

**The Effect of Innovation and Technological Change on Information Flows,
Authority and Industry Associations in Japan**

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Abstract:

How did innovation and technological change affect information flows and the degree of legitimacy afforded authorities such as industry associations? In this paper, six cases from the photography industry are analyzed over time. The findings indicate first that changes in innovation affected information flows and the degree of legitimacy afforded authorities such as industry associations. Second, in response to changes spurred by technological innovation, the legitimacy of authority that was lost could be regained.

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Introduction

Industry associations in Japan have played a key role in facilitating information and knowledge flows among firms in the same industry (Odagiri and Goto 1996, Uriu 1996, Yonekura, 1999). This paper addresses the question: Did innovation and technological change affect information flows and the degree of legitimacy afforded authorities, e.g. industry associations? In particular, this paper focuses on whether knowledge flows among firms in the same industry were affected by innovation and technological change.ⁱ I chose to analyze the effects of innovation in this manner because industry associations acted as an authority that facilitated knowledge flows within — and at times across — industries as well as between the firms they represent and the appropriate government ministry.ⁱⁱ

In this paper, six cases from the photography industry are presented to illustrate the role of industry associations as a facilitator of information flows. The cases follow the evolution of the industry as it was transformed from silver-halide imaging technology (in particular 35mm film) into digital imaging. The paper is laid out in four sections with emphasis given to the second and third sections in which I present the analytical framework and then analyze the six cases in detail. The remainder of this section presents the rationale for the analysis and the choice of the six cases.

In this paper, innovation is defined as (Schumpeter, 1942, 84 quoted in Stopford & Strange, 1991, 76):

...competition from the new commodity, the new technology, the new source of supply, the new type of organization...competition which commands a decisive cost or quality advantage and which strikes not at the margins of the profits and the outputs of the existing firms (and possibly even entire national economies) but at their foundations and their very lives.

The essence of this quote, “competition...which strikes...at their foundations and their very lives” captures the motivation behind the choice of cases of innovation – innovation that stimulates innovation – included in this paper. Many innovations (break through innovations as well as incremental innovations) were sprinkled over the history of this industry, however only early and late ones that fulfill the criteria above were selected for inclusion in this paper.

To illustrate the impact of innovations on the authority of the industry association, the six cases are examined using the double-edged sword metaphor following Stopford and Strange (1991, 71-72, italics added).

Technological change is one of the most potent forces for upsetting existing industry structures. It is driven by competition, for necessity has always been the mother of invention. [...]Technology is a double-edged sword. It can *create new advantages for innovators*; it can also *erode the position of incumbents* by altering the ‘rules’ of supply and encouraging new entrants.

This paper examines how innovation both created new advantages for innovators while eroding the position of incumbents. As the representative of the firms in the industry, the industry association acts as a legitimate authority.ⁱⁱⁱ In representing the industry, industry associations seek to *protect the stability* of the industry as a whole (Uriu, 1996).

Two assumptions are made in this analysis. First, one of the functions of the industry association is to facilitate information flows among the firms it represents and between the industry (the firms) and the relevant government ministry. To this end, stability – particularly in the interests of the lead firms – is a desirable objective of the industry association. Second, innovation over time had various effects; key innovations changed the competitive structure of the industry.

The double-edged sword metaphor is useful in analyzing the two sometime conflicting forces: innovation stimulating competition and protection to maintain stability. Thus, the two edges of the sword are: (1) protection of incumbent firms that control in the industry association when innovators attempted to upset stability; and (2) competitive challenges to the authority of

the industry association through technological change. This study shows that the industry association's position on innovation and technological change was inconsistent. While it supported innovation to help top firms remain profitable and competitive, it also attempted to limit competition to a few firms, the incumbents. A stable oligopolistic structure was most desirable. The argument presented in this paper draws from and supports previous work on industry structures and competition in Japan (e.g. Fransman, 1995; Okazaki and Okuno-Fujiwara, 1999; Schaede, 2000; Uriu, 1996; Yonekura, 1999).

Three of the six cases discussed in this paper reveal an element of protectionism or, more precisely, an effort to maintain stability by, for example, limiting competition and preventing 'price destruction.' 'Price destruction' refers to 'over competition' such that firms drive prices downwards which in turn threatens to drive major competitors out of an industry. Competition solely on price was undesirable precisely because it reduced the number of competitors and upset the stability of an industry (see Uriu, 1996).

Innovation struck at the foundations of the industry and upset its stability and provoked both protective and competitive responses. Protection of incumbent firms — or what might be called prevention of competition — and efforts to at first achieve stability and then maintain this appears to have been important in the early years (the 1950s and 1960s). This was partly because lead firms, incidentally those that were key exporters, were allowed to rise above the other firms. Protection encouraged and nurtured knowledge flows among firms especially in the early years while the technology was still young. In later years, particularly in the 1990s and early 2000s, the competitive environment changed. This was due to impact of changing technology, that is the movement toward – and then convergence around – digital imaging technologies. In recognition of this change, the industry association adapted its membership and changed its name to absorb new lead firms, new incumbents.

The findings from this paper indicate first that changes in innovation affected information flows and the degree of legitimacy afforded authorities such as industry associations. Second, in response to changes spurred by technological innovation and induced partly by a competitive profit motive (or price destruction), the legitimacy of authority that was lost could be regained in a new form. The cases as a whole indicate that the trend toward increased competition — and decreased protection of incumbents — intensified after the digital era arrived, partly because the new technology reshaped the industry.

