

## Factors Which Determine Corporate Diversification : The Case of Camera Producers

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出版者	Institute of Comparative Economic Studies, Hosei University
journal or publication title	Journal of International Economic Studies
volume	4
page range	83-99
year	1990-03
URL	<a href="http://hdl.handle.net/10114/272">http://hdl.handle.net/10114/272</a>

## **FACTORS WHICH DETERMINE CORPORATE DIVERSIFICATION: THE CASE OF CAMERA PRODUCERS \***

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This research is concerned with the factors which determine diversification. I have studied the diversification attempts of the main five camera makers which were roughly the same size and which all possessed the same technology. All five have succeeded in diversifying into various other industries. The research is done by simple statistic methods used on time series, financial data for the five manufacturers between the two years 1975 and 1987. The analysis implies that management rather than technology influences the extent and the direction of diversification. R&D, managerial efficiency, profitability and financial conditions also seem to be related to the movement towards diversification. My contribution is to combine an industrial structure approach with a firm specific approach for analyzing the characteristics of diversification.

### **1. Introduction**

Japanese firms have often turned to diversification of their products as a means of dealing with a slowdown in the growth rate of traditional markets. Firms which can not expect an expansion of demand for their main products have to look for new markets to maintain their growth. Some firms have succeeded in completely changing their main products, but, generally speaking, it is not easy to succeed in diversification; obtaining a sufficient market share and sufficient profit.

Recently, Japanese firms have rushed to enter such promising markets as electronics, new high technology materials, biotechnology, etc., and also have increased the competition in these fields. The development of the semiconductor, which is applicable to many industries, has made it easier to enter various markets and entry barriers have become lower.

A characteristic of Japanese firms is that they have conducted diversification by utilizing their own managerial resources. This is partly because it is impossible in Japan to acquire or merge with corporations listed on the stock market without an ex ante agreement between an acquirer and an acquired firm<sup>1)</sup>. Moreover, as a result of the structure of the Japanese employment system, Japanese firms cannot readily employ additional high-level human resources (such as researchers, engineers, or managers) by entering the labour market. (This problem may be

\* I would like to thank Prof. David Jay Green of Hosei University for his helpful comments. However any remaining errors are the sole responsibility of the author.

easing as the employment system is showing some signs of change.)

Relative to many Japanese industries, firms belonging to the camera industry seem to have had great success in diversification<sup>2)</sup>. These firms dominate the world market for cameras through exports. In addition, the internal Japanese market has become saturated both for cameras and for substitute products such VTR. Camera makers can not expect that their traditional markets will continue to expand. As a result, they have actively pursued diversification and there are a few firms in which the camera sector represents only 20% of total company sales.

The speed of diversification has been so fast that for some of these firms it may not be proper to continue to call them camera makers. Why these makers have succeeded in rapidly diversification and how they have transformed their resources are interesting topics.

This paper is concerned with the factors which have determined the success or failure of diversification for the main five camera makers. Some economists contend that these firms have succeeded in diversification because they had access to advanced technology which could be readily applied to other industries<sup>3)</sup>. However, in fact, there were a few firms which failed to diversify their products. The technology and know-how which the industry had accumulated certainly contributed to the success in diversification found by some firms, but other important factors have also influenced the extent and the direction of diversification.

This paper seeks to answer the question, 'Which factors have been importantly related to corporate diversification within the camera industry?' Namely, this study is concerned with examining the largest five camera makers, Canon, Nikon, Minolta, Olympus and Asahi Kogaku from 1975 to 1987. At the initial point in time, they all seem to have held relatively homogeneous technology and were all of roughly the same corporate scale (except for Canon which was roughly twice the size of its competitors).

Much work on this topic has been done by using inter-industry data<sup>4)</sup>. Some economists have concentrated on the industrial structure in which the firm operates, because they think that this should affect the extent of diversification. On the other hand, business researchers generally adopt a narrow focus, emphasizing the importance of studying firm specific factors which can promote diversification. The research in this paper is designed to identify common factors among firms which have helped to determine corporate diversification.

This paper is organized as follows. Section 2 presents the conditions and structure of the camera market. Section 3 is concerned with the process of diversification of the camera makers. Section 4 discusses the managerial performance of the firms. Section 5 presents the results of a statistical analysis of these factors. The final section contains some concluding remarks.

## 2. The Conditions of the Camera Market

By the end of the second half of the 1960's, Japanese camera makers, competing with each other for exports, had won the major share of the world camera market. However, in the 1970's, the managerial environment changed drastically. The oil crisis of 1973 caused a jump in the price of materials and the rise of the yen after the so-called "Nixon shock" made exports of cameras unprofitable<sup>5)</sup>. The firms responded in a number of ways: they invested in energy and labour saving machines and in process innovations; they reorganized their plants to cut costs; and, at the same time, began to develop overseas production. In addition, they began to search for some avenues for diversification. In this competitive process, some companies such as Yashika, Mamiya, and Tokyo Optical could not keep up in the drive for cost reduction and in R&D, so they dropped out of the competition and became relegated to minor market positions.

Within the traditional camera industry, technological innovation has contributed to the enlargement of this market, in particular the introduction of the compact type camera greatly contributed to an increase in demand. For example, in 1977 a new type of compact camera was developed, namely the 35mm compact camera with an autofocus function. Later a flash was fitted to the camera. More recently a new camera of a compact type, one which had two convertible lenses, both a wide angle one and a telephoto one, was introduced. Each of these innovations raised the demand for compact cameras by enhancing their convenience. In contrast the demand for the high priced single lens reflex camera has declined. The net result has been that total production, including exports for Japanese camera makers has increased, but revenues of the camera makers have begun to decline because of the fall in unit price and the keen competition (see Table 1).

