variation of Market Shares

	CR4		*CR3*		*CR2*		*CR1*	
	US	*JAPAN*	*US*	*JAPAN*	*US*	*JAPAN*	*US*	*JAPAN*
Mean	69.34	69.19	63.08	63.40	52.33	50.77	32.95	31.61
Variance	419.84	280.91	406.47	382.38	376.12	314.94	241.13	209.67
Observations	59		75		80		80	
Pearson Correlation	0.30		0.41		0.40		0.46	
Hypothesized Mean Dif.	0		0		0		0	
df	58		74		79		79	
t Stat	0.05		-0.13		0.68		0.77	
P(T<=t) one-tail	0.48		0.45		0.25		0.22	
t Critical one-tail	1.67		1.67		1.66		1.66	
P(T<=t) two-tail	0.96		0.90		0.50		0.45	
t Critical two-tail	2.00		1.99		1.99		1.99	

	CV14		*CV24*		*CV13*		*CV23*		*CV12*	
	US	*JAPAN*	*US*	*JAPAN*	*US*	*JAPAN*	*US*	*JAPAN*	*US*	*JAPAN*
Mean	0.56	0.48	0.39	0.27	0.46	0.44	0.29	0.23	0.32	0.33
Variance	0.09	0.09	0.08	0.04	0.09	0.08	0.06	0.05	0.08	0.07
Observations	56		56		74		73		80	
Pearson Correlation	0.43		0.20		0.42		0.31		0.28	
Hypothesized Mean Dif.	0		0		0		0		0	
df	55		55		73		72		79	
t Stat	1.82		2.87		0.45		1.71		-0.10	
P(T<=t) one-tail	0.04		0.00		0.33		0.05		0.46	
t Critical one-tail	1.67		1.67		1.67		1.67		1.66	
P(T<=t) two-tail	0.07		0.01		0.65		0.09		0.92	
t Critical two-tail	2.00		2.00		1.99		1.99		1.99	

(2) Determinants of Market Share Instability

The regression results are **shown in Table 4.** According to the table, CV_{14}, the coefficient of variation of the market shares among the four largest firms, has a significantly positive regression coefficient in all the regressions. This fairly strong result suggests that the stability of market shares, which is considered a proxy for similar behavior among competing firms, stems from competition.

On the other hand, CR_4, a cumulative concentration ratio of the four largest firms, does not have a significant coefficient in any of the regressions. Moreover, its sign is positive except for equation (11), when it is not added to CV_{14}. These results do not support the hypothesis that the stability of market share, that is, similar behavior among competing firms, stems from collusion.

Regarding with the control variables, *ABSAAGR* always has a significant and positive regression coefficient for every market share instability measure. *ADR* has a significant and positive regression coefficient except for equation (10) and (12). *CAPREQ* does not have a significant regression coefficient for any of the market share instability measures, however, the sign is negative as we expected. *RDR* has no significant regression coefficient, and its sign is negative for *A4* and *R4*.

These results, which are favorable to the hypothesis that similar behavior stems from competition and are unfavorable to the hypothesis that it stems from collusion, are consistent with other observations and empirical results. These results suggest that the firms of similar sizes compete by behaving similarly. If so, similarity in firm sizes should be associated with low profitability of the firms. Asaba (1996) finds that there is a positive relationship between the profitability and the coefficient of variation of the market shares. Porter (1996) also argues that the large Japanese firms imitate with each other and suffer from mutually-destructive battles.

Moreover, Odagiri (1992) finds that the profit rates of the Japanese firms are lower than foreign counterparts. As described earlier, the coefficient of variation of firm market shares is smaller in Japan than in the US. Since similar behavior is associated with the coefficient of variation, the results of this paper suggest that the Japanese firms behave similarly. If similar behavior stems from competition, profitability of the Japanese firms is lower than that of the US counterparts. This is exactly the finding of Odagiri (1992). Thus, one reason for lower profitability in Japan may be intense competition stemming from behavioral similarity.

Other than CV_{14}, *ABSAAGR* has a strong association with market share instability. It means that, as expected, exogenous disturbances play an important role in determining market share instability[27].