Background

The Role of Industry Associations

Legally, industry associations are referred to as *zaidan hojin* (literally foundational juridical persons), or “the nearest equivalent in Japan to a US not-for-profit organization.” (Dees, 1997, 209). Historically, *zaidan hojin* played a significant role in Japan’s technological progress. Therefore they have been important in both promoting and inhibiting technological change. Because the cases presented in this paper begin in the early postwar period, it is useful to consider the early postwar legal designation of *zaidan hojin*.

The Scientific and Technical Division of the Economic and Scientific Section (ESS/ST) of the General Headquarters of the Supreme Commander of the Allied Powers (SCAP) studied the prewar role of *zaidan hojin*. Before the WWII, according to Bowen C. Dees (1997, 210) the head of the ESS/ST, *zaidan hojin* were provided for by law as private organizations to encourage scientific and cultural development to benefit the public. Nevertheless, Dees noted (pp. 210-211) that *zaidan hojin* were administered under “extremely loose and ill-defined laws” including liberal interpretations of patent rights, manufacturing privileges and tax exemptions. Given the questionable legality of some of these practices, SCAP drafted a law on January 19, 1949 “to assure that more meaningful controls were applied so the *zaidan hojin* were in all

cases operated in the public interest” (Dees, 1997, 211; Yonekura, 1999). The law was clearly intended to guide postwar *zaidan hojin*, making it legal for them to receive government support for scientific research.

Industry associations have their prewar origin in the control associations that played an essential role in collecting information, managing and controlling the supply of goods for the wartime economy (Gao, 1997; Odagiri and Goto, 1996; Okazaki and Okuno-Fujiwara, 1999; Teranishi, 1999). Gao (1997) argues that competitive pressures in the 1950s and 1960s changed their role from control to the promotion of technological change and innovation based on Schumpeterian ideas. Uriu (1996, 26) further argues that industry associations were important for increasing “the political bargaining power of each industry” because they provide critical “points of access.” These access points allow influence to run in two directions, from bureaucrats to firms (through e.g. old boys networks and *amakudari*) as well as from firms to bureaucrats (through e.g. consensus building and lobbying).^{iv}

Informal policy networks from the ‘top down’ have been well documented in the literature (e.g. Johnson, 1982; Katzenstein, 1978; Krasner, 1987; Okimoto, 1989). They have been complemented with studies that have additionally analyzed ‘bottom up’ policy formation (e.g. Friedman, 1988; Noble, 1988, Samuels, 1987; Uriu, 1996, Yonekura, 1999). In the early years of postwar economic recovery and rapid growth when firms could reap benefits from cooperating with the government, power rested with the bureaucrats. Under these circumstances, there was no need to coerce firms to comply with top down policy decisions. In rapidly-changing high technology industries, however, the power rested with the firms that could – if they so desired – sidestep the Ministry of International Trade and Industry’s (MITI) guidance.

MITI bureaucrats, who rotated positions every few years, looked to industry associations for specific information on the industry. Industry associations were key sources of

information for bureaucrats on the state of the industry as a whole and on emerging technologies. They exercised influence over regulators because firms held information necessary for bureaucrats to formulate industry policy. Firms held the power to cooperate – or not – in the implementation of industry policy.

Industry associations generally limited their activities to the exchange of information and public relations-type activities (Odagiri and Goto, 1996). They in effect helped members share information via informal channels that facilitated information flows among Chief Executive Officers (CEOs) and among scientists. In doing so, the associations acted as intermediaries among firms as well as between the government and firms. The government communicated its policy guidelines to firms through the associations and firms communicated their concerns to the bureaucracy.

Industry associations were further linked with the government bureaucracy through representatives who sat on government councils (Odagiri and Goto, 1996). Permanent staff members were seconded (on rotation) from the government, mainly from MITI. Firms paid membership dues to the industry association and often supplied their own employees (also on secondment) for short stints. The mix of government and firm employees contributed to achieving the objectives of the industry associations, e.g. promoting exports, raising the industry's technological level and investigating new markets. These objectives, including promotion of exports, were used to maintain stability – if possible – and to prevent or limit the intense rivalry that emerged among producers. How this worked – and how it did not – is discussed in more detail below.

Six Cases from the Photography Industry

The six cases included in this paper were selected because they illustrate the nature of information flows within the industry association and the impact of technological change on the authority of the industry association.^v In brief, the cases indicated that there was a substantial

degree of industry compliance with government industry policy in the 1950s and 1960s, highlighting the importance of top down information flows over the early period. However, by the early 2000s, the competition had changed; digital technology gradually shattered the stability of the industry association and forced a realignment among the top firms. This is discussed in greater detail below.

In the early 1950s, to support export promotion of cameras, lenses and film, several postwar *zaidan hojin* were established, specifically the Japan Camera Industry Association (JCIA), the Japan Photo-Sensitive Materials Manufacturers' Association (PSMA), and the Japan Optical Measuring Instruments Manufacturers' Association (JOMA).^{vi} The general atmosphere among firms in Japan at that time was to either export or die. As a result, the industry association members were keen to comply with government policy initiatives directed at export promotion. Not surprisingly the leading firms of the JCIA, the 'Big Five' – Canon, Nikon, Minolta, Olympus and Pentax – were also Japan's most successful exporters.

The JCIA acted as an information intermediary between the government, primarily MITI, and the firms. MITI guidelines were transmitted through JCIA officials to the firms and the staff of the JCIA collected data from the members and passed it on to MITI officials. Firms used the industry association as a discussion forum where the CEOs of the incumbent firms – the largest and most successful firms who usually controlled an industry association – could meet informally (Noble, 1988). Firms passed on their opinion as a group (developed by consensus) when it suited their interests.

