

What is Essential is Invisible to the Eye

Industrial Policy as a Dynamic Interaction Process between Government and Firms

– A Case of the Provisional Act for Promotion of Machinery Industry¹

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1. Introduction

It is well known that Japanese high-quality industrial products attained very strong international competitiveness in the post-World War II period. Japanese products, however, were not always high quality. Rather, until the 1970s, Japanese goods were considered to be “cheap and shabby” and no one willingly wanted to buy them in the global market. This essay tries to examine a part of reasons how Japanese industrial goods could improve their quality and gained international competitiveness.

As Japan has never had enough natural resources for industrialization, oil in particular, in order for her to buy oil for industrialization, it needed to earn a key currency, i.e. US dollar. In order to earn US dollar, Japan should have industries that could earn it through the international trade. That was the reason why the prewar Ministry of Commerce and Industry (MCI) was reorganized as Ministry of “International Trade” and Industry (MITI) in 1949, since the Japanese economic bureaucrats thought that the first

and the most important priority to be promoted was the “international trade.” In addition, in order for them to promote international trade, it was necessary to improve the quality of Japanese industrial goods, that was to strengthen the international competitiveness of the Japanese industries. How can the quality of industrial goods be improved?

It was a kind of innovative for Japanese bureaucrats to come up with the idea to improve the quality of the basic machine tools that made machines. Before promoting exports of the appliance, machinery or automobile industries, they found the promotion of the machine tools was essential to the international competitiveness. As a famous French novelist as well as an adventurer Antoine de Saint-Exjupery wrote “what is essential is invisible to the eye,” Japanese bureaucrats found the important ingredients behind the final products; the quality of parts and components.

In order to fundamentally improve the condition and increase the international competitiveness of the

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¹ This article is a part of the outcome of “Research on the Economic and Social Impact of the Provisional Act for the Promotion of the Machinery Industry,” led by the Research Institute of Trade and Industry and with Professor Konosuke Odaka at Hitotsubashi University as the chief investigator, between 1986 and 1988. I would like to thank its research members and members of Japan Die & Mold Industry Association (especially Shoichi Kuroda, the chair of the Association) for their precious comments.

parts and components, the Provisional Act for the Promotion of the Machinery Industry was enacted in 1956. The Act was one of the industrial promotional policies of the Ministry of International Trade and Industry (MITI) to enhance Japanese postwar recovery and it focused on the promotion of Japan's basic machine tools, machinery production, production of common components and parts such as springs and gears, and exportable components and parts.

The most significant difference between the Provisional Act and other industry promotional policies was that its content as an act was extremely flexible and abstract. On this point, the officer responsible in the Ministry reminisced:

*This act was very different from conventional acts in nature. It was a very unique one. Aside from not applying the Anti-monopoly Act for joint activities of firms, it was just similar to administrative guidance. We thought it might be very difficult to justify it as an act.*²

Furthermore, even though the machine tool industry and the production of common components and parts were recognized as being very important for the competitiveness of the finished goods, it seemed difficult to promote the fragmented machine tool industry, since the bulk of the industry was made up by the very small- and medium-sized companies. This was another major difference from the promotional policies for the heavy and chemical industries such as shipbuilding, steel, and petro-chemistry. In addition, these small- and medium-sized companies sometimes existed as subsidiaries/sub-contractors of large assemblers that would manufacture the end product.

Policymakers were concerned about the efficiency of promoting these small- to medium-sized companies

as opposed to larger general electronic makers and car manufacturers. They tended to think that it would be better for the final assembling companies to internalize these small- and medium-sized corporate functions to guarantee quality. However, the Heavy Industrial Division of MITI at that time had, from the beginning, a clear strategic intention in promoting small- and medium-sized companies as independent entities. The Division issued Methods of Promoting the Machinery Industry: Explanation and Application of the Provisional Act for the Promotion of the Machinery Industry in 1956, in which the Division clearly stated its position.

There has been a growing gap in managerial and technical skills between companies producing final assembled products and companies manufacturing parts, components and basic machines as subcontractors. As a result, the larger assemblers have a tendency to internalize their parts and components production by owning machinery equipment low in operation rate. This is not rational tendency, because if assemblers internalize such machines tools, common components and parts and others basic things, their operation ratio would be very low and inefficient. Those goods should be produced independently so that the benefit from the social division of labor, the improvement of the quality and scale economies can be appreciated. From this perspective, the bearing industry is seen as an ideal example of the division of labor growing to an independent and specialized manufacturer. On the contrary, as independent and specialized manufacturers of gears and springs are low in skills and management, buyers have consequently begun to produce their own parts in this domain internally. As die and mold, die cast, powder metallurgy, and others are new industries, with small- and medium-sized companies making up

2 Japan Die & Mold Industry Association Twentieth Anniversary Annals Compilation Committee, Twenty-Year History since Foundation (Japan Die & Mold Industry Association, 1977), 24.

the majority, they do not have the financial capability to meet the demand, the concern is that these companies would end up following the downward path that the gear and spring manufacturers have taken already, ie as vertically integrated into the large companies.

Therefore, from the rational view point of the production structure, independent small- and medium-sized companies and subcontractors, that are manufacturing parts and components and basic machinery, are very important not simply because their sheer quantity but also for an efficient division of labor, ie economies of scale. There is a greater need to promote these companies than any other industries, not for social policy but as active industrial policy to realize economies of scale and quality production.³

As is obvious from the statement above, the Ministry did not envision to have final assembling companies integrate basic machinery equipment that would be low in operational rate. Instead, small- and medium-sized companies were to be promoted as independent manufacturers to achieve a structure in which a rational division of labor would be possible.

It is a historical fact that the machine assembly industry in Japan did not integrate basic machinery and the production of common parts and components, and rather grouped the processes internally to create the keiretsu (sub-contracting) relationship. The keiretsu relation enabled flexible production systems

(as represented by the Toyota Production System or a “Just-in time Production System”) and achieved an astonishing level of international competitiveness.⁴ It is notable that as early as 1956, MITI aimed to promote competitive small- and medium-sized companies and to structure a social division of labor, rather than to integrate them into large corporations. This suggests that Japanese machinery assembly makers’ keiretsu structure did not happen accidentally. While there is general understanding that keiretsu was an outcome of Japan’s industrial backwardness, it must be noted that there was a rather strategic intention of the Ministry at this point in history.⁵

With this basic understanding of the division of labor, MITI specified the following eighteen types of machinery to be covered by the Provisional Act for the Promotion of the Machinery Industry.⁶

- Basic Machinery Components and Parts:

- ① machine tools, ② electric welding machines,
- ③ electric tools, ④ tools, ⑤ molds,
- ⑥ measuring machines, ⑦ test equipments,

- Common Components and Tools: ⑧ high toughness cast iron, ⑨ die cast, ⑩ powder metallurgy, ⑪ screws, ⑫ bearings, and ⑬ gears

- Specified Export Machinery Parts: ⑭ sewing machine parts, ⑮ watch and clock parts, ⑯ automotive parts, ⑰ resistors, and ⑱ condensers

3 The Ministry of International Trade and Industry Heavy Industry Division, *Methods of Promoting the Machinery Industry: Explanation and Application of the Provisional Act for the Promotion of the Machinery Industry* (Industry Research Group, 1956), 55-56.

4 Daniel Roos et al, *The machine that changed the world*, New York; Macmillan, 1990; Kim Clark and Takahiro Fujimoto, *Product Development Performance*, Boston: HBS Press, 1991.

5 It has been noted that Japan's automotive industry and other machinery industry had relied on their keiretsu in their assembly. See Konosuke Odaka, "Introduction to Subsidiary-Based Machinery Industry," *The Economic Research* 29, no. 3 (1978). This is because restrictive conditions such as technology, management, and market in Japan at the time enabled an increase in the rate of orders placed to outside suppliers for parts, and later Japan's original production system based on subsidiaries called the Keiretsu or Toyota Production System. See Hiroyuki Itami et al., *Competition and Innovation: Corporate Growth in the Automotive Industry*, Tokyo: Toyo Keizai Shimpo Sha, 1988. However, it has been less known that the Ministry of International Trade and Industry supported specialization and independence of basic machinery and part and component manufacturing as early as 1956 or before.

6 Development Bank of Japan Tenth Anniversary Annals Compilation Committee, *Ten-Year History of the Japan Development Bank*, (1963), 295; Shigeru Matsushima, "The Approval Process of the Provisional Act for the Promotion of the Machinery Industry and Its Capacity," in Odaka and Matsushima (2013).

This essay will examine the relationship between the Provisional Act and the machinery industry, especially molding machines in order to fill the following scholarly gaps:

- 1) How was a real (dynamic) relationship between public and private sectors in the process of Japanese industrial policy formulation, and
- 2) In addition to the direct impact of Japan's industrial policies, how was their secondary and indirect impact (soft impact of industrial policies).

On Japan's industrial policies, Tsuruta and Komiya et al. respectively published their systemic analytical work in 1982, *Industrial Policies in Post-WWII Japan*, and in 1984, *Japanese Industrial Policies*, and Ito et al. published *Economic Analysis of Industrial Policies* in 1988 based on economic theories. These works analyze macro-economic impacts from policy perspectives. Few studies, however, have shown exactly how policies were implemented, how companies and industries reacted, or how companies and industries were involved in creating these policies. Unlike wartime economy or planned economy of a socialist society, Japan's postwar industrial policies dealt with companies with a free will. Therefore, without an analysis of corporate responses and reactions about to policymaking and implementation, one would risk a static conclusion that portrays a top-down planned economy. A prototypical example of such an analysis is so-called "Japan Inc. Theory" which suggested that the MITI assumes the role of the headquarters to make all business plans, and companies loyally follow them.⁷ However, many of the successes that Japan's industrial policies

witnessed were outcomes of the dynamic bilateral relationship between the public and private sectors. Here, the rest of the essay will primarily aim to reveal how the Provisional Act was implemented, by examining both the policy and corporations, and to show the dynamics of this relationship.

The second object of this essay is to reveal the indirect as well as direct impact of the Provisional Act for the Promotion of the Machinery Industry. The Act in itself was comprised of very simple content, or what I call hardware, with twenty four articles and three pillars; ① establishing basic rational planning for specified industries, ② securing funds needed for rationalization, and ③ allowing collaboration mainly via joint activities to promote rationalization. What is more important, however, is revealing the process and its effectiveness in implementing the Act, and realizing the rationalization in machinery industry, which is not apparent from the wordings of the Act. Although examining the direct impact is important, it is also important to the policy's indirect impact, or software impact.