V. Conclusion

In this paper, we find that firm sizes are more similar in Japan than in the US, while there is no difference in market concentration between the two countries. We also find that market share stability in Japan has a strong and positive association with firm size similarity, but no significant relationship with market concentration. These two results suggest that Japanese firms tend to take similar behavior stemming not from collusion but

Table 4 : The Regression Results

Dep. Var.	*A4*			*A2*			*R4*			*R2*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
C	3.12	3.11	4.37	0.45	2.09	2.20	-0.11	-0.05	0.09	0.02	0.15	0.17
	(0.92)	(0.43)	(0.60)	(0.22)	(0.54)	(0.53)	(-0.60)	(-0.12)	(0.23)	(0.30)	(1.23)	(1.37)
CV14	12.10		12.79	6.68		7.60	0.90		1.01	0.25		0.33
	(2.06)**		(1.85)*	(1.92)*		(1.91)*	(2.84)***		(2.72)***	(2.28)**		(2.70)**
CR4		0.06	-0.02		0.01	-0.03		0.00	0.00		0.00	0.00
		(0.60)	(-0.20)		(0.16)	(-0.49)		(0.64)	(-0.59)		(-0.47)	(-1.41)
RDR	-0.05	0.00	-0.07	0.24	0.20	0.21	-0.01	-0.01	-0.02	0.01	0.01	0.01
	(-0.08)	(-0.61E-02)	(-0.12)	(0.67)	(0.57)	(0.59)	(-0.44)	(-0.33)	(-0.55)	(0.85)	(0.66)	(0.65)
ADR	1.39	1.81	1.38	0.72	1.00	0.71	0.11	0.14	0.11	0.02	0.03	0.02
	(2.13)**	(2.77)***	(2.08)**	(1.87)*	(2.76)***	(1.82)*	(3.15)***	(3.86)***	(3.07)***	(1.34)	(2.31)**	(1.27)
ABSAAGR	0.59	0.69	0.60	0.56	0.64	0.57	0.05	0.06	0.05	0.02	0.02	0.02
	(1.96)*	(2.22)**	(1.94)*	(3.04)***	(3.48)***	(3.05)***	(3.01)***	(3.27)***	(3.04)***	(2.68)**	(3.31)***	(2.92)***
CAPREQ	-13.99	-14.85	-13.57	-8.87	-8.72	-8.16	-0.50	-0.52	-0.43	-0.31	-0.27	-0.25
	(-0.86)	(-0.86)	(-0.81)	(-0.88)	(-0.85)	(-0.80)	(-0.57)	(-0.54)	(-0.48)	(-0.97)	(-0.82)	(-0.78)
R^2	0.32	0.26	0.32	0.37	0.32	0.37	0.48	0.38	0.48	0.35	0.28	0.38
Adj. R^2	0.23	0.17	0.21	0.29	0.24	0.28	0.41	0.31	0.40	0.28	0.20	0.30
No. of Obs	46	47	46	49	52	49	46	47	46	49	52	49

Numbers in parentes are t statistics.
Significance levels are using 2-tailed test: * = 10%, ** = 5%, *** = 1%."

from competition. In other words, size similarity in Japan promotes competition. This is consistent with several anecdotes and observations mentioned in this paper or elsewhere.

Japanese firms are sometimes criticized as copycats[28]. Porter (1996) also argues that they should stop imitating their rivals and have their own strategy. However, mimetic isomorphism economizes on search costs. Moreover, for fear of being caught up by their rivals, firms might try to go a little ahead of their rivals. They might model themselves on others, add their own strength on the model, and improve little by little. In contrast, when firms tend to behave differently, once they succeed in their own way, they might be reluctant to improve further for lack of fear of imitation. Therefore, similar behavior might be one reason for the success of Japanese firms.

Although the analysis in this paper suggests that Japanese firms are likely to adopt similar behavior stemming from competition and mimetic isomorphism, it is not so sure that similar behavior is a distinctive feature of Japanese firms. To examine this, US-Japan comparison of market share stability with longitudinal data is necessary. This is a future research agenda.

While in some Japanese industries, firms might behave similarly because of tacit collusion, the results show that it is not often the case. However, we do not know the determinants of firm size similarity or causality between similar behavior and firm size similarity. To examine them, we need more comprehensive time series-data. This is also a future research agenda.