To understand the web of inter-connectedness among the firms, I use Figure 1 to depict three different 'industries.' Industries 1, 2 and 3 figuratively represent the JCIA, the JOMA and the PSMA respectively. The industries overlap indicating that some PSMA firms, i.e. Konica and Fuji Photo Film, manufactured cameras *and* photographic film and were therefore members of both Industry 1 and Industry 3. Likewise, some JOMA firms manufactured

photographic lenses *and* microscopes, and were members of both Industry 1 and Industry 2. The membership of Industry 2 was more diffuse than Industry 3; it included firms such as Fuji Photo Optical (the lens-making subsidiary of Fuji Photo Film), Topcon (a subsidiary of Toshiba) as well as the lens-making members of Industry 1 including Canon, Nikon and Olympus.

The JCIA was run by one of the CEOs of the ‘Big Five’ companies listed above on a rotation basis and the staff of the JCIA was hired for permanent positions.^{vii} The CEOs met on a regular basis (about once a month) to discuss developments in the industry and desirable future directions.^{viii} The PSMA was organized in a similar fashion; the heads of lead firms of the PSMA, Konica and Fuji Photo Film, also met informally to exchange information.

According to industry experts, information flowed among the JCIA member firms related to technological change and innovation and proved exceptionally important in the 1950s and 1960s but gradually fell off in importance in the decades that followed.^{ix} Firms’ responses to the changing Japanese and overseas markets varied according to their profitability, business strategies and their performance relative to other leading firms. But government guidance — especially through the industry associations — remained important to the success of firms, e.g. the photography exporters, in the early years. When employees of member firms were seconded to the industry association, intra-firm information flows were evident.

By the late 1990s, industry associations became less visibly important; increasingly their main role was self regulation (Schaede, 2000) or regulation of their “own” activities without government intervention. Competitive changes inspired by digital imaging raised the level of rivalry among the incumbent firms across industry boundaries. Firms in the photography industry found themselves competing against firms in the electronics industry. Innovation and technological change had shaken the very foundations of authority in the photography industry.

This paper focuses on the JCIA. Nonetheless it is important to understand how firms' memberships in industry associations overlap (as depicted in Figure 1), and how information flows cross industry boundaries. There was — and still is — fluidity in the system. At the same time, highly competitive behavior (dubbed 'overcompetition' or destructive competition) among leading firms was stymied; it was the government's aim to preserve stability. This was in essence "controlled competition" (Fransman 1995) where powerful incumbents sought to maintain their positions at the top within a system that promoted *protection* of stability and *competition* through innovation. Over time, a reconfiguration of the industry altogether was necessitated. The six cases discussed in the next section highlight how this change occurred.

The Six Cases

This section presents the six cases in light of the double-edged sword of innovation and technological change. The cases are evenly split between the concepts 'protection' and 'competition.' The three protection cases promoted stability and sought to maintain the status quo. They describe measures taken by the JCIA to limit competition in the industry thereby protecting the incumbent firms from technological change that might over time erode their established positions.

The first of these three cases is about protection and promotion. It describes the establishment of the Camera Information and Service Center in New York City in 1954 whose objective was to promote – and in so doing protect – Japanese exporters of cameras. The second case describes an event in 1964 when the lead firms of the JCIA petitioned MITI to establish a recession cartel to deal with the oversupply of cameras in the domestic market that resulted from the Tokyo Olympics. The third case is much more recent. In 2002, the JCIA was reorganized into the Camera and Imaging Products Association (CIPA). I argue that the

incumbents agreed to this change as a necessary – and protective – response to the rise of digital imaging and to outright competition from powerful firms from other industries.

The three cases of competition represent technological challenges to the industry association's authority that provoked a change in the competitive dynamics among the lead firms. The first case of competition occurred in 1961 when Canon introduced the Canonet, the first mass-market camera produced using mass-production techniques. Canon ended up having to comply with the industry association's wishes, but the process of manufacturing cameras — and more importantly their price structure — was changed forever. The second and third cases are more recent. In 1994, an industry-association-wrecking consortium of five firms led by Kodak and including Canon, Fuji Photo Film Nikon and Minolta introduced the Advanced Photo System (APS), a new 24 mm photographic film format. It spelled the beginning of major changes to come in how the industry was organized. A few years later, in 2003, Canon repeated its Canonet strategy when it broke the price barrier to 35mm-quality digital imaging through the introduction of the EOS Kiss Digital (in Japan; the EOS Digital Rebel in the USA and EOS D-300 in Europe). It was the first digital single-lens reflex (SLR) camera for the advanced amateur market, the final hurdle in transition from photographic film to digital. All three cases describe important technological innovations that challenged the stability of the industry, i.e. the authority of the JCIA.

The six cases are represented graphically in Figure 2. The three cases in the top half of the arrow are cases that protected the incumbents; the three cases in the bottom half of the arrow are cases that encouraged competition within – and in some cases beyond – the boundaries of the industry. The cases at the top of the arrow represent stability in the industry while those at the bottom of the arrow represent challenges to that stability. The area at the left of Figure 2 indicates strong government influence. This was especially true in the 1950s and 1960s in the photography industry. The area at the right of Figure 2 indicates weak government influence.^x

This was particularly true in the 1990s and 2000s. The time-line arrow across the bottom of the figure indicates the shift from 35mm photographic film to digital imaging. The six cases are presented in greater detail in the next section.