**Table 1. Quantity and Sales of Cameras**

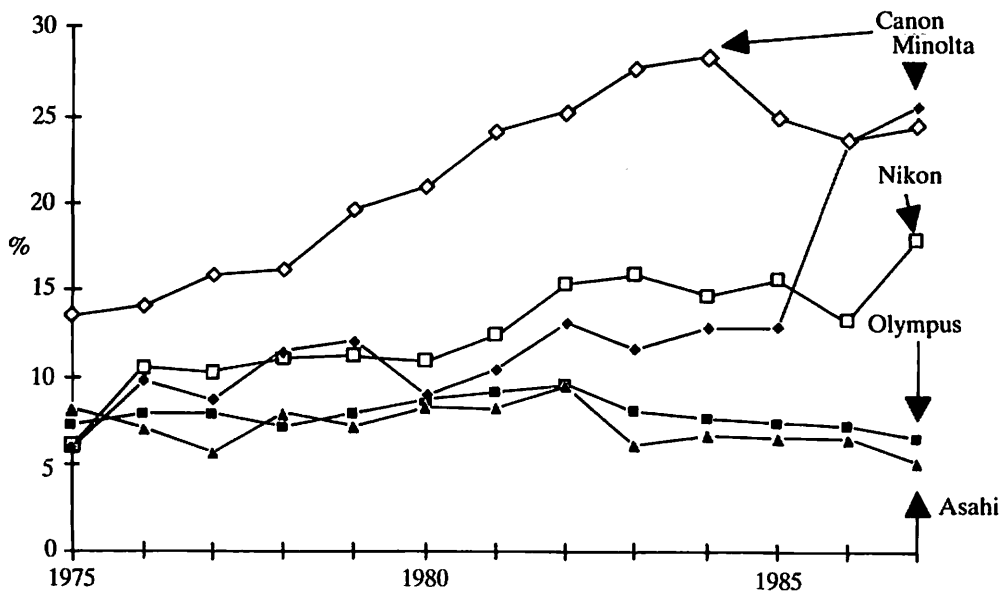
	Quantity	Sales(Million yen)
1975	7,324,192	295,767
1976	8,130,289	365,758
1977	9,669,501	442,293
1978	10,932,291	455,571
1979	12,265,972	491,276
1980	13,986,997	553,278
1981	15,174,214	573,602
1982	13,850,453	518,142
1983	14,183,830	485,324
1984	15,338,277	505,079
1985	17,040,219	520,136
1986	17,383,429	533,064
1987	16,608,086	461,851

Source; Nikkei Needs

Note; The table begins with data for 1975 when the industry had begun to recover from the first oil shock, recession.

The camera market is a typical oligopolistic market. That is to say, the top five competitors hold more than 80% of the market share <sup>6)</sup>. However, within the industry, competition seems to be severe because the market share of the five firms has often fluctuated with the appearance of new products (see Figure 1). Perhaps more importantly the fortunes of these large five firms have been affected by the activities of other firms including new-comers in the camera world. In fact, in the case of the compact type camera, the most innovative products have often been developed by Konika and Fuji Film. (the firms known as film makers rather than camera makers). In the latter half of the 1970's both of these companies contested for a major share of this market. Ricoh, a producer of office machinery, also has held a big market share.

Figure 1. Market Shares in the Camera Industry



Source; Annual Reports.

Note; Ratio of revenues from the camera industry to total firm revenues.

In case of the single lens reflex camera, the big five makers, Canon, Nikon, Minolta, Olympus and Asahi Optical, have each sharply contested for market shares, but demand has fallen off since 1980. Since the 1970's Canon, Nikon and Minolta have each struggled for the top position in the market. As a by-product of this competitive process, a new single lens reflex camera with an auto focus function was developed, though it was originally thought that this particular innovation might be impossible. Technological innovations have had an impact on the market, even though it is basically oligopolistic and considered a stable and mature industry.

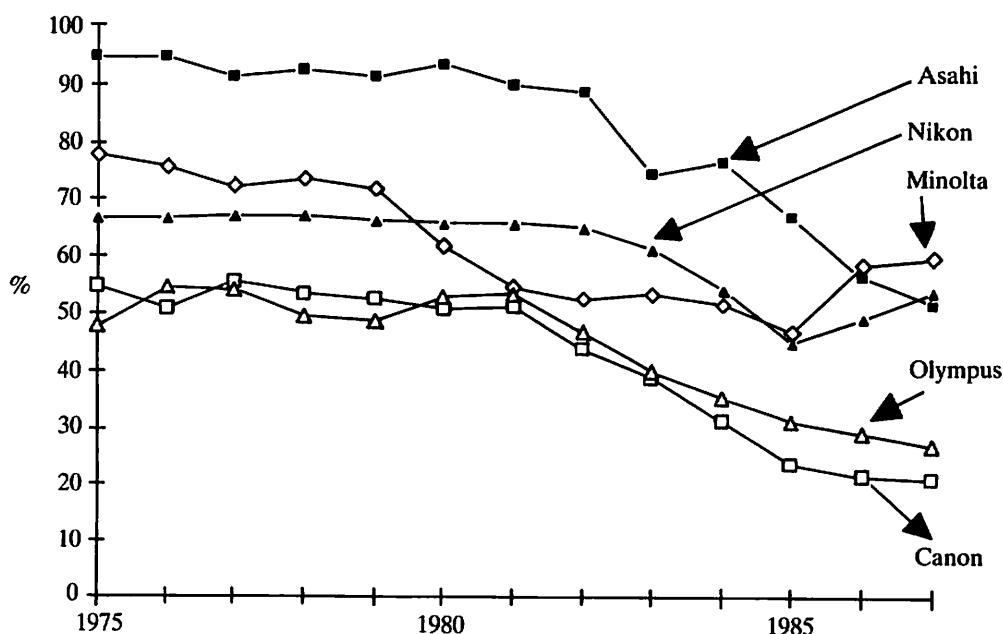
It is difficult to look into the level of profits in this market, because we can not discriminate the profits from the camera sector from that of the other sectors in the financial reports which are formally published in Japan<sup>7)</sup>. In addition, there is the difficulty of allocating joint R&D funds, even though the makers seemed to have

invested for substantial funds.