As Japan's success in industrial policymaking became apparent, many developing and developed countries tried to implement similar policies. Very few resulted in success. The reason why their attempts have failed was because these cases not only lack the dynamics that the first aim of this essay will reveal but also because they end up simply copying the hardware of industrial policies and did not fully comprehend the software, or the peripheral information about relevant policies. There are some intensive researches on the Act, such as Konosuke Odaka (1998) and Juro Hashimoto (2001) and Odaka and Matsushima eds (2013). Matsushima has touched upon the indirect effect of the Act as "the strategic signaling effect".⁸ This essay will

⁷ See Thomas McCraw and Patricia O'Brien, "Production and Distribution," (1986),

build upon these analyses to unearth the direct and indirect impacts of the Provisional Act through the detailed case study of the die and mold industry, a very fundamental aspect of this basic industry.

2. An Enactment of the Die and Mold Industry

Metallic dies and molds refer to the pattern sample or a container into which liquid is poured to create a given shape, which is necessary for non-cut processing through mass production. The die and mold industry refers to the group of firms that manufacture such dies and molds. Metallic molds are basic goods that have fundamental quality and roles in mass production. It is not an exaggeration to say that these molds determine the basic competitiveness of a mass producer. Despite this fact, very few people were aware of its presence, let alone its importance. Nonetheless, its market in the 1990s was larger than what they expected was more than 15 billion yen with the high international competitiveness and exportability.

However, die and mold production has always taken place behind the scenes and was rarely considered as a subject of industrial promotion. Especially around 1956 when the Provisional Act was enacted, automobiles and consumer electronics were not developed enough to secure the status of mass molding and mass production industry. Metallic molding was a very small and instable business that did not deserve even a title of industry. Therefore, the fact that the Ministry foresaw the business to be subject to the promotion similar to machine tools, automotive parts, and precision machinery was

a sign of the Ministry's foresight. I will, hereafter, examine the process by which the Ministry established the group of firms that were too small to deserve the title of an industry but nonetheless recognized as such, and deployed the Provisional Act. I will also study what kind of relationship was established between the government and firms, and as a result, what kind of dynamics were generated.

2.1 Collaboration between the Government and Firms

Although the metal die and mold industry today are categorized by the compound materials as Table 1 shows, it was thought difficult to categorize as a single industry in the 1950s. For example, a firm that produced a mold for plastic used in household appliances was considered to be just a subsidiary of the appliance company or a plastic fabrication firm. On the other hand, the firm that made molds for cars were considered as a molding body shop or a pressing firm. When the government committed to promoting an industry through a set of acts, it was a significant question to determine how to categorize the industry in order to ascertain its success. Categorization alone can embody the purpose of the policy and determines its scope and effectiveness. For instance, whether or not targeting only a group of integrated firms in the steel industry, or including even open hearth and electric furnace manufacturer would show different natures of a policy. Therefore, the specialization process of the metal die and mold industry by the Ministry in itself was a story that reflected the intent of the Act and its *raison d'être*. The following will examine the process through which the Ministry specified the die and mold industry and the relationship between the government and companies.

8 See Matsushima (2013).

Table 1. Types of fabrication industries that use metallic dies and molds based on materials

| Material | Fabrication Industry | Major Materials to be Fabricated | The Condition of the Material upon Fabrication | Areas of Demand for the End Products | Types of Metallic Molds |
|----------|-------------------------------|---|---|--|--|
| Metal | Press Industry | Sheet metal, Non-Ferrous Sheet Metal | Process at room temperature | Automobiles, Consumer electronics, Sundries, Miscellaneous household goods | Depending on the function of molding, various categories exist including stamping, bending, drawing, and coining |
| | Forging Die Industry | Steel rod materials, Nonferrous metal materials | Heat steel material to 1,200°C. For cold or warm forging, process at room temperature or a few hundred degrees C. | Important safety parts for automobiles, Construction machinery parts | Depending on the forging machine, types will include, drop hammer, press, upsetter, forging role, etc. |
| | Die Cast Industry | Aluminum alloy, zinc alloy, and other ingots | Casting temperature at the molten stage for aluminum alloy is 635-705°C, and for zinc alloy at 390-410°C | Consumer electronics, Automobiles, Sundries | Depending on the structure of the mold, the types can include direct carving, nesting, and others |
| | Metal Mold Casting Industry | Aluminum alloy | Process in molten stage | Automobiles | Mold |
| | Powder metallurgy | Powder metal | Room temperature for compression molding of powder (pressure 5t/cm ²) | Oil retaining bearing, small gears | Mold |
| Rubber | Rubber processing | Synthetic rubber, Natural rubber | Depends on the vulcanizing method | Industrial rubber products (molded), Automobiles, Automotive tires and tube, Other automotive products, Footwear | Depending on the processing method, pressing (press vulcanization), injection molding |
| Plastic | Plastic die and mold industry | Thermoplastics resin: Polyethylene, Polypropylene, Polystyrene, Vinyl chloride, and others. | Used at the molten stage. The melting point varies by the kind of plastic | Consumer electronics, Automobiles, and many others | Depending on the molding method, injection molding, blow molding, compression molding, and others |
| | | Thermosetting resin: phenolic resin, melamine resin, and others | | | |
| Glass | Glass product manufacturing | Glass material | Glass materials at the molten stage around 700°C (also called (parison or gob) | Glass containers, Lighting, Sundries, Bottles | Depending on the molding method, press molding, blow molding and others |

Source: The Medium and Small Business Research Institute, “Structural Analysis of the Die and Mold: Research Report on Die and Mold Companies,” Research Series 11, The Medium and Small Business Research Institute (1979), 10.

As just before enacted the Provisional Act for the Promotion of the Machinery Industry, it started to specify molding as an industry and began its preparation for its promotion. The Japan Die & Mold Industry Association records the situation at the time as follows;

Before the Provisional Act for the Promotion of the Machinery Industry was enacted in June 1956, the deliberation took place inside MITI to determine the processes and policies to promote the machinery industry. They initiated communication with main die and mold companies in Tokyo, Nagoya, and Osaka regions to hold the First Precision Molding Rationalization Discussion Committee to discuss rationalization and promotional processes.⁹

What must be noted here is that this preparation work was not a one-way process led by MITI. It was a collaborative process that involved the government, companies, and mold users. Around March 1956, MITI began to interview major die and mold companies on the status of the business activities and attempted to establish an industrial association. However, MITI at the time did not have a specific plan how to organize the die and mold industry. As Shoichi Kuroda, Chairman of the Japan Die & Mold Industry Association, remembered, MITI's initial contact was abstract as follows;

Government officials didn't know what a mold really was. When they saw the Chinese characters for a mold, even they did not know how to pronounce it. It was supposed to be read as "kanagata" and they said "kinkei" instead. Since we had been involved in the press molding, MITI called us and said, "We hear molding is important. Can you tell us about it?" After twists and turns, they asked us if it was possible to organize the industry.¹⁰

As this account suggests, MITI did not force the private companies to form the industry to be applied the Provisional Act. Instead, MITI started an interactive communication with the companies by announcing that die and mold were "important," without a specific definition in mind, in order to promote the organization of the industry. However, this anecdote in itself does not mean that MITI lacked any knowledge about molding. For example, the Heavy Industry Division of the Ministry wrote in *Methods of Promoting the Machinery Industry*, published in June 1956, that "since the precision and longevity of molds directly affects the precision and cost of products, high precision and longer longevity are strongly required," emphasizing mold's importance.¹¹ Furthermore, the Ministry's bureaucrats, most of them were military officials during the war, were fully aware of the importance of mold as the base for plastic molding from their wartime experiences.

Then, why did MITI start its effort with such a vague idea as "molding appears to be important"? Based on the unfolded events, there were two major reasons why. One was most likely because in spite of their importance the bureaucrats did not know how to envision the scope of the industry comprised of very small and various companies. Takeo Wakebe, who was responsible for casting in the Ministry, wrote, "We decided that we should gather those involved in molding. After I talked to my superiors in the section in charge of casting in the Ministry, we first formed a Molding Discussion Committee in April, 1955. ... I asked its participants to share their ideas for the promotion and modernization of the die and mold industry." This is proof that there was no way but to ask the private companies to be involved in policymaking.¹²

9 Japan Die & Mold Industry Association Twentieth Anniversary Annals Compilation Committee, *Twenty-Year History Since Foundation* (hereafter 20-Years History), (Japan Die & Mold Industry Association, 1977), 19. The Discussion Session actually took place in March, 1956.

10 Japan Die & Mold Industry Association Thirtieth Anniversary Annals Compilation Committee, *Thirty-Year History since Foundation* (hereafter 30-Year History), (Japan Die & Mold Industry Association, 1987), 181-2.

11 The Ministry of International Trade and Industry Heavy Industry Division, 157.

The second reason was that MITI put more emphasis upon the bottom-up private initiatives rather than the top-down state control. Through the wartime controlled economy, the bitterest and the most significant lesson for the bureaucrats of the Ministry of Commerce and Industry, the predecessor to MITI, was the limitation of the top-down approach. The top-down state-controlled methods continuously failed to improve the productivity of major industries in preparation for the final stage of the war against the Allied Powers. By losing national productivity, they were forced to learn that it was impossible to increase productivity of industries without incentive and motivations, private corporations' autonomous actions, in particular.¹³ From these wartime experiences, bureaucrats aimed to encourage corporate autonomy. Based on a rather passive call for action, the Precision Molding Rationalization Discussion Committee was formed in March 1956 and the industry-driven self-organization started. Regarding this point, Kuroda stated,

“Molding (kanagata in Japanese)” became a common term as we started saying that powder metallurgy needed molding, die cast also needed molding, and so on. Molds are different between die cast and power metallurgy, or between press molding and plastic molding. So we discussed if we should include them all to treat them as an independent industry, or molding skills should be developed in each industry. I think it was meaningful that we were able to converge them ultimately as the die and mold industry.”¹⁴

As this witness account reveals, the die and mold industry was specified not as MITI-driven top-down initiative but as a collective effort with the private companies to find the “common term.” This was how the group of molders those were small, diverse, and difficult to be organized came to be categorized as an industry for the first time. In order to know the reality of Japan's industrial policymaking for small- and medium- companies, it is important to be aware that the important decision of specifying target industries for the Provisional Act was made not unilaterally but through interactions with private companies.