Appendix

(1) Test of linearity of positive and negative market growth

We set the two variables, *POSI* and *NEGA*. *POSI* is *AAGR* if the value is positive and is 0 otherwise. *NEGA* is the value of *AAGR* if the value is negative and is 0 otherwise. Clearly, $AAGR = POSI + NEGA$. We ran the two regressions of constrained and unconstrained models as follows.

$$MSI = \beta_0 + \beta_1 ADR + \beta_2 RDR + \beta_3 CAPREQ + \beta_4 POSI + \beta_5 NEGA + \varepsilon$$

$$MSI = \beta_0 + \beta_1 ADR + \beta_2 RDR + \beta_3 CAPREQ + \beta_6 AAGR + \varepsilon .$$

(MIS is either of *A4*, *A2*, *R4*, or *R2*, and ε is an error term)

The null hypothesis is $\beta_4 = \beta_5$. To test the hypothesis, F-statistics are used. In this case, F-statistics with numerator degrees of freedom equal to the number of constraints and denominator degrees of freedom equal to the degrees of freedom in the unconstrained model can be computed from the sum of squared residuals of the two models[29]:

$$[(RSSR - USSR)/m]/[USSR/(T - K)] \sim F(m, T - K).$$

RSSR: sum of square residual in the restricted model

USSR: sum of square residual in the unrestricted model

T - K: degree of freedom in the unrestricted model

m: number of constraints.

The result is, the null hypothesis is rejected at 1% lever for three specifications, at 5% level for six specifications, and at 10% level for 3 specifications (The maximum P-value is .058). Therefore, we consider posi-

tive growth and negative growth have different effects on market share instability.

(2) Test of linearity of positive and absolute value of negative market growth

Next, we test if we can use *ABSAAGR* only instead of using both *POSI* and *NEGA*. Clearly, *ABSAAGR* = *POSI* - *NEGA*. We ran the two regressions of constrained and unconstrained models as follows. The null hypothesis is $\beta_4 = -\beta_5$.

$$MSI = \beta_0 + \beta_1 ADR + \beta_2 RDR + \beta_3 CAPREQ + \beta_4 POSI - \beta_5 NEGA + \varepsilon$$

$$MSI = \beta_0 + \beta_1 ADR + \beta_2 RDR + \beta_3 CAPREQ + \beta_7 ABSAAGR + \varepsilon .$$

(MIS is either of *A4*, *A2*, *R4*, or *R2*, and ε is an error term)

The result is that F statistics are small enough not to reject the null hypothesis (maximum F-value is 0.537). Therefore, we use *ABSAAGR* in this paper.

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Notes

1 Developing the same technology results in better performance in only the limited cases. One is the case of the technology diffusion. If firms are developing the same technology, one firm can utilize the results of others and avoid duplication of efforts. The other is the case of psychological stimulus. A firm might hustle, knowing the development stage of the other firms. However, developing the same technology is risky. Suppose all firms are pursuing the same technological opportunity, which is not the right one. Then, no firms in one country accomplish it and the country as a whole is behind in global competition. High definition TV might be such a case, where the Japanese firms all pursued one technology, which turned out inferior to digital HDTV.

2 Applying this interpretation for the Japanese economy leads to the idea of a "Japan Inc.", or the conspiracy theory saying that the government guides the businesses, listened to their views, and coordinate them to avoid damaging competition (Odagiri, 1992).

3 They point out three other fundamentals; pursuit of growth, establishment of competitive advantages, and consistent financial and personnel policies. There are many studies about these three, therefore in this paper, monitoring rivals is mainly discussed. See, for example, Odagiri (1992) for pursuit of growth, Kagono et al. (1983) for competitive advantages, and Abegglen (1958), Hazama (1971), Iwata (1977), and Tsuda (1977) for financial and personnel policy.

4 Asaba (1996) uses the standard deviation of advertising sales ratios among competing firms as a behavioral similarity measure, and finds that it has a significant and positive relationship with the coefficient of variation of market shares. Greve (1996) studies on mimicking behaviors with a unique data on the spread of new radio formats in the US, although it is a single industry study.

5 With some first mover advantages, the initial lead of the first mover may continue. However, rapid imitation will tend to diminish the advantages of the pioneering firm. On first mover advantages, see Lieberman and Montgomery (1988).

6 Caves and Porter (1978) expect a non-linear relation with instability rising and then falling as concentration increases from very low to very high levels, because as the number of the firms in the market increases, they can influence market structure less, and their market share changes are smaller. However, as described later, the product markets in

our sample are highly concentrated. Therefore, even if their expectation holds, we should see negative correlation between concentration and mobility statistics.

7 In his mobility statistics, the more the market shares fluctuates, the lower the coefficient. Therefore, the expected sign of the correlation between the statistics and concentration ratio is positive.