### 3. The Process of Diversification

After the oil shock, each of the five major camera firms began to search for a way to diversify (see Figure 2). Figure 2 shows the trends in the relative importance of the camera sector for each of the five firms. The major two firms, Canon and Olympus, which already had reached 50% diversification by the mid-1970s, showed an acceleration in diversification after 1980.

Figure 2. Diversification Ratio



Source; Annual Reports.

Note; Ratio of revenues from the camera industry of total firm revenues.

Which industries have these camera firms entered into? The camera makers, of course, had command of optical technology and precise processing technology, and moreover, had accumulated considerable electronic technology, all of which seems to have contributed to the diversification as well as to the development of new products. From the view point of economic theory, we can classify the diversification into five categories; technology-related, scale economy, marketing, vertical integration and conglomerate<sup>8</sup>). In most cases, the firms have adopted the type of technology related diversification. Each firm combined existing technology and entered into fields such as copying machinery, semiconductor processing machinery, medical equipment, electronic test equipment, Japanese word-processing, personal computers etc..

A first Canon <sup>9)</sup> diversified into electronic calculators and secondly into copying machines, word processors, office computers, and personal computers. Recently Canon has expanded its product line to include office machinery such as facsimile machines, laser beam printers, optical disc drives, VTR's and semiconductor processors. Canon was the first company which promoted an active diversification of product lines. At present one third of total sales is derived from copying machines, and it seems that Canon has developed a strategy to enter into the information and communication sector, principally into office machinery.

Nikon has mainly moved into the semiconductor processor industry where its sales amount to 40% of gross industry sales — the largest market share in this industry. Nikon has also specialized in such products as eye glasses, microscopes, telescopes, and test equipment in spite of the small scale of each of these separate markets.

Olympus mainly entered into the medical equipment industry (with endoscope production) and has managed to gain more than 70% of the world market share for some submarkets. Sales in this sector amount to more than 40% of its total sales. At present the weight of camera sales is only about 20%. In addition, Olympus produces microscopes (Olympus was a producer of microscopes originally) and reagent analyzers. It is clearly attempting to diversify into the field of biotechnology. Olympus' diversification has been, on the whole, successful, although the markets which it has entered are relatively slow growing: a fact which restricts the growth of the company as a whole.

Minolta has mainly diversified through the production of copying machines and the sales of such office machinery have now reached about 50% of total sales. Minolta also produces medical analyzing equipment, laser printers, and even planetariums. But in the case of this company, the main product remains the camera.

Asahi Optical was the last company to actively begin to diversify and produces such products as eyeglass lens of glasses, medical equipment, and CAD/CAM systems. But Asahi does not have a widely diversified product line.

The five firms have moved into various industries and it seems that some these diversifications have met with considerable success, such as office machinery for Canon, semiconductor processors for Nikon, medical equipment for Olympus and copying machines for Minolta <sup>10)</sup>. It should be emphasized that they have chosen different industries for diversification.

#### **4. The Performance of Management**

Figure 3 shows the real growth rate of each firm. The proceeds of Canon, Minolta and Nikon have grown at a rate of more than 20% per year. Their growth can be allocated to two factors, namely the growth rate of the camera sector and the growth rate derived from their diversification from other products (see Table 2). In the case of Canon, diversification has contributed 77.5% of overall sales growth, while in the case of Minolta and Nikon diversification has done to only provided 27.7% and 26.8% respectively. On the other hand, Olympus and Asahi not only have grown at a very slow rate but have also lost part of their share of the camera market.

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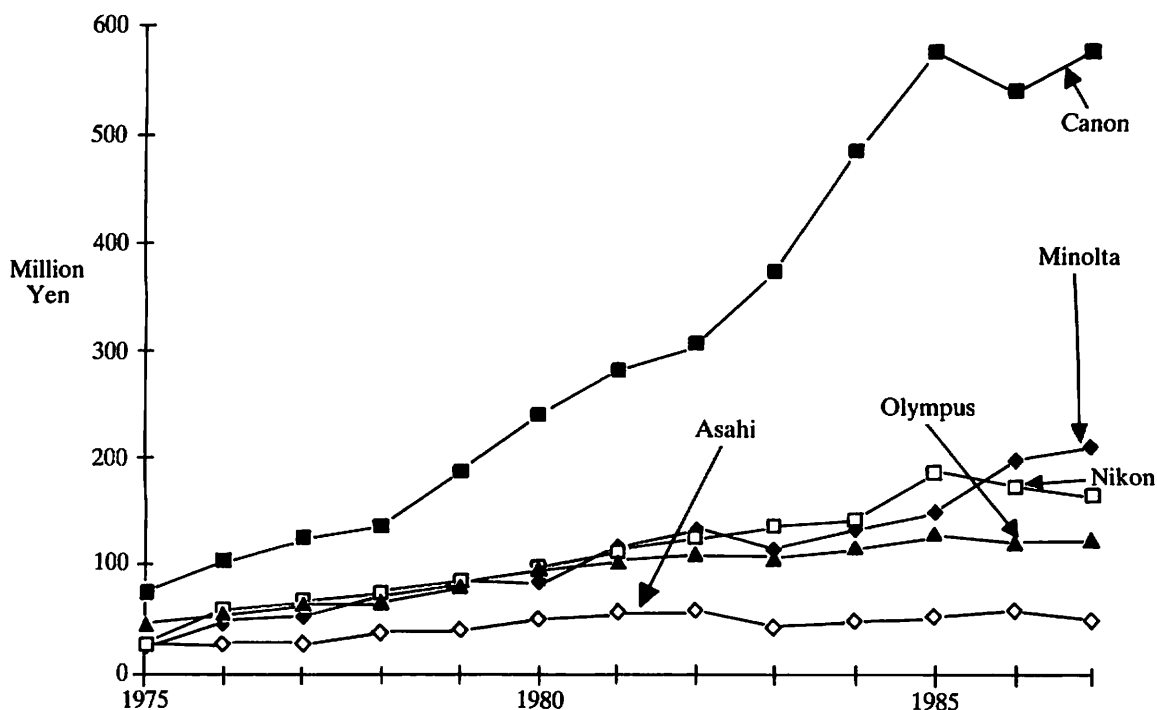
**Table 2. Allocation of Growth Rates(%)**