Furthermore, MITI established the Machinery Industry Council upon the enactment of the Provisional Act to make a basic and implementation plan to encourage modernization. The Council had a subcommittee as an advisory board for each specified industry to decide specific policies and the details for infrastructure modernization. MITI continued to invite the autonomy of private companies in this process, as well. Based on the aforementioned general call for action, MITI held the Precision Molding Rationalization Discussion Committee to examine concrete ideas to promote rationalization. Specifically, the session members cooperated to examine the status quo of mold manufacturing and agreed to “promote molding specialization through direct sales” and to “implement high-quality and high-precision machine tools (especially boring machines, milling machines, die sinking machines, grinders, and others).”¹⁵

12 Japan Die & Mold Industry Association Twentieth Anniversary Annals Compilation Committee, 20-Year History, 24. Also, Wakebe wrote, “[The Provisional Act] was very different from conventional acts in nature. It was a very unique one. It was because aside from not applying the Anti-monopoly Act for collaborative works, it was similar to administrative guidance. It was difficult to justify that we had to make it an act” (ibid, 24). This is a testament for the fact that the Act was drafted in a very flexible context. The Committee actually met in March, 1955.

13 Seiichiro, Yonekura. “Function of Industrial Organizations” in Masahiro Okuno-Fujiwara and Tetsuji Okazaki The Source of Modern Japanese Economic System. (Tokyo: Nihon keizai shinbun-sha, 1993).

14 Japan Die & Mold Industry Association Thirtieth Anniversary Annals Compilation Committee, 30-Year History 1987, 184.

15 Japan Die & Mold Industry Association Twentieth Anniversary Annals Compilation Committee, 19-20. This source explains in detail that the Discussion Committee, private organization for corporations, drafted the promotions plans for the die and mold industry while keeping pace with the enactment of the Provisional Act.

Closer examination into the process of the Provisional Act implementation also reveals private corporations' autonomous efforts to work together despite their small size to deal with the Act's policies. For example, Katsutaro Kuroyanagi, Vice Chair of the Japan Die & Mold Industry Association and Executive Chairman of Meiki & Company, Ltd., heard about the launching of the Association during the process of the enactment. He then gathered small plastic die and mold companies to establish the Kanto (A Greater Tokyo) Plastic Molding Union to deal with the policies under the Provisional Act.

As you know, the plastic die and mold companies in Kanto are mostly small and the Tokyo Plastic Molding Union was almost invisible. That was when I heard about the expected launching of the Japan Die & Mold Industry Association. But there was no way to get in touch with others. This is why I decided to gather small companies and start the Kanto Plastic Mold Industry Association, without the old title of "union." ... Since we were all so small, we agreed that we would do business on installment contracts for milling, shaping, and others. At the time, shaping skills in Ota industrial district was well known. On the other hand, when you look at the members of the Die & Mold Industry Association, there were big names like Shibaura Machinery (a subsidiary of Toshiba), Ikegai, Kuroda Gauge Manufacturing Company, Showa, and others. At that time, nobody imagined that a big company like Shibaura Machinery was involved in molding. So, it seemed that small companies could not be a part of the Association. But we just tried to organize those small ones that might not participate in it.¹⁶

While these activities happened, small- and medium-sized companies in the industry fostered relationships and formulated the base for the organization by establishing cooperative societies or unions for press molders, rubber molders, glass molders, die cast molders, and others. Similarly, the Nagoya and Osaka regions had cooperative societies and other unions for die and mold companies, allowing the founding of the Industrial Association to be easier at the national level.¹⁷ These cooperative societies were established to deal with plastic materials and other parts and components disseminated from the U.S. after the war, and to serve as intermediaries for active technological introduction and capital investment. Along with the enactment of the Provisional Act, under the autonomy of private companies, they were forming a basic environment to deal with policies.¹⁸

2.2 Knowledge Diversity: the Detailed Enactment

In the process of promoting the die and mold industry, another important issue was that the scope of the industry and detailed regulations for enforcement and objectives of the Provisional Act were determined by various participants. Upon the enactment of the Act in June 1956, the Machinery Industry Council was established inside the MITI to encourage the promotion of 19 kinds of specified machines. At this stage, the Die and Mold Subcommittee was founded with representatives from die and mold companies, mold users, and intellectuals to study specific methods of promotion. The fact that not only those in the industry but also intellectuals and users participated in this effort shows that the implementation of the Provisional Act took place within a wide context. Especially

¹⁶ Japan Die & Mold Industry Association Thirtieth Anniversary Annals Compilation Committee, 30-Year History , 185.

¹⁷ Ibid, 19-21.

¹⁸ As Nathan Rosenberg revealed, "the successful transfer of technology is not a matter of transporting a piece of hardware from one geographic location to another." See Nathan Rosenberg, Inside of Black Box: Technology and Economics. (Cambridge: Cambridge University Press, 1982), 249. Examination of Japan's industrial policies requires a constant consideration of the capacities and autonomy of private companies that were to be affected by the policies.

when mold manufacturing could have expanded as an in-house business for major corporations, it was significant that the industry was established as a standalone entity with the involvement of mold users. On this matter, Takeo Wakebe, an officer in charge in the Ministry, noted as following.

Many Japanese molds have been manufactured internally and there was limited production by specialty manufacturers. This is why I strongly hoped to establish a system to promote specialized production. As mold manufacturing is a high added value industry, I think a steady development as an independent industry suites for Japan. Machines for mold are very costly, however, I expected large user companies might increase their in-house production. Fortunately, with the support of the large companies/users, such as Mr. Kanno, the President of Furukawa Casting, Mr. Nakao, the Vice President of Sumitomo Bakelite, and Mr. Takaya Sato, the President of Tokyo Electric, we were able to set our target at promoting the specialized die and mold industry. Now I hear that 70% of the mold production is direct sales, I am emotionally moved to realize that the situation has reversed since twenty years ago.¹⁹

In addition, Toshiba, Sekisui Chemical, Matsuda Manufacturing (currently Mazda Motor Corporation), and others participated in meetings as representatives of users to share their ideas.²⁰ It is well known that breadth of knowledge diversity increase quality of a new product/knowledge.²¹ When MITI implemented the Act through the

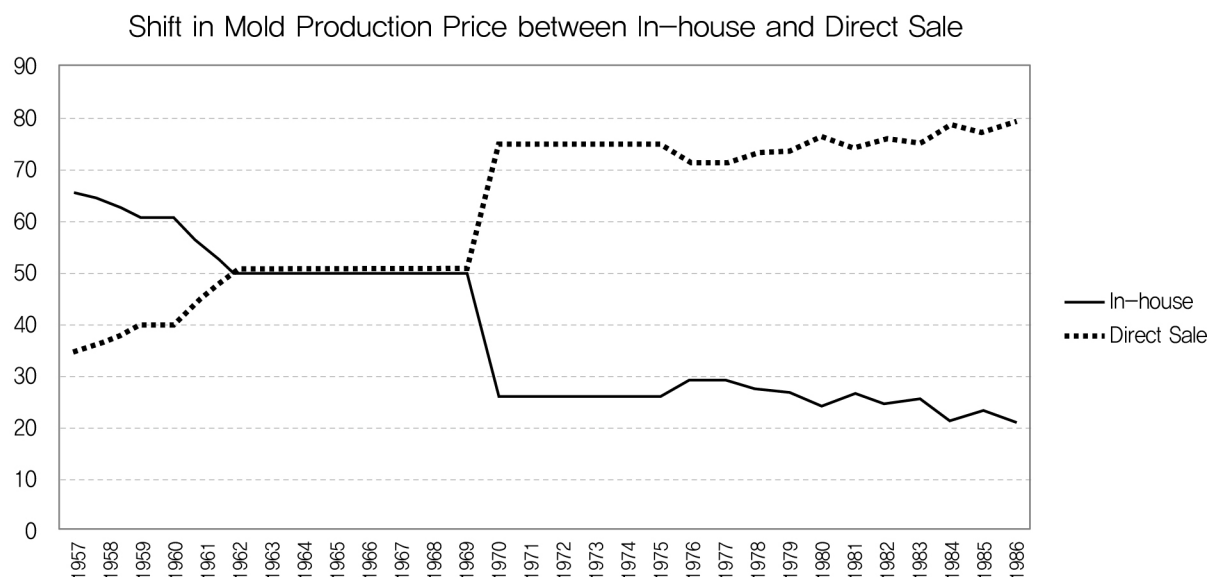
subcommittee discussion, it was very important that it called for not only die and mold producers but also various but related users for the members. In addition to the users, as we will see later, MITI called for academic scholars in the field to the discussion. Due to this knowledge diversity, as Figure 1 shows, the direct sales of molds grew steadily (aggregate of about 620 companies with over 20 employees). Direct sales accounted for about 80% by 1986, having specialized die and mold companies as one of the representative exporters. Furthermore, during that period, the in-house sales grew by 38 times whereas direct sales rolled up by 287 times, showcasing that Japan's die and mold industry grew with direct sales by specialized manufacturers. This is the outcome of the Provisional Act involving not only manufacturers but also various users and specialists in its Council and subcommittee members so that the economic efficiency of specialization was widely recognized.

This is how, upon the implementation of the Provisional Act, the Molding Subcommittee of the Machinery Industry Council drafted the Basic Plan for Die and Mold Industry Rationalization as the general aggregated view of the companies, intellectuals, and users. They analyzed technology, production plans, and optimal management styles to clarify the standard of application of the Provisional Act. Japan Die & Mold Industry Association was founded in November 1962 representing about 210 companies across the country as the organization to spread this basic plan and propagate technology and information related to the die and mold industry.

19 Japan Die & Mold Industry Association Twentieth Anniversary Annals Compilation Committee, 30-Year History 25.

20 Shoichi Kuroda, interview by Seiichiro Yonekura, January 27, 1986, at MITI. Kuroda was at the time the president of Kuroda Gauge Manufacturing Company and the Chairman of the Japan Die & Mold Industry Association.