Three Cases of Protection: Limiting Competition for the Sake of Stability

1956 Assisting Exporters: Japan Camera Information and Service Center in New York City

In August 1955, representatives of the JCIA traveled to New York City to set up the Japan Camera Information and Service Center which opened the following February (JCII, 1984, 3-10).^{xi} The NY Camera Center, as it came to be known, provided information and repair service for *all* cameras and lenses manufactured by Japanese firms. Initially located in the offices of the Japan External Trade Organization (JETRO), the NY Camera Center moved to a separate location on New York City's prestigious Fifth Avenue five months later.^{xii}

The NY Camera Center's total budget in 1956 of ¥43.7 million (or \$121,000) came from both public and private funds (JCII, 1984, 5). Both the Japanese government and the JCIA provided funds at an estimated 70:30 ratio. The public funds, controlled by MITI, were the bicycle racing funds (*keirin shikin*) at ¥20 million (\$56,000) and the banana funds at ¥10 million (\$27,000). These MITI funds were used specifically to foster industries deemed important for the nation and covering, for example, export marketing and research expenses (JCII, 1984, 5-6; Johnson, 1978, 47, 156).^{xiii}

The JCIA firms could not rely on *sogo shosha* (general trading companies) to help them expand overseas since *sogo shosha* had little or no knowledge of how to sell to consumers. Each firm on its own had to learn about local market conditions by establishing an agent to handle their overseas sales (Takahashi, 1963). Prior to 1955, Canon, Minolta, Nikon and Ricoh had — with varying degrees of success — begun to distribute their products in the US through local dealers (JCIA, 1987, 19-20; JCII, 1984, 14-22). When Canon tried to set up US distribution through Bell & Howell Co. in 1952, their response was, “‘Made-in-Japan’ means

cheap and shoddy goods here” (*The Japan Times*, November 30, 1961 quoted in Miyabayashi, 1963, 115). Not only was there the expense, but the negative perception of Japanese cameras to be overcome.

The solution was the NY Camera Center. It assisted the *whole* industry, especially the smaller firms with less capital to spend on developing export markets (Yayama and Ito, 1988, 333). Furthermore, the establishment of the Center meant that the four emerging lead firms – Canon, Minolta, Nikon and Ricoh – were hindered in their efforts to gain oligopolistic control of the industry, an undesirable outcome in MITI’s view. But because the Center worked for all firms, the lead firms could reap benefits too. In the interests of fairness, the staff of the Center came JCIA members that participated in the export promotion project.^{xiv}

The long-term success of the industry depended on establishing a positive image in the US (and later in Europe) for Japanese cameras and lenses and on building trust among customers.^{xv} One of the top priorities of the NY Camera Center was to provide information that would satisfy the public’s curiosity about the new Japanese cameras.^{xvi} Another was to reassure customers that should anything go wrong with their Japanese cameras, they could turn to the New York Camera Center for information and repairs. Japan’s export promotion campaign including the work of the New York Camera Center led to a first postwar peak in 1957 of exports to the US of 2.5 billion yen (\$6.9 million) (Seki *et al*, 1961, 83).

1965-66 Recession Cartel: Incumbents Exercise Their Power

In preparation for the Tokyo Olympics and encouraged by the high speed growth policy, firms increased production capacity to its maximum (Tsuruta, 1988). Aiming to satisfy both expanding domestic demand as well as tax-free sales to tourists, camera production and sales reached a peak in 1964. After the Olympics, the Japanese economy entered a mild recession, and faced with over capacity and unsold stock, the camera firms entered a price war. Slashing

prices was effective on one level, but it was destructive for the industry as a whole. MITI was not supportive of price destruction. However, without price destruction, the incumbents realized that they would soon lose market share to smaller firms, such as Pentax whose Spotmatic camera was one of the most popular single-lens reflex (SLR) cameras on the market that year. Pentax was not an incumbent (yet) and did not have the problem of over-stocked warehouses.

The solution to their over-capacity problem and a way to prevent new competition from potentially ousting the incumbents was a recession cartel. Most other industries had expanded rapidly in the early 1960s in response to high-speed growth, so recession cartels were not particularly unusual. For example, in machinery industries, 14 recession cartels were approved by MITI in 1963 and another 14 in 1964 (Kosai, 1988, 47).

The CEOs of the JCIA incumbent firms met over lunch to discuss the cartel issue led by Canon's CEO Mitarai (JCII, 1984, 165-167). Although the industry was large, it was relatively concentrated. The Big Five controlled nearly 53 percent of the market, and the top 12 firms controlled nearly 80 percent of the market. The CEOs agreed to lobby MITI for permission to set up a temporary recession cartel for six months beginning in April 1965 (JCIA, 1987, 25-27). It was approved by MITI and the Japan Fair Trade Commission (JFTC). They later decided to extend the cartel by an additional six months until March 1966 when it was dissolved (Tashima, 1965).

Influenced by the Big Five, the 12 members of the recession cartel agreed to control retail prices and limit production of 35mm cameras to effectively reduce total production by 20 percent (JCII, 1984, 167).^{xvii} With a price floor in place, firms were protected from price destruction and incumbents with warehouses full of overstocked – but under-demanded – goods could retain their leadership places.

The main beneficiaries of the cartel were the incumbents. The JCIA members with cameras in greater demand such as Pentax and its popular Spotmatic were penalized. Stability in the industry, much sought after by MITI bureaucrats, was regained (Uriu, 1996).

2002 Reconstituting Power: From the JCIA to the CIPA

By the early 2000s, the market for digital cameras was growing faster than for traditional photographic film cameras. Market growth was so fast for the new products that METI only began to collect significant statistics on production and sales in 2001.^{xviii} About five years earlier, the JCIA was in crisis; MITI officials reported that the JCIA had not prepared a ‘vision’ for the next five years.^{xix} This meant that the industry did not have a plan for the future, or at least they were not telling MITI about it, one of the prerogatives of the industry association (see Yonekura, 1999). The circumstances raised an important question: Given that innovation is a potent force for altering industry structures (Stopford & Strange, 1991, 71), how could the JCIA survive?