	Growth Rate	Camera Market	Diversification
Canon	394.4	88.8	305.6
Minolta	472.6	341.7	130.9
Nikon	279.4	204.4	75.0
Olympus	71.0	-5.0	76.0
Asahi	18.3	-35.5	53.8

Source; Annual Reports.

Note; Sales deflated by the consumer price index.

**Figure 3. Scale of the Firms**



Source; Annual Reports.

Note; Real total sales (revenues) deflated by the consumer price.

From the view point of profitability, profit levels have generally declined since 1980 (see Table 3-1 and 3-2). Olympus has been the most profitable company, with Canon and Nikon following in terms of an operating profits-to-sales ratio. In terms of current profits-on-sales, Olympus is clearly the most profitable firm. The performance of Minolta and Nikon are relatively stable, while that of Asahi shows considerable weakness in the most recent period.

For the industry as a whole, the rate of return to assets (ROA) seems to be declining (see Table 4), although it is generally above 3% (with the exception of Asahi). Table 4 shows the performance of the five firms with respect to ROA. Canon has diversified its products successively through a large R&D expenditure



**Table 3-1. Operating Profits to Total Sales (%)**

	Canon	Minolta	Nikon	Olympus	Asahi
1975	7.16	8.79	6.47	13.42	12.9
1976	10.35	6.04	7.79	13.06	6.87
1977	8.54	6.18	6.91	13.31	6.28
1978	7.35	7.38	9.63	7.91	8.4
1979	15.96	6.16	8.16	13.84	8.43
1980	13.69	9.12	8.81	14.08	11.37
1981	11.28	6.55	8.98	12.38	10.74
1982	10.72	3.01	6.23	11.79	6.67
1983	9.12	3.77	6.13	6.04	0.35
1984	9.48	3.75	10.04	5.84	-1.3
1985	7.46	5.66	4.66	5.24	0.02
1986	0.84	3.03	1.67	2.57	0.04
1987	3.52	0.75	3.54	4.3	-6.33

Source; Annual Reports.

**Table 3-2. Current Profits to Total Sales (%)**

	Canon	Minolta	Nikon	Olympus	Asahi
1975	2.58	4.15	3.35	13.03	11.09
1976	7.29	4.55	5.55	12.45	6.67
1977	8.0	5.69	4.47	13.67	5.71
1978	8.5	6.7	6.35	10.19	8.15
1979	9.91	5.37	6.53	12.7	9.57
1980	10.72	7.96	6.78	13.62	14.35
1981	9.23	7.76	7.03	12.55	11.21
1982	9.29	4.84	3.7	13.02	10.38
1983	8.48	4.92	3.75	6.24	3.08
1984	7.99	4.83	7.0	6.91	1.25
1985	7.39	6.16	4.1	6.34	3.38
1986	2.44	3.96	0.72	4.06	0.96
1987	3.53	2.59	3.34	5.3	-8.74

Source; Annual Reports.

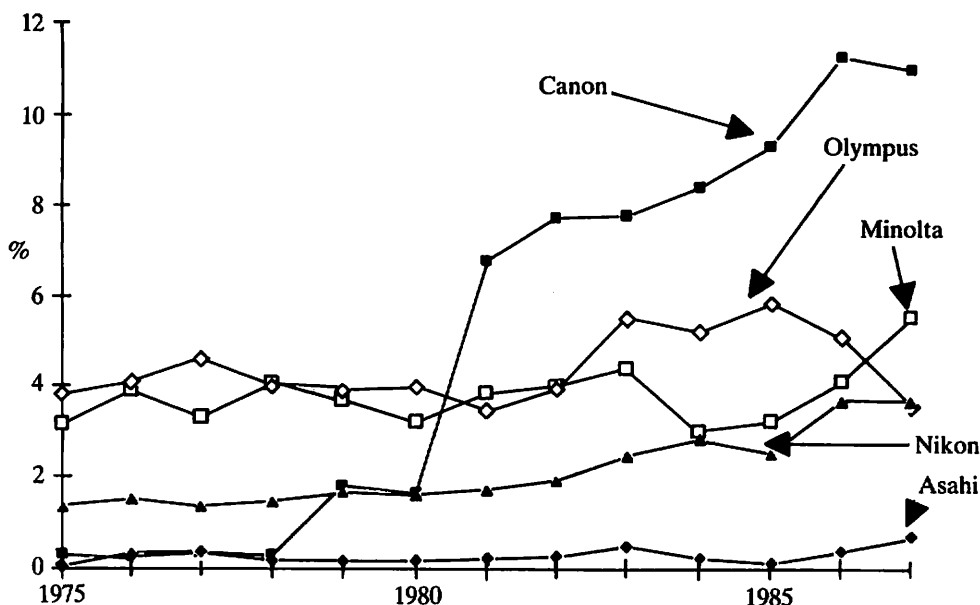
**Table 4. ROA (Operating Profits/Total Assets; %)**