21 Ritta Katila and Gautam Ahuja, "Something Old, Something New: A Longitudinal study of Search Behavior and New Product introduction", Academy of Management Journal (2002)

Figure 1. Shift in mold production price between in-house and direct sale

Source: The Medium and Small Business Research Institute, “Structural Analysis of the Die and Mold: Research Report on Die and Mold Companies,” Research Series 11, The Medium and Small Business Research Institute (1979), 10.

As shown above, the implementation process of the Provisional Act in the die and mold industry was not a one-way promotional order by MITI, but a bilateral process between the government and the industry. This is the main difference between a planned economy of the controlled economy or socialist economy, and the Provisional Act. In a planned economy, an implementation process of a policy is a one-way flow of information involving a discussion committee by bureaucrats, planning, distribution of resources, implementation, monitoring, assessment of outcomes, and adjustment of plans. However, as for the Provisional Act, MITI started the process by making a passive call that stated “molding appears to be important.” Private companies independently created an environment in which they could handle policies through

establishing the Industry Association and offered field information regarding policy content via the Council. This information flow was two-way between the government and the industry. From this perspective, while the policymaking model in a socialist economy and a controlled economy is based on top-down information processing from the government, that in die and mold industry promotion was based on bilateral information generation between the government and companies. As the outcome of the organizational theory has shown, the bilateral information generation model witnessed information rich both in quality and quantity. This model was also quick in adjusting its implementation process and reflects reality.²² Additionally, a combination of heterogeneous information provided by MITI, industry, users, and intellectuals not only

²² Regarding information generation of an organization, see Ikujiro Nonaka, *Corporate Evolution Theory: Managing Information Generation* (Tokyo: Nihon Keizai Shimbun sha, 1985); Ikujiro Nonaka, “Toward Middle-Up-Down Management: Accelerating Information Creation,” *MIT Sloan Management Review*, Spring 1988.

reflected the field, but also enhanced the validity of the policies and enabled quick planning and implementation. An examination of Japan's industrial policy should not miss the advantage of such a bilateral policy deployment that acknowledged the autonomy of private companies.

3. Direct Impacts of the Provisional Act

This section aims to understand the direct numerical impact that the Provisional Act had and will reveal the relationship with the management of the policies.

First, Japan's die and mold industry grew by 128 times, from 10.6 billion yen to 1.3613 trillion yen, between 1957 (One year after the Provisional Act was enacted) and 1985.²³ The majority of the companies were very small with less than 20 workers. As far as the machinery statistics show, 641 business establishments that employed more than 20 workers (5.4% of 11,923 establishments in total) yielded 375.5 billion yen (27.6% of the total output). About 80% was produced as direct sales. This evidence shows that Japan's major companies in the industry had grown to be specialized makers (See Figure 1).

When we compare the international outlook of the industry, we can use international statistics provided by ISTA (International Special Tooling Association). The figures in these statistics seemed not so accurate in many ways.²⁴ However, as the data provided to ISTA is the only data that is internationally comparable and is likely to include

a yield of major companies in each country, we are able to observe a general trend.

According to the ISTA statistics of 1989, as Table 2 shows, the total output by its fifteen member countries is 2.28 trillion yen, with the U.S. yielding the most at 833.3 billion yen, Japan yielding the second at about 451.9 billion yen, and West Germany at that time as third with about 258.5 billion yen. Japan recorded the highest export value with about 165.2 billion yen (36.6% of its entire yield), or 32.4% of the entire global export value. Japan's import value was about 13.2 billion yen and ranked ninth out of the fifteen countries. This was about 10% of the U.S.'s import value, which was approximately 121.6 billion yen. In exports, Germany ranked second with about 86.1 billion yen and the U.S. ranked third with about 79.1 billion yen. Exporting 36.6% (165.2 billion yen) and importing only 8% of the amount, Japan's die and mold industry showed its usual tendency to focus on export. As for the annual output per employee, Japan led with 15.53 million yen, at a large margin to its follower, Sweden at 14.48 million yen.²⁵

Even though Japan's die and mold industry acquired high international competitiveness by 1989, its yield was merely 30 billion yen in the 1950s when the Provisional Act was enacted. Because of its smallness, in order for the Provisional Act it was not so easy to promote the industry compared with the other large industries. It had the following issues;²⁶

23 Japan Die & Mold Industry Association Thirtieth Anniversary Annals Compilation Committee, 207.

24 For example, the figure for Japan in use in this statistic is from machinery statistics which had a gap of over 1 trillion yen compared to industrial statistics. Similarly, since it is unlikely that ISTA's member countries were able to provide aggregate domestic data that truly reflects the entire yield, ISTA statistics do not correlate with the real numbers in the world.

25 Japan Die & Mold Industry Association, "International Comparison of the Die and Mold Industry (1989): Status of Fifteen ISTA Members," Japan Die & Mold Industry Association Newsletter (1992). The newsletter is based on the ISTA report released on March 31, 1992.

26 About the characteristics of the die and mold industry, see Japan Die & Mold Industry Association Twentieth Anniversary Annals Compilation Committee, 30-Year History and The Medium and Small Business Research Institute, 1979.

Table 2. International comparison of the die and mold industry (ISTA Statistics) as of FY 1989 (unit: million yen)

| | US | Japan | West Germany | South Korea | Italy | Spain | England | France | Switzerland | Belgium | Sweden | Netherlands | Portugal | Finland | Denmark | Total |
|---------------|----------------|----------------|---------------|--------------|---------------|---------------|---------------|---------------|---------------|---------------|--------------|---------------|---------------|--------------|---------|-----------|
| Annual Output | 833,330 | 451,856 | 258,464 | 160,039 | 140,828 | 86,135 | 83,875 | 82,112 | 49,527 | 49,080 | 33,315 | 20,070 | 18,278 | 10,071 | N.A | 2,276,480 |
| Exports (%) | 79,093 (9.5) | 165,205 (36.6) | 88,154 (33.3) | 13,008 (8.1) | 24,068 (17.1) | 19,902 (23.1) | 10,914 (13.1) | 23,084 (28.1) | 25,687 (51.9) | 29,095 (59.3) | 3,302 (9.9) | 15,012 (74.8) | 12,518 (68.5) | 888 (8.8) | 2,667 | 510,598 |
| Imports (%) | 121,636 (14.6) | 13,234 (2.9) | 49,227 (19.0) | 15,691 (9.8) | 7,261 (5.2) | 15,219 (17.7) | 30,305 (36.3) | 31,994 (39.0) | ■■■■■ | 27,780 (56.6) | 7,610 (22.8) | 15,271 (76.1) | 3,313 (18.1) | 1,243 (12.3) | 4,160 | 343,944 |

Source: Japan Die & Mold Industry Association, "International Comparison of the Die and Mold Industry (1989): Status of Fifteen ISTA Members," Japan Die & Mold Industry Association Newsletter (March 31, 1992).

* These figures represent those of industrial associations included in ISTA in its fifteen member countries. Therefore, the figures do not represent the total in each country. German and English figures do not include companies with less than twenty employees. Japan's figure is a machinery statistics (total of about 620 companies with 20 or more employees).

- (1) Companies manufacturing the die and molds were very diverse in size, utilized material, and organizational structure from each other.
- (2) Companies were very small (80% had 10 or fewer employees).
- (3) It was a very unstable industry based on build-to-order manufacturing.
- (4) Reliance on manual labor was high.
- (5) Fixed capital investment through costly tools and others was necessary for modernization.

The first issue was solved by categorizing diverse companies as into the die and mold industry with the mutual recognition between the government and companies as stated earlier. But the other issues necessitated some solutions. First was to clarify the rationalization target for 1960 in order to refine mold manufacturing. Second was to establish a financial scheme to enable the purchase of high-precision but costly machine tools, so that very small and manual labor dependent companies would be able to modernize. Third was to expand corporate output through administrative guidance and collaboration. What follows here is the direct impact of the Provisional Act.

3.1 Basic Plan for Die and Mold Industry

Rationalization and Rationalization

Setting the rationalization target was handled in the Basic Plan for Die and Mold Industry Rationalization (hereafter Basic Plan) drafted by the Die and Mold Industry Discussion Committee consisted of manufacturers, users, and intellectuals. Specific numerical targets and the scope of the financial investment for tool purchases were determined, allowing the promotion to happen accordingly.

According to the Basic Plan, as Table 3 shows, detailed targets were set to be attained by the end of FY1959. It also listed specifically sixteen tools and four kinds of heat treatment equipment that should be introduced. The Basic Plan was superior not just because of these numbers but also because it scheduled/encompassed the number of technicians and employees while considering the proper size, sales, repayment capacity of each promoted company. As a targeted corporate statue, the Basic Plan mentioned that it would be "a company whose main business is direct sales of molds," with "three or more employees who graduated from a high school under the prewar system of education, studied

mechanical engineering, and worked in mold manufacturing for five years, or those with equivalent experiences.” It also stated that “after the completion of capital investment, it must be possible to secure at least 5,000 yen per year from direct sales.” The plan concretely suggested, as an example for personnel distribution, to have sixteen employees for material processing, fifteen for part and component processing, and twelve for milling.

Additionally the Basic Plan was very cautious, when it also considered financing relatively large metal processing manufacturing companies and other specialized mold makers, since tools to be introduced were very costly. The plan stated, “those companies that have other businesses may utilize the financed equipment in other divisions. In order to prevent this, companies must be responsible for the allotted production output.” Expected production values were also included in the Basic Plan for Die and Mold Industry Rationalization Reference Document, attached to the Basic Plan.²⁷ Specific figures were listed and the selection standard for the number of

technicians and personnel distribution was able to be determined because the Basic Plan was drafted not only by bureaucrats but was also based on various inputs by manufacturers, users, and intellectuals.

Although it is difficult to measure the level of promotional attainment up to 1957 with the Basic Plan, as Table 4 shows, between 1958 and 1964, the amount of machinery owned by a company grew from 14.9 to 23.6. The number of specialized machinery and rationalization machinery specified as the subject of promotion in the Basic Plan owned by a company steadily grew from 2.5 to 4.6 and from 2.1 to 3.7 respectively. The growth in the number of machinery five years old or younger was the highest with specialized machines from 506 to 2,386 and rationalization machines from 783 to 1,915. This suggests that new-style machinery was introduced after the enactment of the Provisional Act. The Basic Plan under the Provisional Act modernized Japan’s die and mold industry through several concrete measures.