The answer was reorganization. Under the leadership of the CEO of Olympus, Masatoshi Kishimoto, the JCIA was dissolved on June 30, 2002 to make way for the Camera and Imaging Products Association (CIPA) created on July 1, 2002 (CIPA, 2002).^{xx} The new association was an outgrowth of the JCIA’s Digital Still Camera Committee established on December 19, 2000 to deal with international standards and technical issues. It, in turn, was preceded by the Digital Still Camera Study Group established in 1995 just prior to Casio’s release of the first digital camera aimed at the consumer market.

Innovation had changed the nature of knowledge flows within the industry thereby affecting the degree of authority afforded the industry association over time. By 2002 a reconfiguration of the association was carried out that included the ‘old’ JCIA members and new members active in digital imaging mainly from the electronics industry. The effect was to

reposition the JCIA firms at the cutting edge of technological change by bringing them into the center of the newly created industry association. The incumbents successfully protected their position at the ‘top’ – however temporary that might be – and may have prevented marginalization.

As the pace of technological change accelerated, mergers, joint ventures and other arrangements developed among the incumbents who were faced with new competitors in a very different competitive environment (see Figure 3). Many of the former JCIA ‘Big Five’ are engaged in lens supply to electronics firms as well as producing their own brand digital cameras. Consolidation drawing from core competences is evident in the Konica Minolta merger of 2003, the first of the former JCIA members to merge.

Three Challenges to Stability: Provoking Competition among Incumbents

1961 Mass Production: The Canonet

In 1960, Canon introduced the first mass produced camera, the Canonet (Canon, 1994, 14). It was a mid-priced camera that could be manufactured at high volume and low cost; the 1961 sales price was ¥19,800 or \$55. The Canonet was technologically superior to any other Japanese camera at that time, and given that it was mass produced it was a technological marvel. *Amateur Photographer* (October 26, 1960, 631) called it “one of the most ambitious” cameras introduced at the 1960 Photokina Show in West Germany. Canon challenged accepted production methods through the use of new mass production techniques. Precisely because the process innovation used to make the camera dramatically cut total production costs, the market for the Canonet, and thereby high-quality cameras, was significantly broadened due to the increased affordability of the new Canonet. Canon in effect challenged other firms to follow suit or lose market share.

The other incumbent firms did not let the Canonet challenges go by unnoticed. They criticized Canon claiming that the Canonet's retail price "...was in violation of the manufacturers' agreement [of October 1959] to fix prices industry wide" (Lewis, 1991, 104-105, 108). Competition among the JCIA member firms had intensified throughout the 1950s to such an extent that between 1957 and 1961 ten firms were forced to declare bankruptcy. Part of the problem was an incessant proliferation of new camera models and aggressive retail price cuts. The instability that this had caused motivated the JCIA – with the support of MITI – to agree to fixed retail prices.

The incumbents were also highly critical of Canon was because the Canonet was introduced in West Germany at Photokina, the most important photography show, not at the Japan Camera Show in Japan. The JCIA member firms, including Canon, had agreed to bi-annual product introductions at the Japan Camera Shows beginning in March 1960 (Lewis, 1991, 104-105). New products were to be introduced in Japan, *not* overseas.

In a show of good will and in the spirit of cooperation, Canon agreed to withhold the camera from the Japanese market for six months with the other JCIA members caught up (Miyabayashi 1963, 44). When on January 24, 1961, the Canonet was finally introduced at the Mitsukoshi Department Store in Tokyo, all 300 units sold within 30 minutes (JCII, 1984, p. 123). Despite the efforts of the JCIA, Canon succeeded in scooping the market changing the competitive playing field.

The effect of Canon's move was to intensify efforts among the Japanese companies to cut production costs and increase production levels. The result of this effort was clear by the end of the 1960s. Manufacturers that did not begin to use mass production methods but instead sought to compete using traditional and far more labor-intensive production methods lost market share. Canon set the trend for decades to come.

1996 Widening the Market: The Advanced Photo System

In February 1996, an international consortium of one American and four Japanese photography companies, namely Canon, Fuji Photo Film, Kodak, Minolta and Nikon, introduced a new photographic standard, the Advanced Photo System (APS). The consortium, formed under the general leadership of Kodak in the mid-1980s, set new product standards for a ‘hybrid’ photographic film that integrated traditional silver-halide film with digital technology using a 24 mm high-resolution negative.

Because the new film was smaller than the old 35mm standard, the new APS system allowed for smaller, more compact cameras. Generally speaking, the availability and format of photographic film determined what types of cameras, photofinishing equipment and photographic paper were sold in the market. Until the APS consortium was formed, Kodak alone had successfully manipulated the consumer photographic film market.^{xxi} The APS consortium represented a major change in Kodak’s strategy; it linked Kodak with leading Japanese firms in the development of a new product innovation. It signaled the end of the 35mm film era and the coming of the new digital age.

The APS consortium had a second competitive effect because it created a new competitive dynamic among the incumbents. Of the seven leading firms in Japan, only Fuji Photo Film, Nikon, Canon and Minolta were invited to join. The incumbents not included were Konica, Olympus and Pentax. Discussions among the CEOs at the monthly meetings of the JCIA and PSMA became strained; the flow of knowledge among incumbents was disrupted and rivalry among the firms intensified.^{xxii} Some feared that the number of incumbent firms would be reduced, however most firms simply formed new technological alliances.