	Canon	Minolta	Nikon	Olympus	Asahi
1975	10.04	9.59	6.83	21.85	10.73
1976	11.8	8.53	8.58	18.86	6.16
1977	11.51	10.13	7.69	19.99	4.68
1978	13.8	10.01	9.36	13.49	8.64
1979	17.63	9.35	10.32	19.73	7.47
1980	18.01	12.7	10.87	19.79	9.65
1981	12.22	11.45	10.04	16.58	8.97
1982	12.45	7.37	6.81	15.65	5.18
1983	11.28	7.07	6.4	7.67	0.21
1984	11.8	6.72	9.13	8.37	-0.88
1985	8.54	7.86	5.16	7.41	0.01
1986	2.81	5.04	3.09	9.37	0.03
1987	3.86	3.38	5.07	4.83	-3.74

Source; Annual Reports.

and has succeeded in penetrating a variety of markets (see Figure 4), but its return to assets and its net worth ratio has declined for the period. Minolta delayed in diversification, but succeeded in developing a new single lens reflex camera, the "α-7000" with an auto focus function, so that it was able to expand its share of the camera market and Minolta also has maintained a high level of R&D outlay which has contributed to its success. Although Nikon had not actively pursued diversification during this period, it has maintained a relatively stable level of good performance.

Figure 4. R&D Expenditure to Total Sales

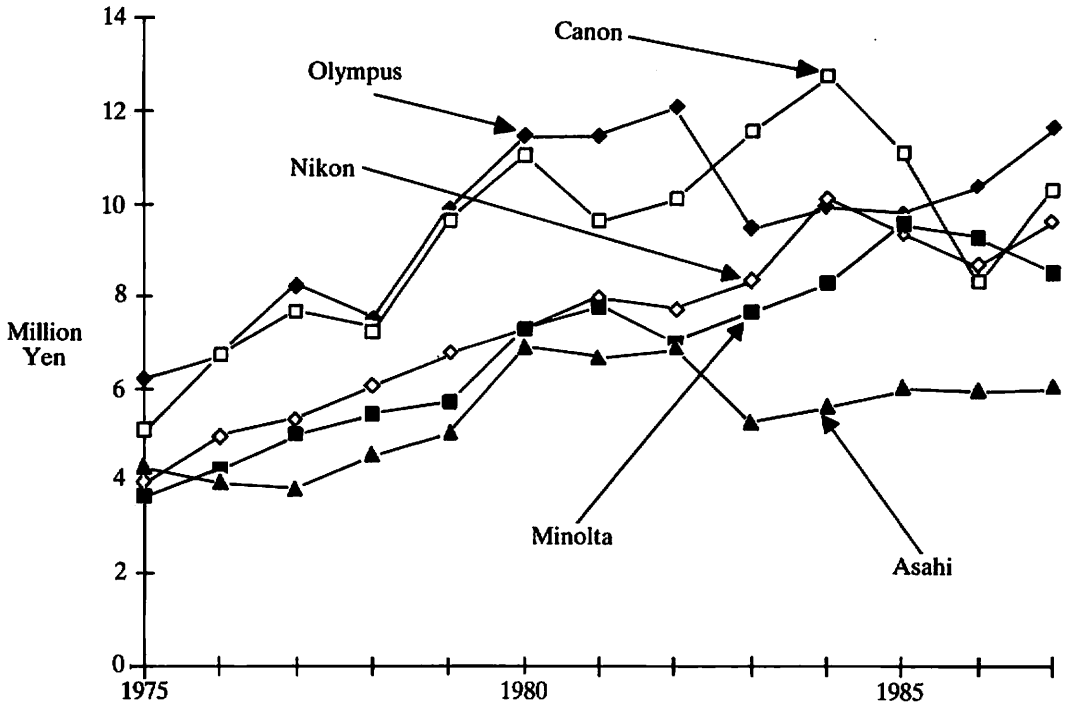


Source; Annual Reports.

As Olympus has moved to actively promote diversification, it has lost some of market share for cameras. Its growth rate has been less than the average of all the five firms considered, partly because the market for endoscopes is rather limited. However Olympus has been relatively profitable and its outlook is stable thanks in part to diversification. Asahi began rather late to diversify, but it has been actively promoting it since 1980. Its managerial performance has been unstable and the worst of the five firms examined. The managerial attitude seems to be passive, — the level of R&D, for example, has been the lowest, but counter-balancing this Asahi's net worth ratio is comparatively high.

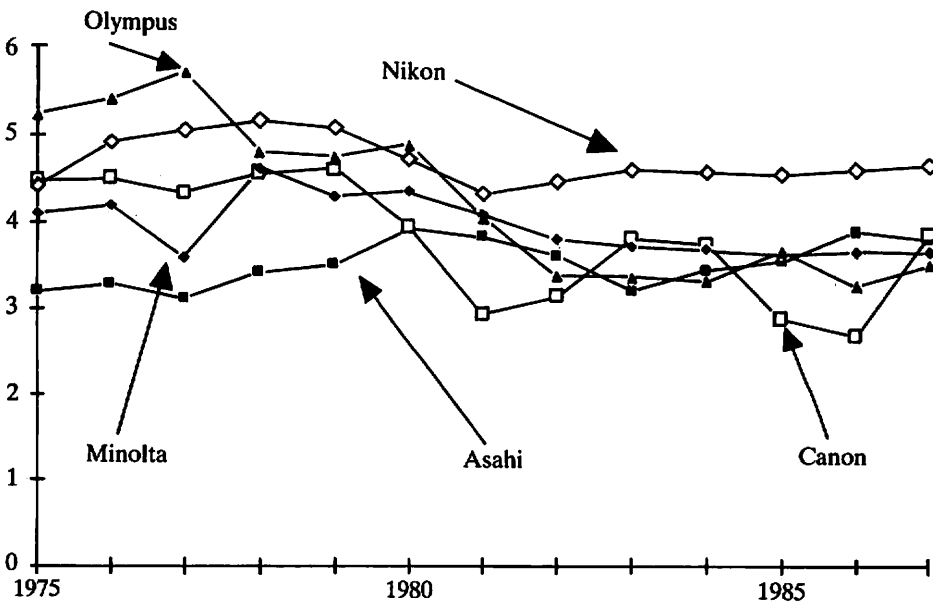
We look next at overall managerial efficiency (see Figure 5). When it is evaluated in terms of labour productivity, the period between 1975 and 1987 is divided into two. In the 1970's managers had pursued the object of "rationalization" of coping with the oil crises and the rising yen. As a result of successful activities, labour productivity continued to increase. In the 1980's the strategy of diversification began to be more widely accepted and, at the same time, the world

**Figure 5. Labour Productivity**



Note; Value added per an employee.