Table 3. Examples of target precision according to the Basic Plan

| Product Type Quality Category | Die cast | Plastic | Forging Industry | Press (punching) | Press (drawing) | Powder metallurgy |
|---|-----------------------|----------------|------------------|---|--------------------|----------------------|
| Absolute value of error (millimeters) | $\leq 1/100$ | $\leq 1/100$ | $\leq 3/100$ | $\leq 1/100$ for large $\leq 1/1000$ for small | $\leq 5/1000$ | $\leq 5/100$ |
| Roughness of the Finished surface(S) | ≤ 0.4 | ≤ 0.4 | ≤ 0.8 | ≤ 0.8 | ≤ 0.4 | ≤ 0.4 |
| Life expectancy (cycle) | $\geq 50,000$ | $\geq 100,000$ | $\geq 5,000$ | $\geq 1,000,000$ per grinding | $\geq 25,000$ | $\geq 20,000$ |
| Material | JIS standard or above | | | | | |
| Hardness (Rockwell) | 47-50 | 47-50 | 40-50 | 58-62 | 58-62 | 53-62 |

Source: MITI, Basic Plan for Die and Mold Industry Rationalization, Announcement No. 307 (Sep. 15, 1956), 2.

²⁷ Regarding expected production values, the vertical axis listed die cast, plastic, and other materials, and the horizontal axis listed years. For each company, expected value for each year was clearly stated. It was a very detailed policy implementation plan. See MITI, Basic Plan for Die and Mold Industry Rationalization Reference Document, 307 (Sep. 15, 1956).

Table 4. Production facilities improvement in die and mold companies

| | | 1958 (1,164 factories) | | | | | | | | 1964 (961 factories) | | | | | | | |
|---------------------------|---------------------------------|------------------------|-----------------|---------------|-----------------|------------|-----------------|----------|-----------------|----------------------|-----------------|---------------|-----------------|------------|-----------------|----------|-----------------|
| | | < 5 years | | 5 to 10 years | | > 10 years | | Subtotal | | < 5 years | | 5 to 10 years | | > 10 years | | Subtotal | |
| | | No. | No. per company | No. | No. per company | No. | No. per company | No. | No. per company | No. | No. per company | No. | No. per company | No. | No. per company | No. | No. per company |
| Specialized machinery | Milling machine | 261 | 0.2 | 307 | 0.3 | 1,712 | 1.5 | 2,280 | 20. | 1,482 | 1.5 | 628 | 0.7 | 1,011 | 1.1 | 3,121 | 3.2 |
| | Die sinking machine | 157 | 0.1 | 63 | 0.1 | 149 | 0.1 | 369 | 0.3 | 645 | 0.7 | 142 | 0.1 | 107 | 0.1 | 894 | 0.9 |
| | Engraving machine | 88 | 0.1 | 44 | 0 | 66 | 0.1 | 198 | 0.2 | 167 | 0.2 | 69 | 0.1 | 43 | 0 | 279 | 0.3 |
| | Profile grinding machine | Included in grinde | | | | | | | | 92 | 0.1 | 42 | 0 | 33 | 0 | 167 | 0.2 |
| | Subtotal | 506 | 0.4 | 414 | 0.4 | 1,927 | 1.7 | 2,847 | 2.5 | 2,386 | 2.5 | 881 | 0.9 | 1,194 | 1.2 | 4,461 | 4.6 |
| Rationalization machinery | Boring machine | 21 | 0 | 17 | 0 | 93 | 0.1 | 131 | 0.1 | 143 | 0.1 | 24 | 0 | 56 | 0.1 | 223 | 0.2 |
| | Jig boring machine | 79 | 0.1 | 17 | 0 | 88 | 0.1 | 184 | 0.2 | 244 | 0.3 | 82 | 0.1 | 77 | 0.1 | 403 | 0.4 |
| | Grinders | 683 | 0.6 | 267 | 0.2 | 1,127 | 1.0 | 2,077 | 1.8 | 1,528 | 1.6 | 735 | 0.8 | 659 | 0.7 | 2,922 | 3.1 |
| | Subtotal | 783 | 0.7 | 301 | 0.3 | 1,308 | 1.1 | 2,392 | 2.1 | 1,915 | 2.0 | 841 | 0.9 | 792 | 0.8 | 3,548 | 3.7 |
| Special machinery | Honing machine | 24 | 0 | 11 | 0 | 15 | 0 | 50 | 0 | 83 | 0.1 | 32 | 0 | 26 | 0 | 141 | 0.1 |
| | Discharge machine | 78 | 0.1 | 2 | 0 | 4 | 0 | 84 | 0.1 | 240 | 0.3 | 80 | 0.1 | 21 | 0 | 341 | 0.4 |
| | coldhopping | 16 | 0 | 8 | 0 | 62 | 0.1 | 86 | 0.1 | 15 | 0 | 11 | 0 | 27 | 0 | 55 | 0.1 |
| | Subtotal | 188 | 0.1 | 21 | 0 | 81 | 0.1 | 290 | 0.2 | 338 | 0.4 | 123 | 0.1 | 74 | 0.1 | 535 | 0.6 |
| General purpose machinery | Lathe | 425 | 0.4 | 730 | 0.6 | 3,731 | 3.2 | 4,886 | 4.2 | 2,046 | 2.1 | 1,006 | 1.0 | 2,211 | 2.3 | 5,263 | 5.4 |
| | Boo-bank Chilling machine | 1,228 | 1.1 | 680 | 0.6 | 1,516 | 1.3 | 3,424 | 2.9 | 1,877 | 2.0 | 1,118 | 1.2 | 909 | 0.9 | 3,904 | 4.0 |
| | Flat surface grinder | 21 | 0 | 38 | 0 | 347 | 0.3 | 406 | 0.3 | 237 | 0.2 | 106 | 0.1 | 216 | 0.2 | 559 | 0.6 |
| | Shaping machine | 275 | 0.2 | 347 | 0.3 | 1,613 | 1.4 | 2,235 | 1.9 | 867 | 0.9 | 440 | 0.5 | 866 | 0.9 | 2,173 | 2.3 |
| | Slotter | 25 | 0 | 34 | 0 | 252 | 0.2 | 311 | 0.3 | 79 | 0.1 | 73 | 0.1 | 181 | 0.2 | 333 | 0.4 |
| | Other metal machining equipment | 263 | 0.2 | 128 | 0.1 | 268 | 0.2 | 659 | 0.6 | 962 | 1.0 | 564 | 0.6 | 388 | 0.4 | 1,914 | 2.0 |
| | Subtotal | 2,237 | 1.9 | 1,957 | 1.6 | 7,727 | 6.6 | 11,921 | 10.2 | 6,068 | 6.3 | 3,307 | 3.5 | 4,771 | 5.0 | 14,146 | 14.7 |
| Total | | 3,644 | 3.1 | 2,693 | 2.3 | 11,043 | 9.5 | 17,380 | 14.9 | 10,707 | 11.1 | 5,152 | 5.4 | 6,831 | 7.1 | 22,690 | 23.6 |

Notes

(1) Discrepancies may exist due to rounding of numbers for each company

(2) Other metal machining equipment is included under the general purpose machinery since its content was not specified.

Source: Japan Die & Mold Industry Association Twentieth Anniversary Annals Compilation Committee.

3.2 Financial Support Measures

As a financial support measure to realize aforementioned costly capital investment, the Basic Plan initially estimated approximately 1 billion yen worth of investment. But die and mold companies were mostly small- and medium-sized companies with limited financial muscle. Therefore, Basic Plan Reference Document stated, “in general, it is difficult to improve the standard for aforementioned purposes without special measures. Based on the Provisional Act, die and mold companies were promoted through the Development Bank of Japan (DBJ)’s special

interests and direct loans from Japan Finance Corporation for small- and medium- Enterprise (JFC-SME)” and planned special financing by both DBJ and JFC-SME.

DBJ had a loan with flexible collateral principally to only purchase specified equipment at the rate of 6.5% per year with the period of redemption set at approximately 10 years. Since the standard interest rate of DJB was 9% at the time, 6.5% was a special low rate. However, the total loan from the DBJ to die and mold companies between 1957 and 1961 was 397 million yen, or only 3.5% of

the bank's total loan for a whole machinery industry (11.2 billion yen). Therefore, it is difficult to assume that DBJ alone played a major role in modernization of the die and mold industry facilities.²⁸ DJB was one of the most powerful and prestigious banks designed to finance Japan's recovery from the war defeat. It financed mainly large industrial industries such as steelmaking, shipbuilding, coal mining and so on. The fact that DBJ was designated to finance the die and mold industry meant that the industry was recognized one of the important industries for the recovery.

In addition to DBJ, the Provisional Act anticipated loans from Japan Finance Corporation for Small and Medium Enterprise (JFC-SME). But its interest rate was high at 9.6% and was essentially to purchase supplementary facilities other than specified machinery or as long-term operational capital that were outside of the scope of loans by DBJ. The loans by JFC-SME became more significant after the duration of the Provisional Act was extended by five years. At the time, specified machinery loans for 3 billion yen was allowed for JFC-SME, in addition to the 7 billion yen allowance for DBJ. The high interest rate of JFC-SME was lowered to 7.5% to 7.6% by some measures including an exemption of a part of the interests for a certain period of time. As a result, 10.1 billion yen was financed for specified machinery by September 1963. For the die and molding industry, 380 million yen, or 3.8% of the total loan was financed.²⁹

However, since Honda Motor Co., Ltd. alone planned to purchase a total of 450 million yen in 1952, the loan amount of 397 million yen from DBJ and 380 million yen from JFC-SME to die and mold companies were not very large. Those loans from

DBJ, however, played more important role than what the amount indicated, since DBJ's financing had a pump priming effect, encouraging co-financing from commercial banks. According to the document by DBJ showing the status of financial procurement for specified machinery between 1956 and 1960, 32% was from Development bank, whereas 51% was self-financing and 17% was from others such as JFC-SME and commercial banks. Similar rates are assumed to have been the case with the die and mold industry.³⁰ In reality, a president of Japan Die & Mold Industry Association, in his interview, stated, "when you get a loan from DBJ as facility capital, principally, the same amount of money was self-financed." It is fair to assume that co-financing by commercial banks for approximately the same amount with the loan from DBJ happened.³¹ This pump priming effect suggests that the impact of the loans by DBJ under the Provisional Act should be evaluated not only by the amount of loans but also by the trigger effect for co-financing. This effect is particularly important since die and mold companies were so small in size that they had difficulty securing loans from commercial banks. Combined with indirect impacts to be discussed later, the impact of the loans by DBJ was greater than the actual loan amount.