2003 Canon EOS KissDigital: The Digital SLR Camera Revolution

In 2003, Canon revolutionized the digital camera market when it released the EOS Kiss Digital (in Japan) and EOS Digital Rebel (in the US) and EOS D-300 (in Europe), the first advanced amateur digital single-lens reflex (SLR) camera (Mine, 2003). The EOS Kiss Digital shocked the industry because it brought 35mm quality to digital imaging at a very reasonable price. The real shock was the demand for the camera; it proved much more popular than anyone expected.^{xxiii} The 'EOS shock' left the other leading camera makers behind, but only a short while in the case of the JCIA incumbents that quickly announced their own digital single-lens reflex (SLR) models, e.g. the Nikon D70 and the Pentax *ist.

Canon used a 6.3 megapixel chromium metal oxide sensor (CMOS) in its EOS Kiss Digital which had a larger total imaging area (22.7 x 15.1 mm) than charge-coupled devices (CCDs) which were used in most other digital cameras. The size of the CMOS allowed for very crisp enlargements; clarity in the digital enlargements had been a major stumbling block to achieving image quality comparable to 35mm photographic film. As in the rest of the Canon line, the EOS Digital Kiss used the DIGIC (digital integrated circuit) in combination with the CMOS to achieve excellent photographic quality (Nakata, 2004).

Most digital cameras used CCDs to convert real-life analogue images to a digital image made up of zeros and ones. CCDs could be manufactured smaller and with better sensitivity than CMOS which allowed for very small cameras. It was a difference similar to the clarity achieved with 35mm film vs. large format film. Now, as then, image clarity could be improved with better and better lenses. However, the components in the camera replaced the film. The result was a scramble to produce better and better components and combinations of components to adjust for the shortcomings of the CCD and CMOS imaging devices.

The EOS Kiss/Rebel/D-300 challenged the other imaging firms to meet – and surpass – the price and quality of its advanced amateur digital SLRs. It was a challenge to the status quo,

and forced the competition to intensify their efforts or be left behind (Mine, 2003). The race to standardize components used in digital imaging products was however far from over.

Conclusion

In summing up the six cases, the two sides of the sword represented 1) stability and protection of incumbent firms and 2) the challenge to incumbents through the introduction of new, highly competitive products. On the one hand, the focus of the industry association was stability at all costs. Incumbent firms attempted to secure their positions in the industry and maintain stability. Such behavior was by no means unique to the photography industry (Uriu, 1996). On the other hand, the industry association was able to adapt to changed competitive circumstances. In the early years, firms welcomed the help and support of the industry association even if it meant compromises were necessary. Firms, in a sense, needed to work together until they were established, prior to any consolidation in the industry.

Once they were entrenched as leaders in the industry, however, incumbent firms sought to protect themselves and their established positions. But they were also competitive; they sought to challenge the competition and better their positions. Significant technological changes were those that radically changed the dynamics of industry. Under these conditions, stability was sacrificed. The most important change in recent years was the rise of digital imaging. It remains to be seen if competition and technological change will disrupt this new arrangement and if the CIPA will seek stability and protect the incumbent firms. In this section, I present the cases in chronological order.

The NY Camera Center case (1956) was an opportunity for MITI to support the emerging leaders in the industry while saying (rhetorically) that they were helping *all* firms. At the same time, MITI could prevent the few firms with cash to do so to take control of the industry. By clearly favoring some firms over others, MITI prevented the formation of a

monopoly. The firms that survived export promotion became the incumbent firms. It shows the importance of technological change and support offered by MITI to a large number of firms on the 'cutting edge.'

The Canonet case (1961) signified how an incumbent firm, Canon, could 'rebel' against the status quo and upset the stability of the consensus-based JCIA with the introduction of a new technologically important camera. Canon participated in cartel-like agreements made by the JCIA regarding where and when to introduce of new cameras and minimum retail prices. Nonetheless, the firm broke ranks to introduce the Canonet in West Germany, not in Japan, and at a record-breaking low sales price. Although the JCIA succeeded in pressuring Canon to withhold its new camera from the market to let competitors catch up, the nature of the competitive market had been transformed and the degree of trust possible among the incumbents was forever changed.

The Recession Cartel case (1965-66) illustrated that the powerful leadership of the JCIA's Big Five secured protection mainly for the industry leaders through the establishment of a recession cartel. Weaker firms could do little to protest because they controlled only minor market shares. From the government's viewpoint, the recession cartel was desirable. MITI could not be seen as favoring one firm over another, therefore initiatives to restrict competition such as through a recession cartel had to come from firms themselves, via the industry association. The effect was that incumbents retained their places at the top while other firms were prevented from forcing significant change. In particular, Pentax suffered. With its hugely popular Spotmatic Camera, the firm might have gained market share relative to the other top firms. Eventually, Pentax did become an incumbent and a member of the Big Five when Ricoh dropped out of the top, but this was long after the recession cartel.

The APS case (1996) showed how the changing photographic film market forced Kodak to seek partners in creating a new photographic film standard. By seeking partners in

both the JCIA and the PSMA, Kodak through the APS consortium affected information flows within the industry associations and changed the balance of power among the firms. In effect this was the cusp of a more fundamental change, the reconstitution of the JCIA into the CIPA.

The JCIA to CIPA case (2002) showed that due to technological change — i.e. because digital imaging surpassed photographic film — the incumbents were willing to adapt the structure of the industry association to absorb new powerful members. It was a case of absorb or be absorbed; make yourself relevant or be relegated to irrelevance. The traditional barriers between industries as described in Figure 1 were made more fluid. One example of the blurring of old industry association lines is the Konica Minolta merger which itself was an outgrowth of their 2001 technological cooperation arrangement formed as a response to a changing industry.