8 About their measures of market share instability, relative and absolute share instabilities, see Caves and Porter (1978) and section three of this paper.

9 As to network externalities, see Rofles (1974), Oren and Smith (1981), Kats and Shapiro (1985), Farrell and Saloner (1985). As to the competition and cooperation in such industries, see Asaba (1995).

10 Motta (1994) gives game theoretic explanation for "follow-the-leader" or "bunching" foreign investments which Aharoni (1966) mentioned and Knickerbocker (1973) found.

11 Using the concept of mimetic isomorphism, Fligstein (1985) explains the adoption of the multidivisional structure by firms, and Haveman (1993) explains diversification in California savings and loan associations.

12 The theories of herd behavior give similar explanations about mimicking. They are broadly classified into two types. One type of argument is based on information externality (Banerjee, 1992; Bikhchandani et al., 1992), and the other is based on the incentive of decision makers (Scharfstein and Stein, 1990; Palley, 1995). The first type of theory is different from mimetic isomorphism, because herd behavior can happen even if each player seeks for and gets private information. The second type of theory is quite similar to the idea that mimicking gives organizations legitimacy.

13 As to the Cournot mode, see, for example, Scherer and Ross (1990), PP. 227-229. The relationship between firm's market share and its marginal cost holds only in homogeneous goods markets. Even in differentiated goods markets, however, firm's market share is a good proxy for its capabilities, assuming firm's advertising and R&D expenditures are dependent on its sales.

14 As to Gibrat's law and its violation, see, for example, McCloughan (1995).

15 The source of the US data is Gale Research Inc., Market Share Reporter, and that of the Japanese data is Yano Keizai Kenkyu-sho (Yano Economic Research Institute), Nihon Market Share Jiten (Market Share Directory in Japan) and Nihon Keizai Shinbun-sha (Japanese Economics Newspaper), Shijo Senyuritsu '94 (Market Share '94).

16 Three products in the list, Acrylonitrile, Acetaldehyde, and Ethylene, have the market share data in 1991. However, they are excluded for the analysis of market share stability, because their data are capacity share data. Therefore, market share change are calculated between 1987 and 1992 for all products included in the analysis.

17 The products listed in Market Share Reporter and the data sources change every year. Therefore, we could not collect any credible longitudinal market share data for the US.

18 Caves et al. (1980) and Desai (1985) are examples of studies of industrial organization using the coefficient of variation to measure the degree of firm size similarity.

19 These market share instability measures are almost the same as those in Caves and Porter (1978) except that they took the annual percentage-point change of share in the several year-pairs.

20 It depends either on the characteristics of goods or on the stage of product life cycle. Abernathy (1978) and Abernathy et al. (1983) describe how the way of competition changes along industrial maturity.

21 Even in homogeneous goods markets, the firms have some alternatives of how to decrease the costs to lower the price. However, we think the strategic alternatives are smaller in homogeneous goods than in differentiated goods markets.

22 The data source of the variables is Daiwa Analyst Guide. They are not line of business data but company level data. Therefore, we make a heroic assumption that firms spend the advertising and/or R&D expenditure to any businesses at the same ratio to the sales as a whole.

23 This variable is the same as exogenous sunk costs in Sutton (1991). He defines exogenous sunk costs as set up costs of a plant in the market which are sunk.

24 The source of these data is Census of Manufactures. As to the measurement of minimum efficient scale, see Sutton (1991) and Davies (1980).

25 The data sources are Nihon Market Share Jiten (Market Share Directory in Japan), Kikai Tokei Nenpo (Annual Statistics of Machine), Kagaku Kogyo Tokei Nenpo (Annual Statistics of Chemical Industry), Zakka Tokei Nenpo (Annual Statistics of Miscellaneous Goods), and Kogyo Tokei-hyo (Census of Manufactures). When the sales data is reported by yen, we deflated it with wholesale price indices in Keizai Tokei Nenpyo (Yearbook of Economic Statistics).

26 For more detail of these F-tests, see appendix.

27 Heggestad and Rhoades (1976) and Caves and Porter (1978) point out the importance of market growth, although they do not find significant relationship between mobility statistics and market growth. Their failure in finding the relationship might be related to their using straight growth rate instead of the absolute value of it.

28 See, for example, the article entitled "An American Views Japan's Copycat Culture," Wall Street Journal, July 12, 1988.

29 See TSP User's Guide Version 4.2