3.3 Expansion in Size and Japan Mold Export Co., Ltd. as a Joint Act

There was pressure for die and mold companies to expand their size, because the Basic Plan exemplified a future appropriate size would be 111 employees, and imposed the regulation that a company to be selected for promotion must "have 30 or more employees, 15 of whom with at least

28 Development Bank of Japan Tenth Anniversary Annals Compilation Committee, 297.

29 Japan Finance Corporation for Small and Medium Enterprise, Ten-Year History of Japan Finance Corporation for Small and Medium Enterprise, (Tokyo: Japan Finance Corporation for Small and Medium Enterprise, 1964), 372.

30 Development Bank of Japan Tenth Anniversary Annals Compilation Committee, 1963, 298.

31 Katsutaro Kuroyanagi, interview by Seiichiro Yonekura, November 18, 1987, MITI, Tokyo, Japan. Kuroyanagi was the President of Japan Die & Mold Industry Association and chairman of Meiki & Company, Ltd. at the time.

5 years of experience.” Table 5 shows the change in the number of business entities and their size between 1971 and 1983. Without the data in the 1960s, it is difficult with this data (from 1971 and 1983) to observe a strict correlation. However, assuming that the Provisional Act whose duration was extended twice, actually began to assert its impact in the 1970s is not so unnatural. We can extract some realities from these numbers to some extent. The number one reality is that the number of business entities with fewer than 10 employees did not decline in the 1970s, but increased from 70% to 80%. The Provisional Act alone could not expand the business size. Since it was a highly labor-intensive industry based on the built-to-order manufacturing style, an expansion of business size was a mere desktop theory. During the 1960s, there were many small companies that started only with a lathe, seeking increasing business opportunities

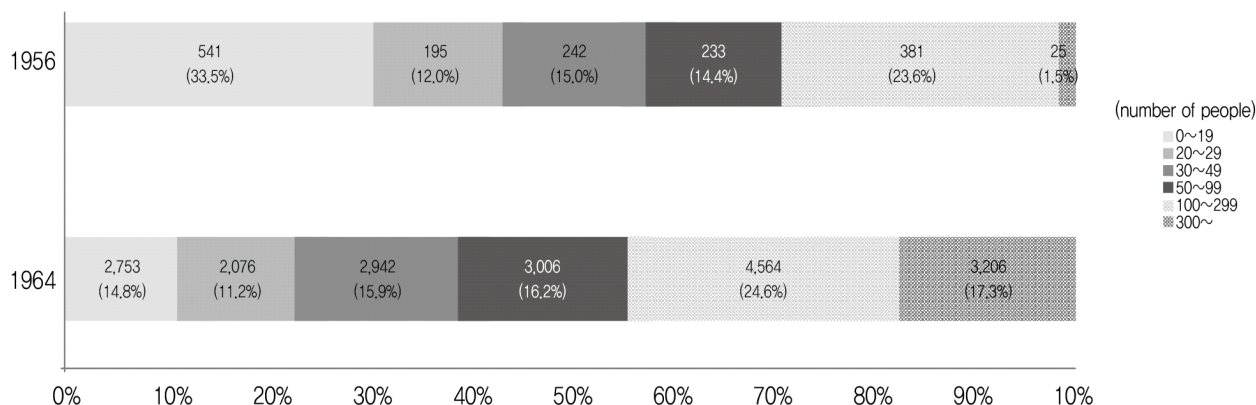
thanks to the rapid growth of the machinery assembly industry.

On the other hand, according to the survey by Japan Die & Mold Industry Association on the size-based sales among specialized companies, the ratio of those with 10 or fewer employees that sold 33.5% of the entire industry sales in 1956 shrunk by half to 14.8%. Companies that had 300 or more employees that manufactured only 1.5% of the total sales in 1956 produced 17.3% of the entire sales in 1964. Combined with companies with 100 or more employees, they produced 41.9% of the overall sales (Figure 2). Therefore, although the Provisional Act did not achieve the expansion of the die and mold industry, it is possible to say that it promoted modernization and rationalization of large companies with 100 and more employees and middle-sized companies, while bringing them high productivity and added value production.

Table 5. Changing numbers of employees: mold manufacturing business entities

| | Business entities | Employees | Fewer than 10 employees (%) | Fewer than 20 employees (%) |
|------|-------------------|-----------|-----------------------------|-----------------------------|
| 1971 | 4,589 | 48,083 | 74.7 | 89.4 |
| 1972 | 5,950 | 56,937 | 77.7 | 91.4 |
| 1973 | 6,090 | 54,311 | 79.0 | 91.9 |
| 1974 | 6,243 | 51,743 | 81.3 | 92.5 |
| 1975 | 7,144 | 54,693 | 83.2 | 93.5 |
| 1976 | 7,409 | 54,096 | 83.9 | 93.8 |
| 1977 | 7,684 | 56,821 | 83.8 | 93.5 |
| 1978 | 8,709 | 63,763 | 84.3 | 93.7 |
| 1979 | 8,977 | 67,897 | 83.8 | 93.7 |
| 1980 | 9,231 | 69,072 | 83.7 | 93.3 |
| 1981 | 9,934 | 76,539 | 82.4 | 93.3 |
| 1982 | 9,874 | 80,589 | 80.9 | 92.0 |
| 1983 | 11,494 | 90,571 | 82.4 | 92.6 |

Source: Industrial Statistics (Industry Edition)

Figure 2. Sales by size of companies

Source: Japan Die & Mold Industry Association. Die and Mold Industry Structure Survey Report (1965), 9. (unit: million yen)

In addition, the Provisional Act permitted joint acts by companies to rationalize the industry. This joint act included a cartel to dispose of equipment upon the purchase of new one, since such a mechanism did not exist in the die and mold industry. Japan Mold Export Co., Ltd was approved in 1959 as the industry's joint act to collaboratively export molds. This firm not only executed export business on behalf of small die and mold companies with little export experience, but also spread export-related information through the Industry Association, and played a significant role during the early phase of the export business. Because of this joint act, Japan ranked number one with 165.2 billion yen in its export, while Germany ranked second with about 86.1 billion yen and the U.S. ranked third with about 79.1 billion yen as discussed before.

To summarize direct impacts that the Provisional Act had on the die and mold industry, it can be summarized as following.

- (1) Of the twenty-four articles of the Provisional Act, what was most important was not the Act itself, but the Basic Plan drafted by the Machinery Industry Council's Molding Subcommittee established upon the enactment. Since participating members of the subcommittee included not only the industry

members but also intellectuals and mold users, it was able to be clear on promoted companies and promotional standards that were reflected of the actual condition.

- (2) The Basic Plan set detailed rationalization targets and encouraged introduction of advanced machinery. It supported special financing from the Development Bank of Japan (and later Japan Finance Corporation for Small and Medium Enterprise). Although the loans were not great in quantity, they had a pump priming effect allowing small company owners to receive co-financing from commercial banks.
- (3) As a result, Japan's die and mold industry witnessed an increase in the rate of machinery introduction and modernization.
- (4) As for the business expansion that the Basic Plan encouraged, it looked as though it was effective because the number of companies with 19 or fewer employees declined while yield of large companies with 300 or more employees increased ten times. But the number of companies with fewer than 10 employees increased by 7.7%. The reason is assumed to be because as a specialized industry, the die and mold industry grew from 10.6 billion yen in 1957, 148.4 billion yen in 1970, and

1.3614 trillion yen in 1985 and offered many business opportunities through which very small business could be started.

- (5) In addition, with the establishment of Japan Mold Export Co., Ltd to conduct mold exporting business as the industry's joint act, exporting became realistic for small die and mold companies.

4. Indirect Impacts of the Provisional Act

A surface-level analysis of the Provisional Act, comprised of total of 24 articles, shows the importance of the special financing measures through Development Bank, approving of joint acts including a cartel, and others. But what has been revealed through the analyses of actual cases in the process of the die and mold industry modernization is the importance of not only the impacts of the Provisional Act alone but of the direct and indirect impacts that the Act's implementation had. Without understanding the process and especially its indirect impacts, the effectiveness of the Provisional Act cannot be understood. The Provisional Act targeted the machinery industry such as basic machinery, common parts and components, but many were small- and medium-sized companies. The die and mold industry that this article has been focusing on was mostly local factories with fewer than ten employees, even though they were an important basic part of mass production. It is no exaggeration to state that the rise in the competitiveness of the machinery assembly industries such as automotive and electronic machinery heavily relied upon the rise in the competitiveness of die and mold companies. This section will examine the indirect impacts that the implementation of the Provisional Act had over the promotion of medium-to-small companies.

4.1 A Signaling Effect of the Strategic Intent

As stated above, the most important indirect impact of the Provisional Act was that it categorized small and diverse companies as an industry. Until then, die and mold companies had been considered as subsidiaries that manufactured anything from bottles for soda water to the mold for the body of a car. It was meaningful that MITI specified them as an industry and promoted as an industry. On this point, Hitoshi Okita, the president of Fuso Machine & Mold Mfg. Co. Ltd. stated the following.

Let me explain the sequence of events that led me to participate in the industrial association. Glass manufacturers in Osaka had what was called the Glass Mold Cooperative Society. We thought that mold manufacturers like us were just supporting the glass manufacturers and were not expecting to have own industrial association. But I heard from Mr. Namie and Mr. Yamada that they belonged to the Osaka Prefecture Die and Mold Industry Union so they let me become a part of it.³² Furthermore, they joined together to make a die and mold industry association in Japan. I still remember it clearly the day when Mr. Namie and others led the process in Kamihoncho, Osaka. I can remember it as if it was yesterday how truly happy I was that the die and mold industry was recognized as an independent industry.³³

As this example shows, the fact that the government organized the die and mold industry, which was difficult to be recognized as such, was a clear signal to affiliated companies that it considered their industry to be “an important and strategic industry.” This signal was, especially because the die and mold industry was diverse and small, encouraging.

These actions were further strengthened by the special loans by Development Bank of Japan, a powerful and prestigious government financial entity.