The EOS Kiss/Rebel/D-300 case (2003) re-established the photographic firms as the technological leaders in optics (and cameras) in the CIPA. It brought 35mm clarity and crispness to the advanced amateur digital market. Not only did Canon broaden the market by filling the advanced amateur market segment, it also challenged other firms to match its technological edge and reasonable price. The firms that did rise to the challenge were the traditional SLR leaders, Nikon, Pentax, Olympus and Minolta. The EOS Digital Kiss/Rebel/D-300 highlighted that the competitive edge may lie in the ability of firms to customize components and combinations of components to produce images that equal photographic film. The standards are still emerging.

These six cases demonstrate how an authority (the industry association) was able to influence the direction of the industry and the information that flowed within it. Furthermore, the cases show that incumbent firms were satisfied with — and even encouraged — intervention by the authority for a mutually beneficial goal: stability. The industry association allowed for a fluctuation of incumbents over time; it was irrelevant which firms were at the top so long as there were a good number of firms, i.e. five or six. In other words, there was fluidity in the

system. This was demonstrated most effectively by the reformation of the industry association in response to dramatic technological change.

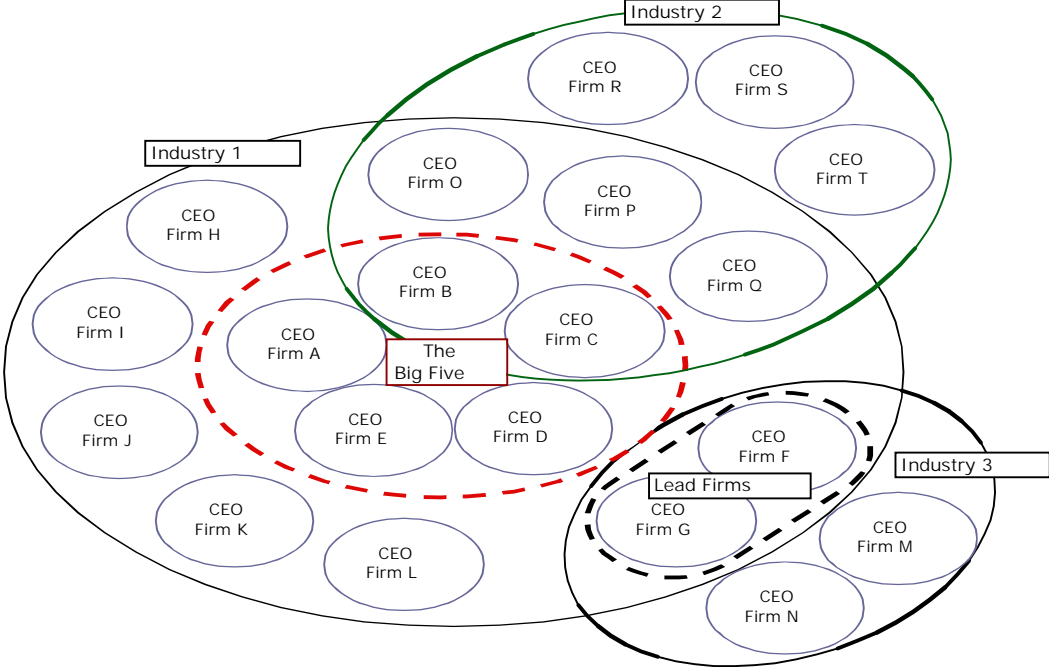
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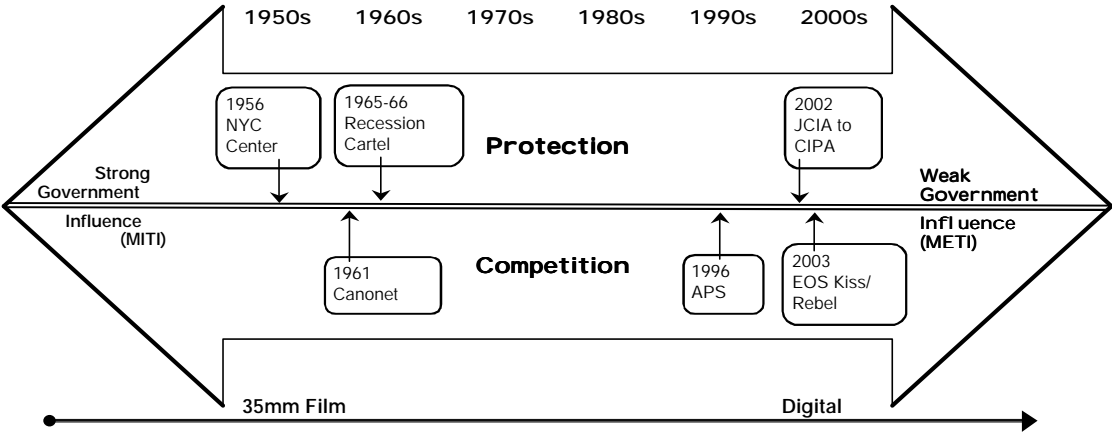
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Figure 1: Overlapping memberships in three industry associations