**Figure 6. Managerial Efficiency**



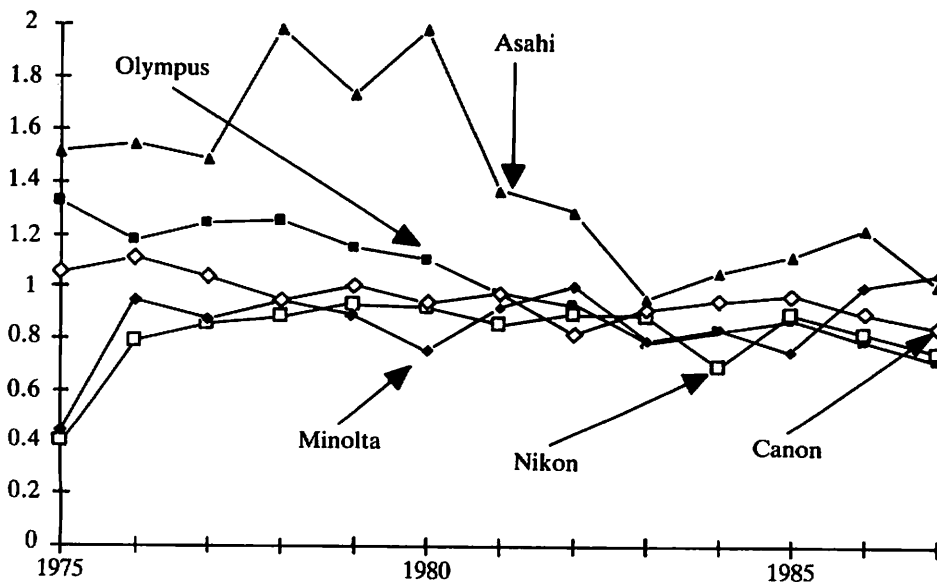
Note; [See Note 12)

economy slowed, becoming stagnant at the beginning of the decade. The movement of labour productivity changed for the worse, which seemed to reflect the large and time consuming investments for necessary diversification. The labour productivity ratio of Canon reflects the impact of diversification very clearly.

Investment can enhance labour productivity, but excessive investment can reduce capital productivity <sup>11)</sup>. For example, in the case of Canon, capital productivity appears to be relatively poor. Accordingly, it is necessary to take an index of both labour and capital productivity into consideration when evaluating overall managerial effectiveness. An index of "managerial efficiency" can be calculated using the sift parameter of the Cobb-Douglas-like production function for the firm <sup>12)</sup>. According to the figure 6, the management of Nikon is excellent from the view point of managerial efficiency, while that of Canon does not appear to be so good. Generally speaking, it is possible for a firm to grow through diversification, when the firm does so by utilizing unused managerial resources. Therefore, diversification and managerial efficiency are not necessarily incompatible.

As a final alternative, we can adopt the "turnover" ratio as an index of managerial efficiency (see Figure 7). This ratio is the ratio of yearly gross sales to total liabilities and net worth. There is a large difference in the index calculated for each firm, which might be partly explained by the heterogeneity of products into which the five firms have diversified. It is well known that this index depends on the mix of products.

Figure 7. Turnover Ratio



Source; Annual Report.

## 5. The Main Factors which Determine Corporate Diversification

It is not easy to generalize concerning the factors which determine corporate diversification, even if the object of research is limited to the camera industry. Which factors are related to diversification will be examined by the use of a simple statistical model. In this, as is well known, we confront various problems in obtaining an index of diversification. The ratio of sales of cameras to the total sales of a firm is both a useful and a simple index of diversification, and will be used here. Although for simplicity of discussion we will use one minus the ratio of camera sales to total sales. In this way a large value of this measure will be integrated as increasing diversification.

If a firm diversifies, it must transfer managerial resources into other sectors. In addition, diversification demands research workers and research funds, and investment in plant and equipment, expands distribution channels, and increases in advertising expenditures. As a first hypothesis, we suggest that the larger is the sum of R&D expenditures, the larger will be the extent of diversification.

A next question might be whether market share is related to diversification. If a firm has succeeded in expanding its market share, it may be moved to promote diversification using its increased earnings. On the other hand, such a firm may be satisfied with the situation in its traditional industry and may be indifferent to diversification possibilities. That is to say, a firm which does not hold a large market share may promote a diversification of its activities for the purpose of survival.

As the third line of examination, we see if managerial efficiency which is defined above is related to diversification. The concept of managerial efficiency is static, because it means how to use both given employees and given equipments efficiently. However, the concept of diversification is rather more dynamic, because diversification demands a distribution of managerial resources over time.

The fourth hypothesis relates diversification to profitability. A likely hypothesis is as follows; in the initial stage, as a firm promotes to diversification, its rate of profits will fall. This is simply because the firm has large start-up costs, including R&D in order to diversify. On the other hand, profit rate will rise, if the firm succeeds in diversification.

Finally, the financial condition of a firm may be related to the extent of diversification. As before, we can only say, a priori, that a firm which promotes diversification may see a deterioration in its financial condition or may improve it by increasing profits.