32 Mr. Namie was the president of Showa Seiki Co., Ltd. Mr. Yamada was the president of Yamada Mold.

33 Japan Die & Mold Industry Association Thirtieth Anniversary Annals Compilation Committee, 183.

As Article II of Development Bank of Japan Act stated, the bank “[promoted] the recovery of economy and development of industries by providing long-term capital,” its purpose was fundamentally considered to loan to significant industries for the recovery of the Japanese economy such as the electric, coal, and steel industries. In reality, most of the loans by DJB were given to these important industries. Therefore, to receive a loan from DBJ meant that the industry bore the responsibility to “recover Japan and develop industries.” It is not difficult to imagine the sense of pride felt by the die and mold industry that received this particular kind of loans. Kuroyanagi summarizes this as following.

The loans from the Development Bank of Japan were 8 million yen in 1960, and 12 million yen in 1961, totaling 20 million yen. They were not so much. But it gave us a sense of pride. The brown envelops of my colleague’s company that received the loan even proudly said, “Corresponding Bank: The Development Bank of Japan,” in print. So it was a bit sad when the loan source moved later from DBJ to Japan Finance Corporation for Small and Medium Enterprise.³⁴

These are the proud words of Mr. Kuroyanagi who started his business as a small factory after having a lathe donated from Tokyo Keiki. Similar to Mr. Kuroyanagi, other managers that received loans from DBJ also mentioned similar comments, suggesting how special DBJ loan meant. It was already mentioned that the loan from DBJ had the premise of co-financing that a half of the loaned amount had to be self-financed, enabling the pump priming effect for commercial banks. However, the loans from DBJ had a larger impact, since a loan from DBJ was “proof of the government’s support.” It was a great sense of motivation for the managers of small companies that had about ten employees

and that had little to do with the government.

The Provisional Act had indirect impacts more than just its articles. For a group of small companies, being promoted as an industry alone was a strong signal from the government that they were recognized as a “designated important industry,” and raised the motivation for corporate management. As will be discussed in the following section, for owners of small-medium sized companies receiving a loan from DBJ was time consuming and cumbersome in terms of preparation. Therefore, for medium-to-small business owners, this signal was an incentive that was more significant than the having to worry about the intricacy of the process.

4.2 Management Improvement Impact

The die and mold companies that had been recognized as an industry by the Provisional Act saw a rising level of motivation through the loans from the DBJ. The next indirect impact it experienced was improvement in management. In industry promotion, special financing and subsidies are common. But these monetary incentives alone have rarely achieved an improvement in competitiveness in a developing nation. There is a need for a monitoring function to make sure that loans are effectively used and for a system that will improve corporate management skills. The loans from DBJ via the Provisionary Act had integrated this mechanism within it. Especially because the die and mold companies had sloppy bookkeeping, the Provisional Act used DBJ loans to modernize not only facilities but also management. Akiji Kamiya, the President of Sanshu Finetool Co., Ltd. remembers the skills before the Provisional Act as following.

We made the hour hands for clocks and watches. But it was all manually pressed. Even foreign hour hands could have been miraculously copied, as long as we could see a sample. Of course,

34 Katsutaro Kuroyanagi, interview by Seiichiro Yonekura, November 18, 1987, MITI, Tokyo, Japan. Kuroyanagi was the chairman of Meiki & Company, Ltd. at the time.

*without any drawings, we used a boring machine, a filer and a chisel. My father made me do this since 1942, or since I was in junior high school.*³⁵

For these “premodern” companies, receiving loans from DBJ required significant improvement in basic management including bookkeeping, business planning, repayment schedule, and others. Upon application for a loan, DBJ required that the company would submit 14 different pieces of paperwork including an outline of the company, summary of long-term facility planning, production summary and detailed production plan, fund management plan, personal distribution plan, and balance sheet and income statement.³⁶ The content was very detailed and the provided formats had to be followed. Companies spent substantial efforts to create these documents.

Many of the interviewees talked about “a truck loads of” documents, countless number of book correction, and other troubles that they underwent as they applied.³⁷ For relatively large companies at the time, DBJ loans brought further improvement in management. Mr. Kuroda, who was at the time the president of Kuroda Gauge Manufacturing Company and the Chairman of the Japan Die & Mold Industry Association, commented that the screening process of DBJ was strict but trained managers and workers basic financial concepts in corporate management such as “direct cost accounting method and the break-even point.”³⁸ As these examples show, the Provisional Act not only allowed simple financial support but brought indirect impact on the improvement of small business

management through its screening process of business plans and repayment schedules to make sure that loans would be effectively used.

4.3 Skill Improvement Impact

One of the interesting issues about the indirect impacts of the Provisional Act was how much it influenced the increase of workers’ skills. On this matter, we can see four effects there.

The first effect, through the Basic Plan, was what used to be manual labor was standardized and it was made clear what machinery was needed to attain this objective. Specifically speaking, the Basic Plan clarified the margins of error, roughness of the finished surface, life expectancy of products, the use of the JIS (Japanese Industrial Standards), and other standards (Table 6). Next, the Basic Plan listed specific “kinds of equipment that must be newly introduced.” The use of the loans from DBJ to introduce these specified equipment enabled effective correlation between the improvement of skills and modernization of facilities.

Second, as DBJ financed, it had conducted stringent worker skill screening, offered skill training, and provided facility-related advice, to improve skills. For example, at Kuroda Gauge Manufacturing Company, when it received a loan from DBJ, an advisor from the bank, who used to be a technical advisor in the military, functioned as an engineer for the introduction of new equipment. Similarly, Toyota Machine Works, Ltd., a machine tool manufacturer, also underwent a strict skill screening.³⁹ As the Screening Division of

35 Japan Die & Mold Industry Association Thirtieth Anniversary Annals Compilation Committee, 183.

36 See Japan Society for the Promotion of Machine Industry, Manual for Special Loans upon the Provisional Act for the Promotion of the Machinery Industry (Tokyo: Japan Society for the Promotion of Machine Industry, 1962). This manual stipulated very detailed regulations to receive a loan, showing how stringently the Development Bank was examining loan recipients.

37 Shigemitsu Asai, interview by Seiichiro Yonekura, November 26, 1986 at MITI and Katsumi Nanjo, interview by Seiichiro Yonekura, May 13, 1988 at MITI, Katsutaro Kuroyanagi, interview by Seiichiro Yonekura, November 18, 1987 at MITI. Asai was the chairman of Toyota Machine Works Ltd. Nanjo was the President of Tonan Drop Forging Co., Ltd. These interviews and others report stringent selection processes.

38 Shoichi Kuroda, interview by Seiichiro Yonekura, January 27, 1989 at MITI. Kuroda was at the time the president of Kuroda Gauge Manufacturing Company and the Chairman of the Japan Die & Mold Industry Association.

39 Similarly, interviews with Kuroda and Asai show that skill screening was strict but useful. An interview with Toyota Machine Works, Ltd. revealed that skill information and legal information from abroad provided through the Provisional Act was useful to plan its strategy.

DBJ wrote, “since screening involves technical knowledge and judgments, fifteen to sixteen part-time technicians work to mainly research on technical issues.”⁴⁰ As this shows, dedicated technical screeners conducted skill screening upon the procurement of specified machinery. However, the Provisional Act or DBJ did not instruct companies to buy a specific machine or technology. From the interviews, it has been confirmed that the “technical selection was left to companies.” This is assumed to have been because companies’

autonomous judgments were emphasized. In addition, the fact that bureaucrats and government-related financial entities were not involved in the selection of specified machinery is a proof that they had no interests in machinery procurement. As far as the Provisional Act was concerned, there was no intervention to private companies that could easily become a hotbed for corruption. It was an important characteristic of Japan’s industrial policy that the government remained neutral from the procurement of specified machinery.⁴¹

Table 6. Overseas dispatch by Japan Die & Mold Industry Association FY 1958 ~ FY 1972

| FY | Country | Purpose | Notes |
|-----------|------------------------|-------------------------------|--|
| 1958 (33) | USA | Facility Visit | From Japan Productivity Center |
| 1959 (34) | South East Asia | Market Research | Commissioned by JETRO |
| 1960 (35) | Canada, USA | Market Research | Commission to JETRO |
| 1961 (36) | Australia, Philippines | Market Research | Commissioned by JETRO |
| 1962 (37) | Europe | Industry Research | From Productivity Center |
| 1963 (38) | Israel, South Africa | Market Research | Commissioned by JETRO |
| 1964 (39) | ----- | | |
| 1965 (40) | Mexico | Market Research | Commission to JETRO |
| 1966 (41) | Brazil, New Zealand | Market Research | Commission to JETRO |
| 1967 (42) | Germany | Trade show and Plant Visit | Hosted by Japan Management Association |
| | USA | Market Research | Commission to JETRO |
| 1968 (43) | Italy | Market Research | Commission to JETRO |
| 1969 (44) | Spain, USA | Market Research | Commission to JETRO |
| 1970 (45) | Europe | Industry Research | |
| 1971 (46) | West Germany | Market Research | Commission to JETRO |
| 1972 (47) | Singapore | Market Research | Commission to JETRO |
| | USA | Int’l conference attendance | |

Source: Japan Die & Mold Industry Association Thirtieth Anniversary Annals Compilation Committee

The third was that in order for a company to be considered for the Provisional Act, the Basic Plan stipulated that the company had to have “three or more employees who graduated from a high school under the prewar system of education, studied mechanical engineering, and worked in mold

manufacturing for five years, or those with equivalent experiences.” The plan attempted to improve the worker skill level by hiring more technicians. It is difficult to follow how strictly this condition was followed, and was probably not followed especially in the die and mold industry in which most of the

40 Development Bank of Japan, *Development Bank of Japan and Its History*, (Tokyo: Development Bank of Japan, 1958), 30-31.

41 Ezra Vogel, *Japan as number one: Lessons for America* (Cambridge: Harvard University Press, 1979)

companies had about ten employees. However, the fact that the plan clearly stated the required number of technicians in addition to the standardization of precision and optimal size of a company, meant that the promoted companies should have a clear corporate vision/direction.