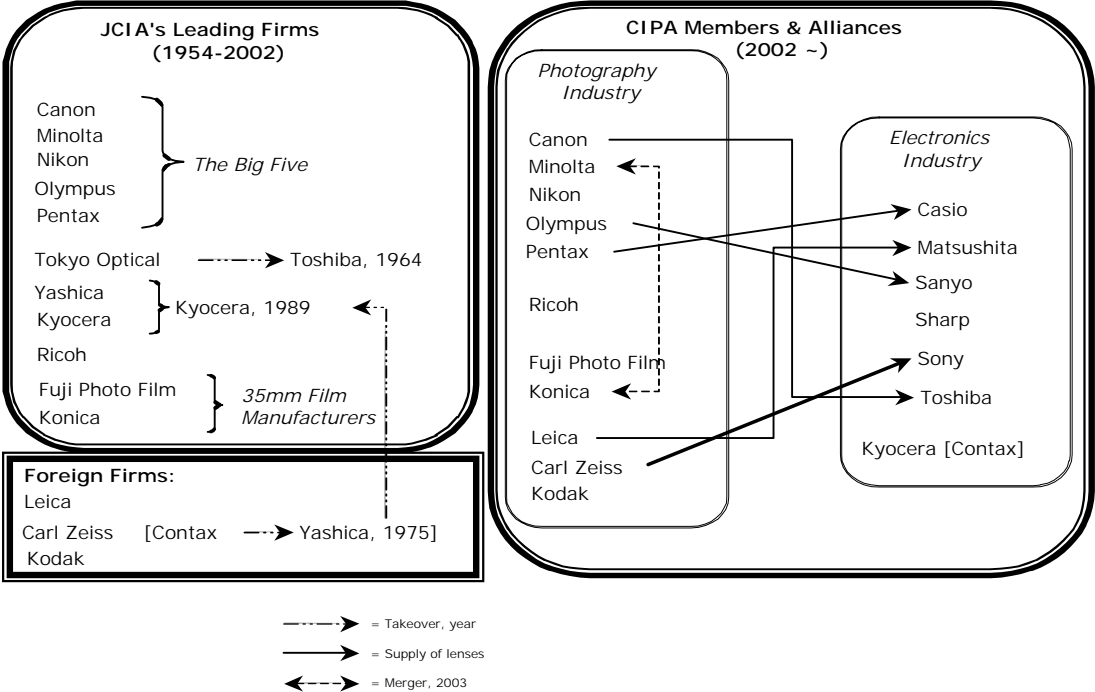
Source: Author’s research.

Figure 2: The double-edged sword of technology: Protecting incumbents and promoting competition



Source: Author’s research

Figure 3: From the JCIA to the CIPA



Sources: Company websites; author’s research.

Endnotes:

ⁱ Technology is used here following Ernst and O’Connor (1989: 2) as quoted in Stopford and Strange (1991, 72):

...technology cannot be reduced to machines. It has to do with certain kinds of knowledge, which allows the adaptation of means to ends. Part of this knowledge is embodied in machines, but most of it is not. It is embodied elsewhere – in the brains of people, in organizational structures and in behavioral patterns, which in turn are conditioned by the strategies of different social factors and their patterns in conflict and cooperation. Understood in this broader sense, technological change cannot be separated from market structures, patterns of competition and social regulation, and from the quality of the educational system and of the labor force.

ⁱⁱ In this paper, an industry is defined by the composition of firms in the industry association.

ⁱⁱⁱ Authority is used in this paper as defined by Strange (198x). Industry associations are non-state actors, neither economic entities nor the government.

^{iv} *Amakudari* (descent from heaven) refers to the practice of bureaucrats to take advisory jobs with firms upon retirement (age 60). The former bureaucrats may be useful to the firms as a direct link to the ministry.

^v The cases are based partly on information gathered from interviews in 1994, 1996, 2001 and 2004 at the JCIA and JCII and with the incumbent firms.

^{vi} Other *zaidan hojin* were also formed, but they are not the subject of this paper which focuses mainly on the JCIA.

^{vii} Noble (1988, 44) notes the same arrangement among the seven top firms in the Electronics Industries Association of Japan.

^{viii} This information is based on interviews with JCIA officials and industrialists, Spring 1996.

^{ix} This information is based on interviews with officials, Fall 1994 and Spring 1996.

^x MITI was reorganized and renamed Ministry of Economy, Industry and Trade (METI) in 2000.

^{xi} The members of the initial team were: Kinji and Mayumi Moriyama, two politicians with a long history of involvement in the camera industry, Takateri Koakimoto of Nikon, Toshiro Shimoyama of Olympus and Kojiro Sugawara, at that time president of Mamiya and vice president of the JCIA.

^{xii} JETRO is the export (and now import) arm of MITI, established by law (no. 95) as a public corporation on 26 April 1958 (Johnson, 1982, 230-231).

^{xiii} As noted above, it was legal for the government to supply such funds to *zaidan hojin*.

^{xiv} At that time, there were thousands of firms assembling cameras in small shops. The export promotion campaign did not seek to help them.

^{xv} Information based on interviews with industrialists and officials, Spring 1996.

^{xvi} Japanese cameras had already entered the US market through servicemen who had purchased them at the military postal exchanges (PXs). Many of these were in need of repair or replacement.

^{xvii} The 12 firms were: Canon, Fuji Photo Film, Konica, Mamiya, Minolta, Nikon, Olympus, Pentax, Petri Camera, Ricoh, Tokyo Optical, and Yashica.

^{xviii} This information was collected at METI in August 2001.

^{xix} This information was based on interviews in Spring 1996.

^{xx} The Camera Imaging Products Association (CIPA) was designated a *yugen sekinin chukan hojin* which makes it somewhat close to a limited corporation.

^{xxi} The international standard for 35mm photographic film was set by the 1920s with Kodak as one of the primary suppliers. Few alternative formats made a great impact on the world market. The exceptions were cartridge films (i.e. the 110 and 135 cartridges) introduced and popularized in the US by Kodak and instant film invented by Polaroid.

^{xxii} This information was based on interviews in Spring 1996.

^{xxiii} Digital SLRs made by the major manufacturers were well established in the professional market, but they were priced far above the advanced amateur market. In the professional market, digital cameras had attained very high image resolution (up to 32 megapixels) in early 2004.