The present study uses time-series data for the above six variables for the five firms during 1975 and 1987<sup>13)</sup> <sup>14)</sup>. As a method, I concentrate on correlation coefficients between the diversification ratio and other variables. The index of diversification, as I mentioned, is defined as one minus ratio of camera sales to total sales for each firm. As a variable measuring market share, the ratio of each firm's sales from optical industries to total sales of these firms in Japanese markets is used. A variable measuring R&D is the ratio of R&D expenditure during the period to total sales for each firm. As a profitability index, two variables are used for each firm; both ROA and operating profits to total sales. As a variable measuring the financial condition for each firm, the net-worth ratio, namely the

ratio of net-worth to total assets is used.

The results are as follows. Empirical research has established the existence of a significant positive relationship between diversification and R&D <sup>15)</sup> (see Table 5). There are, however, considerable differences among the correlation coefficients for the individual firms. In the cases of Canon and Nikon, the correlation coefficients are extremely large, 0.91 and 0.84. These firms seemed to have succeeded in the diversification through an expenditure of R&D. On the other hand, in the case of Olympus, the coefficient is only 0.38; the relation between diversification and R&D is not nearly so clear. The high correlation coefficients obscure the fact that there are great differences in R&D expenditures among the five firms. Canon expended more than 11% of its total sales revenues for R&D in 1987, but Asahi utilized only 0.71% of its revenues. Except for Asahi, the firms spent more than 3% of their total sales revenues for R&D expenditures. It seems reasonable to conclude that the five firms generally have diversified through the use of R&D expenditures.

The relation between diversification and market share is not significant (see Table 5). If it is possible for a firm to diversify along with expanding its market share, the correlation coefficient between its diversification ratio and its market share index should be positive. The coefficients of Canon, Nikon and Minolta are positive, while the coefficients of the other two firms are negative. (In 1975 Canon held the largest market share, namely 13.5%, while Minolta held the smallest one, namely 6.0%.) Canon and Nikon seemed to have pursued both diversification and an expansion of market share in the base industry. This is somewhat less fine for Minolta which appears to have mainly concentrated on strengthening its traditional industry. In fact, Minolta has succeeded in diversification less than any other firm except for Asahi. Olympus and Asahi have mainly sought diversification for their sake of survival.

**Table 5. Correlation Coefficients of Diversification**

	Canon	Nikon	Minolta	Olympus	Asahi
R&D	0.91	0.84	0.5	0.38	0.62
Market Share	0.69	0.63	0.38	-0.57	-0.64
M.E.	-0.34	-0.34	-0.58	-0.77	0.41
Profitability 1	-0.69	-0.58	-0.44	-0.89	-0.89
Profitability 2	-0.64	-0.59	-0.51	-0.91	-0.9
Financial Cond.	0.51	0.92	0.86	0.72	0.45

Note; M.E; Managerial Efficiency

Profitability 1 ; ROA

Profitability 2 ; Operating Profit to Total Sales

In the camera industry the competition for developing new innovations and cutting costs is very severe. If a firm developed a new type of camera, it could increase its market share. However, for this purpose the firm would need a lot of funds and very able researchers. The directors of the firms have to determine managerial strategy; which market(s) the firm should concentrate its managerial resources, taking technology, distribution channels, customers and available capital funds into consideration. However, whether the technologies which were developed in the traditional industry can be applied to other industries is always

uncertain. The direction of managerial decision-making has an important role to play at this point.

The extent of diversification seems to be related to managerial efficiency. This means that the larger is the extent of diversification, the lower is the managerial efficiency (for the four firms except Asahi). Managerial efficiency measures to what extent a firm is efficiently utilizing both employees and tangible capital assets in order to produce a certain value added. Therefore, we may conclude that the four firms have promoted diversification at the expense of static managerial efficiency. Generally speaking, a firm must hold surplus employees and equipment for growth is not by merger and acquisition but by internal diversification.

In the case of Asahi, the coefficient of correlation between our measure of diversification and managerial efficiency is rather low (0.41). As Asahi has not succeeded in diversification as much as the other four firms (and has expended much less for R&D); this might suggest that Asahi has made efforts to utilize employees and equipment rather efficiently (in a static sense).

The diversification measure appears to be negatively related to both the ROA and the operating profits to total sales ratio. The correlation coefficients between diversification and profitability are fairly high large especially for Olympus and Asahi (see Table 5); In terms of sample period, the extent of diversification has been accelerated after 1980, and, in general, profitability indices have fallen. This finding may imply that diversification attempts have entailed a drop in the profit level. That is to say, the five firms have sought to diversify by spending for R&D and sales promotion and profits have suffered.

From the point of both profitability indices, Olympus and Asahi have larger correlation coefficients (about 0.9) than the other firms (from -0.44 to -0.69). As these two firms diversified, their profit rates have declined relatively more than the other firms. We should remember that Asahi, in addition to sharply falling profit rates, has also lost some of their market share for cameras. It is likely that, of these firms, Asahi may not have earned enough profits to afford a high level of R&D expenditures.

We should note that the average ROA and the average operating profit-to-total sales of large firms were 4.37% and 3.74% in 1987<sup>16)</sup>. The five firms had generally been highly profitable during the 1970's, but reached the lower, average level in 1987 as a result of competition and of the need for large investments for diversification purposes.

Finally there seems to be a relationship between diversification and the financial condition of a firm. All firms have positive correlation coefficients, but Nikon and Minolta have far larger coefficients than Canon and Asahi. That is to say, the former have improved their financial condition more than the latter firms alongside progress in diversification. Though Japanese firms traditionally depended on large amounts of borrowed money, managers have recently come to regard a cut in debt as a key factor in decreasing costs<sup>17)</sup>. These managers face into the dilemma of choosing between increasing expenditures for diversification and improving financial conditions. It is evident that Canon has chosen to diversify intensively at the cost of improving its financial condition while Nikon and Minolta have regarded financial conditions as relatively more important.