Last, as the fourth indirect impact of the Provisional Act on the skill improvement was the information provision, collection, and spreading through the MITI, DBJ, and the Industrial Association. Table 7 is the list of “foreign industry and market research” conducted by the Industrial Association through Japan Productivity Center and JETRO under MITI, starting in 1958, the year after the foundation of the association. Over these fifteen years, there was a research trip abroad about once a year. The fact that association members joined the visit to the U.S. with Japan Productivity Center’s Productivity Team was meaningful in both modernization of facilities and market development. As for the modernization of facilities, Koji Namie, the honorary chair of the Industry Association, who accompanied the Productivity Team to the US, explained its impact as following.

Since I did not know anything but Japan, I was impressed with the US companies. We visited about twenty die and mold factories by starting from San Francisco to around all over the US. Their products were not so refined, but they had facilities we had never seen before. In any case, I returned to Japan so inspired with my conviction that without a proper die and mold industry, the machinery industry and any other industry could be ever prosper. I think it was only after this trip that Japan’s modern die and mold industry began.⁴²

Technical information gathered through these foreign research trips was spread to members via monthly newsletters, workshops, and research meetings of the Industrial Association. The die and mold skill workshop held by the Small and Medium

Enterprise Agency and sponsored by Japan Die & Mold Industry Association were structured as a place to introduce die and mold manufacturing methods using the latest technology, starting in 1962. Visits abroad also had a role in market expansion, in addition to technical information. The most significant information was that “in the US., they charge about 3,000 yen per hour.” Since Kuroda Gauge Manufacturing Company, a major corporation at the time, charged 10%, or 300 yen per hour, members realized that “there was a sales opportunity.”⁴³ In 1959, the Industry Association established the Export Committee and later the Japan Mold Export Co., Ltd. as an organization that would work on estimates for exporting and several paper works for export (contract terms, trade-related administrative work, and others). Lively information brought back from technical and market research trips showed that foreign die and mold production was “not refined,” and “Japan charged less than 10%,” enabling its members to realize that as long as skills were improved, there was a prospect in the world market. It was an opportunity for Japan’s die and mold companies to look at the overseas market.

In addition, when the Ministry of Labor included die and mold as a National Trade Skill Test category in August 1959, the Industry Association fully supported its paper and skill tests, which made a significant contribution to the rise in skill standard. The test was conducted annually after that. Not only were grade certifications were given, it became a category in the Skills Olympics, providing high motivation to the technicians/workers of the die and mold industry. Rationalization through the Provisional Act not only standardized products and promoted the introduction of new technology and equipment, but also promoted standardization and improvement of the skills of technicians and workers.

42 Japan Die & Mold Industry Association Thirtieth Anniversary Annals Compilation Committee, 191.

43 Japan Die & Mold Industry Association Thirtieth Anniversary Annals Compilation Committee, 192.

5. Conclusion: Information Bilateralism and Corporate Autonomy

The Provisional Act was a relatively simple act comprising of 24 articles aiming to promote the basic machinery and common components and parts that were to essential to the international competitiveness of machinery industries such as automotive, electric appliance, consumer electronics and so on. The Act had three pillars for promotion measures:

- 1) drafting the rationalization standard,
- 2) securing funds for rationalization, and
- 3) allowing joint acts to promote rationalization.

With this simple act as a turning point, rationalization of Japan's automotive parts, machine tool, die and mold industries that have been the focus of this article were promoted, resulting in the formation of the basis for the international competitiveness of later days. However, it is too hasty to assume that that the expansion of the industry was possible just because of the industrial policies with 24 articles led by the government namely MITI. Instead, without understanding the actual process of the Provisional Act's implementation, the relationship between the rise of competitiveness among promoted companies and the Act, and the reality of the Provisional Act could not be understood. This article aimed to analyze this specific process through the die and mold industry as a case study.

The most significant characteristic of the Provisional Act implementation through the case of the die and mold industry was the bilateral nature of the information between the government and companies. Because of the bilateral nature, it enabled a group of small companies, that traditional industrial policies would have ignored and that were difficult to be turned into an industry, to be gathered as an independent "industry."

What becomes most difficult as a policymaker while promoting an industry made up of fragmented small

and medium companies such as in the machinery industry is to understand the nature and the structure of diverse companies and build up a program without missing critical components of it. We conclude the Provisional Act was superior, because it took advantage of the private companies' autonomy and voluntariness to establish the die and mold industry as if they did spontaneously. That was neither the top-down decision by MITI nor bottom-up from companies. It stemmed from two ways communication between MITI and private firms.

Similarly, information was exchanged two ways during the drafting of the Basic Plan. Its details were determined by the Industry Association and the Rationalization Council that included not only bureaucrats and industry's participants but also intellectual scholars and mold users. These organizations were located in-between the government and companies and included diverse participants. As a result, the Basic Plan was detailed with very precise numeric targets at the level that bureaucrat-driven scheme could not achieve.

In this manner, the information regarding the implementation of the Provisional Act showed the bilateral flow between the government and companies. It was not an information-processing-based policy model in which orders were sent one way from the government to companies, as was seen in the wartime controlled economy and socialist planned economy. It was an information-generation-based policy model in which information from each other is shared in various ways to generate new information.

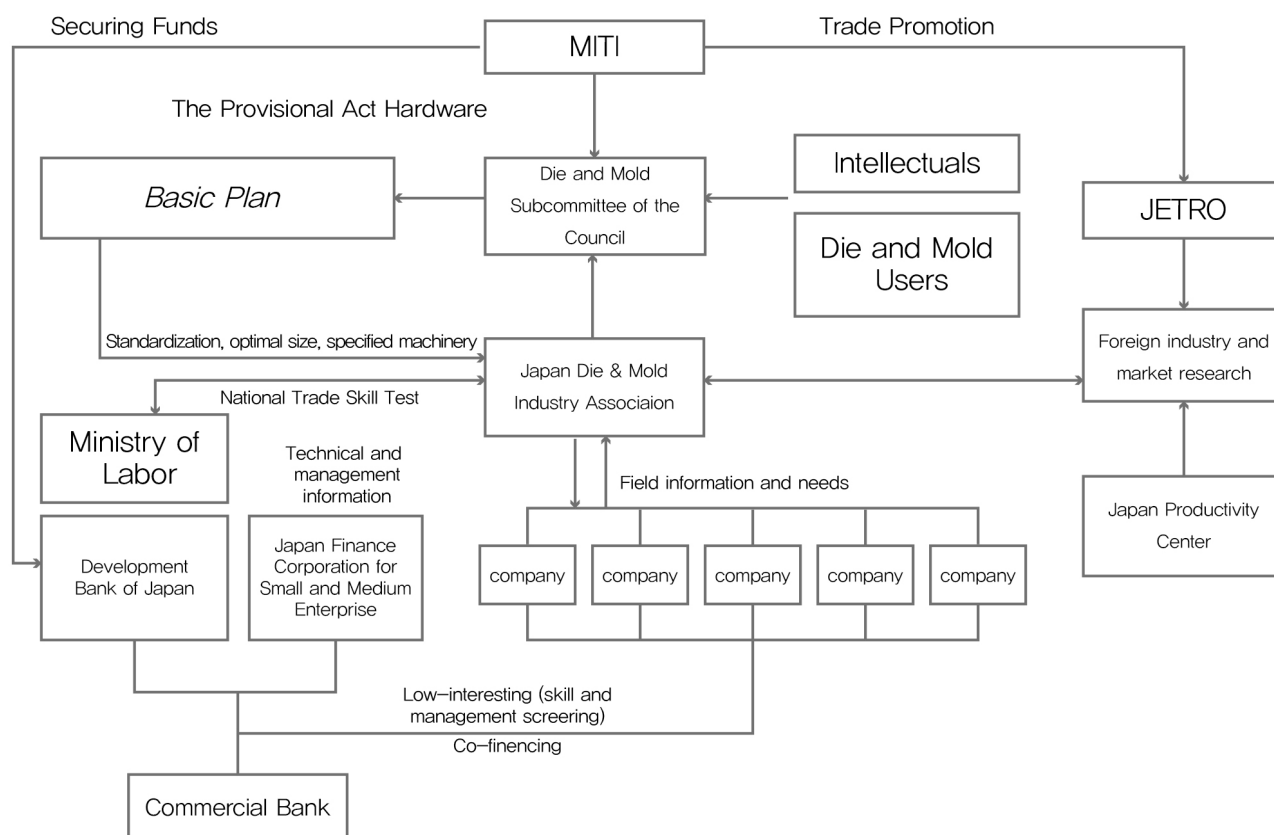
Another important aspect is closely related to the aforementioned bilateral nature of information. It was that the implementation of the Provisional Act presupposed the autonomy of private companies. In addition to the ways in which companies voluntarily participated in specifying policies including rationalization plans, the private positive involvement principle was applied for funding and procurement. The Act required companies that "a half of the

rationalization investment fund must be self-financed,” and “the selection of machinery to be procured would be left to the company.” The Provisional Act was not a policy to realize a government-driven industry development but a set of policies to complement companies’ autonomy to attain their goals. As recent theories on organizations have revealed, an organization would asserts its greatest power when it is given an abstract goals and autonomy.⁴⁴ In addition to the information bilateralism, the Provisional Act subconsciously included the structure to underscore the autonomy of companies.

The Provisional Act’s emphasis on the two-way information sharing and corporate autonomy created

a dynamic relationship between the government and companies and enabled the simple Act to be practical. This part is what can be called the software of the Provisional Act. As Figure 3 shows, the Provisional Act placed the Industry Association, the Council, DBJ, JFC-SME, JETRO (Japan External Trade Organization), and other organizations between MITI and individual companies, in order to structure a policy model in which information is accumulated and spread through an essential flow of funds and skills. In this environment, facilities, loans, technology, and market were organically combined, and the systemic industrial promotion was achieved at low cost.

Figure 3. Flow of information and funds through the provisional act



44 About the autonomy and creativity of an organization, see Chapter 4 of Nonaka. Corporation Evolution Theory or Nonaka and Takeuchi, “The New Product Development Game,” Harvard Business Review, Summer 1986

Without understanding the implementation process of the Provisional Act and know-how or software of information generation, one cannot examine Japan's industrial policies and reveal the essential difference from wartime controlled economy or socialist planned economy. The Provisional Act was not a top-down industrial policy, but was a dynamic policy that generated, accumulated, and spread knowledge between the government and companies, based on corporate autonomy. It was a policy model that can be called the information generation model by a dynamic interaction between the government and companies.

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