Olympus and Asahi had higher net-worth ratios at the initial point in our study

period, and better financial conditions than the other three firms. The relatively good financial conditions of Olympus and Asahi seem to have resulted from the lower growth rate of these companies. As previously stated, the five camera makers have all sought diversification, but we can classify them into two groups depending on the degree to which they pursued or were successful at diversification (see Table 2). In the case of Olympus and Asahi, the extent of diversification overstated the success of these firms, because they have both lost market share in the traditional camera industry. On the other hand, Canon, Nikon and Minolta have promoted diversification and increased their market share in the camera industry.

Olympus and Asahi are not both in the same position financially. Olympus has raised the measure of financial condition used, having the highest ratio at the five firms, to 66.6% in 1987 (from 33.6% in 1975). In the case of Asahi, the ratio has increased very little, from 54.7% in 1975 to 58% in 1987. The management of Asahi may be steady, but may have lost opportunities to diversify and to grow.

## 6. Concluding Remarks

We can summarize the analysis as follows; the five firms have diversified by expending large funds for R&D and related investments which has led to a decline in profitability. At the same time they have endeavored to improve their overall financial conditions.

Generally speaking, it is not easy to succeed in diversification, by utilizing a firm's own managerial resources. The five camera firms did not succeed completely in diversifying into other industries and each firm could not succeed in every project. Some of the firms seem to have succeeded more than other firms.

The main reason why it is difficult for a firm to diversify is that a firm does not necessarily have the right technology to apply some new industry. If there is a new market which the firm can enter into easily by using the proper technology, other firms belonging to the same industry also may enter the new market easily. In the case of the camera industry, the five firms have not had all of the applicable technologies for use in new industries and must have developed new technologies and new products.

The industries into which the five firms diversified were quite varied excepting for some trivial cases. This suggests that managerial decision making rather than the technological base determines the extent and the direction of diversification. Otherwise, they all might have rushed into the same industry, a phenomenon which is often seen in Japan and can sometimes be called the excess competition<sup>18)</sup>. The five camera firms produced the same goods, had almost the same scale of operation, and seem to have possessed almost the same technology. Each firm must have decided the direction of diversification after taking several factors into consideration. The remaining question is what are the factors which determined the diversification. In this respect R&D expenditures and the ability to transfer researchers and engineers play an important role. Therefore, we emphasize the importance of managerial decision-making as the primary factors in determining the extent of diversification attempts.



In addition, even if the importance of the main business decreases, it seems to be still very important for a firm to keep its market share. As the camera sector is a mature, though competitive, industry, the cash-flow of each firm from camera sales is important in underwriting diversification in other sectors.

The camera industry is a typical example of how firms can introduce diversified products through the use of only their own resources. This is one characteristic of so-called Japanese management. In this respect it is necessary to investigate the process of the development of new technologies in the process of diversification.

### Notes

- 1) Most shares of a firm are often held on a long-term basis by other firms for continuous transaction, so that it is difficult for take-over raiders to freely buy shares.
- 2) Some firms which belong to the textile industry, for example Toray and Teijin, are famous for their diversification. However, the extent of diversification is below 50% of their total sales.
- 3) See Niida, Goto, and Nanbu (1987), pp.53-54.
- 4) These are generally studies in industrial organization. See Biggadike (1979), Lecraw (1984), and Niida et al. (1987).
- 5) As a result of the industry distress, the Ministry of International Trade and Industry organized the camera makers into a "Recession Cartel". This allowed the firms to cooperate together in maintaining a minimum price.
- 6) The degree of concentration in terms of sales quantity is different from that sales in yen-terms in camera market.
- 7) Industry sources report that the level of profits in the camera market is comparatively high.
- 8) See Biggadike (1979), pp.13-17, and Yoshihara, et al. (1981).
- 9) Concerning the kinds of products, see the various annual reports and reports for stockholders for each of the firms.
- 10) When a firm enters new markets by developing new technologies and new products and enjoys positive profits, we will say that the diversification succeeded.
- 11) Japanese firms have invested intensively in plant and equipment for raising labour productivity. Therefore, Japanese firms have a tendency for higher labour-equipment ratio than in comparable American firms.
- 12) A firm's production can be expressed by a production function,  $Y = aL^\alpha K^{1-\alpha}$ , where Y is the value-added in production for the firm, using L, labour, and K, capital. The parameters  $\alpha$  and "a" are assumed to vary from one period to another. Both labour (the number of employees) and capital (the value of tangible fixed assets) jointly produce a certain level of value added of the firm. "a" is a parameter which can be interpreted to imply technological progress. Because this depends on not only proper technological change but also upon the management of the firm, we will use this parameter as our measure of managerial efficiency. The parameter  $\alpha$  can be considered as the ratio of the wage bill ( $w \times L$ ) to total production (value-added). Thus in the text, for each year, we will calculate the value for our measure of managerial efficiency as

$$a = \frac{Y}{L^{\alpha} K^{1-\alpha}}$$

- 13) Kigyo Keiei no Bunseki (An Analysis of Industrial Management), Yuka Shoken Hokokusho (Annual Reports) and Toyo Keizai Tokei Geppo.
- 14) There are some problems inherent in this kind of comparison. The category for R&D of one firm may be different from that of another. In addition, some firms tried to conceal the real value of R&D expenditures. Instead of just R&D, we could use total management costs.
- 15) We ignore any possible time-lag between diversification and the other variables. Partly this is because it is impossible to identify the time-lag between diversification and the other variables in any exact manner. Therefore, we suppose that the relations between the diversification ratio and the other variables are contemporaneous. In addition, we should add that the result differ significantly when the calculations were performed using some sample lags.
- 16) The average values of 1167 firms listed on the Tokyo stock exchange.
- 17) Japanese large firms have competed to raise their net-worth ratio by recently issuing convertible debentures and stocks at market price.
- 18) See Okamoto (1988).

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